STUDY OF PROPORTIONS IN VILLA PLANS OF I QUATTRO LIBRI DELL' ARCHITECTTURA

A THESIS

Submitted in partial fulfilment of the requirements for the award of the degree

of

DOCTOR OF PHILOSOPHY

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ARCHITECTURE

by

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis titled **STUDY OF PROPORTIONS IN VILLA PLANS OF I QUATTRO LIBRI DELL' ARCHITECTTURA** in partial fulfilment of the requirements for the award of the Degree of Doctor of Philosophy and submitted in the Department of Architecture and Planning of the Indian Institute of Technology Roorkee is an authentic record of my own work carried out during a period from January 2008 to March 2012 under the supervision of Professor P. K. Patel, Department of Architecture and Planning, Indian Institute of Technology Roorkee and Dr. Jin-Ho Park, Associate Professor, Department of Architecture, Inha University, Korea

The matter presented in this thesis has not been submitted by me for the award of any other degree of this or any other Institute.

(Mr. BHAVESH MAHENDRA SHAH)

This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

(Jin-Ho Park)
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09/7/12
Signature of External Examiner

ABSTRACT

Thesis title:

STUDY OF PROPORTIONS IN VILLA PLANS OF I QUATTRO LIBRI DELL' ARCHITECTTURA

This 'Abstract' is to render a synoptic overview of the topic, contents, constitutional structure, organizational sub divisions and conceptual motive of this research.

Proportions are relationship of part to the whole and whole to the part. It has been used to define parameters of design in architecture since ages. Proportioning system developed in architecture over a period of time which was evolved, refined and reconstituted during Renaissance period. Significance of theory of proportions and its adaptation in practice peaked during Renaissance period.

Andrea Palladio (1508-1580 A.D.) was renaissance period architect from Italy who wrote his theory of architecture in four books of *'I Quattro Libri Dell' Architecttura'* (written and published in 1570 A.D. Translated into English as 'The Four Books of Architecture'). His theory encompasses the gist of theories of his predecessors and transcends beyond to give a theory which could be universally employed to give meaning to dimensions used in architecture.

As the title of the thesis suggests; aim of this academic exercise with theoretical research base is to develop understanding of Palladio's proportional theory (with respect to his villa plans) in the first book of the *'I Quattro Libri Dell' Architecttura'* and its implementation in villa plans of the second book. It is a research in architectural design theory related to use of proportions in residential planning.

The research could be broadly classified in three parts as follows.

The first part of the research interweaves a theoretical backdrop that laid the theoretical foundation of Renaissance architecture with investigation of principles of sound

formation by Pythagoras (Greek philosopher and mathematician; 6th Century B.C.), philosophy of Principles of composition of world and soul in *'Timaeus'* by Plato (Greek philosopher; 427-347 B.C.), the Theory of Proportions based on study of human anatomy by Vitruvius (Roman architect and engineer; 1st Century B.C.) from his book *'De Architectura'* (translated into English as 'The Ten Books On Architecture'), Theory of Proportion (ratios) for architecture based on 'means', double and triple proportions from Pythagorean Lambda by Leon Battista Alberti (Italian architect; 1404-1472 A.D.) from his book *'De Re Aedificatoria'* (written during 1450-1452 A.D., published in 1485 A.D. Translated into English as 'The Ten Books Of Architecture').

Part two encompasses Theory of Proportion by Andrea Palladio's from his book one of *'I Quattro Libri Dell' Architecttura'* and investigates implementation of his theory in his villa plans illustrated in book two of *'I Quattro Libri Dell' Architecttura'*. The analysis of plan is divided into four parts. First part sets all Palladian Villa plan plates to a scale for comparative overview. Second part redraws all plates to set parameters of wall thickness, door and window size to judge missing dimension and typographical errors of wood cut prints of plates in book two. To understand proportional constitution of plan; in step three all the plans are abstracted to line diagrams. The section four of analysis is to regenerate and reconstruct Palladian villa plans on the assumption of modern day construction technologies of this part of the world (Ahmedabad city, Gujarat state, India) to rekindle planning grammar of Palladio for contemporaries.

The third part of the research shows the adaptation of Palladian Theory of Proportion (seven room ratios) in contemporary context and comparative study with other theories of proportions with aid of test applications. Contemporary test applications are analyzed with help of line diagrams as done in analyzing Palladian plans to observe difference in adaptation of same theory in modern day application and see how contemporary construction material and methods can mold same theory to generate visually different planning grammar.

These three parts of the thesis could be understood as constituted by following major eight sections of study.

1a) The study begins with developing a comprehensive understanding of proportioning systems from pre Renaissance period to have brief idea of major proportioning systems that may have influenced evolution of Palladian theory of Proportions.
1b) The study then delves into theories of proportions developed by Palladio's predecessors of theory namely Pythagoras, Plato, Vitruvius and Alberti that laid the foundation for the formation of Palladio's theory of proportions.

2a) Investigation of Palladio's theory of room ratios follows this. This gives in-depth understanding of Palladio's theory of planning proportions.
2b) This is strengthened with in-depth investigation of Palladian theory of proportion in his Villa plans through systematic drawings and enlists proportions followed in Palladian villa plans.
2c) To analyze the proportions used by Palladio with its derivation and interpretation.

3a) Through set of works from contemporary Indian architecture from Ahmedabad; the thesis aims to demonstrate the adaptability of Palladian theory of seven room ratios in modern day architecture that can function with backdrop of modern day planning requirements, construction method and materials. This is mainly a step to propagate Palladian theory of seven room ratios in new age design thought and practice.
3b) To have a comparative overview of similarities between Palladio's theory of proportion and other related theories of proportions, this thesis studies 'Modulor' by Le Corbusier and Vastu Shahstra. This is taken up to deduce parallel between residential planning grammar of one modern and one ancient theory of proportions with respect to Palladio's theory of planning proportion to set an example that could be presided and enhanced through future extension of this research.
3c) Conclusions presents a palette of proportions; defined, suggested or derived on the basis of Palladio's theory of proportion and theory of proportions by his predecessors. This palette and the table of computed dimensions (presented in appendix 2 and 3) those

are proportionally related render an opportunity for architects and designers of various fields to formulate their planning grammar.

Appendix to this research is in four parts. First part presents bibliographical highlights and summery of prime works of Pythagoras, Plato, Vitruvius, Alberti and Palladio. Second part documents table of dimensions (in foot and inch with their decimal equivalent values) based on Palladian Theory of Proportions as ready reference for designers to derive proportional designs. Third part of appendix documents table of room height (in foot and inch with their decimal equivalent values) based on Palladian Theory of Proportions as ready reference. Part four presents all Palladian plates from *'I Quattro Libri Dell' Architecttura'* book two in its original form; unaltered to have an idea of Palladian design ideology and presentation technique. For better understanding they have been numbered and titled which is missing in Palladio's original plates.

Conclusively; Palladio's theory of seven room ratios has been studied, schematically abstracted, pragmatically inferred and consciously adopted in practice. Largely; a step to revive a fading thought and theory of design from receding into oblivion- a stimulant to resurrect a practical tool of design in architectural theory and practice.

Integrity of Palladio's theory of seven room ratios is to be learned, shared and transmitted.

ACKNOWLEDGEMENTS

I thank everyone who has helped me walk so far in life.
I extend **a** vote of **Palladian gratitude** to
the **faculty, friends, fentabbulous family** and everyone
who has helped me understand and appreciate Palladio's proportional theory.

Bhavesh Shah
06 November 2011.
Eklingji.

***

Expressing it proportionally…

1) A Palladian gratitude : faculty : friends : fentabbulous family :: 6:8:9:12

A = 1	P = 6	G = 7	F = 6	F = 6	F = 6	F = 6
	A = 1	R = 8	A = 1	R = 8	E = 5	A = 1
	L = 2	A = 1	C = 3	I = 9	N = 4	M = 3
	L = 2	T = 1	V = 2	E = 5	T = 1	I = 9
	A = 1	I = 9	L = 9	N = 4	A = 1	L = 2
	D = 4	T = 1	T = 1	D = 4	B = 2	Y = 4
	I = 9	V = 2	Y = 4	S = 9	B = 2	
	A = 1	D = 4			V = 2	
	N = 4	E = 5			L = 2	
					O = 5	
					V = 2	
					S = 9	
1	30 3+0= 3	38 3+8=11 1+1=2	26 2+6=8	45 4+5=9	41 4+1=5	25 2+5=7

1+3+2 =6: 8: 9: 5+7=12

That is 6:8:9:12

2) The number attributed to different letters is based on the number theory of Cabbala (also Kabbalah or Qubbalah). Cabbala from the Hebrew word meaning 'oral tradition' is a private and mystic Hebrew rabbinical tradition of which the Zohar is the basic text. 'Sefer ha-Zohar' meaning book of splendor was developed between 1260-1280 A.D. in Spain. The Hebrew Cabbala, the most ancient of Jewish sources; is the wisdom of life, love, the universe and immortality. It also describes the art of attributing numbers to letters in many ways that was employed by architects of renaissance to derive building or room dimensions from the name of the commissioners or architect himself or religious figures and words. In one of the Cabbalian systems a square is divided into nine sub squares, each of which gets a number and letter values as shown below. All letters in a square gets the same number value. This system does not use the consonants 'J' and 'W' while vowel 'U' is substituted with 'V'.

1	2	3
4	5	6
7	8	9

A K T	B L V	C M X
D N Y	E O Z	F P
G Q	H R	I S

On close investigation of Palladian Villa plates with respect to such Cabbalistic number theory, it is observed that Palladio may have employed derivations of such theory in his practice as follows.

On the basis of Cabbalistic number theory, the numbers 5 and 3 appear to evoke the name of the architect 'Andrea Palladio' as follows:

A=1, N=4, D=4, R=8, E=5, A=1 which adds to 1+ 4+ 4+ 8+ 5+ 1= 23, further as 2+ 3 =5

And the name as P=6, A=1, L=2, L=2, A=1, D=4,1=9, 0=5

This adds to 6+ 1+ 2+ 2+ 1+ 4+ 9+ 5= 30, 3+ 0= 3

Thus ANDREA : PALLADIO :: 5:3

Similarly ratio 7:5 could be understood to hold Andrea Palladio's Latin name PALADIVS ANDREAS as follows:

P= 6, A= 1, L= 2, A= 1, D= 4,1= 9, V= 2, S= 9. 6+ 1+ 2+ 1+ 4+ 9+ 2+ 9= 34, 3+ 4= 7

A= 1, N= 4, D= 4, R= 8, E= 5, A=l, S= 9. 1+ 4+ 4+ 8+ 5+ 1+ 9= 32, 3+ 2- 5

Thus PALADIVS : ANDREAS :: 7:5 which is root 2 or *diagonea.* (Shah; Bhavesh, 'A Study in Palladian Palette of Proportions', pg v, 68.)

We would see through this research, the use of ratios 7:5 and 5:3 in villa plans of book 2 of *'I Quattro Libri Dell'Architecttura'.* With close investigation and scrutiny we can observe that Palladio may have intentionally employed some ratio intentionally as under.

On the basis of one of the Cabbalistic number theories the use of number 30 as the diameter of the central Sala and number 26 as the length of the principle room could be understood as bearing the Latin name of the patron PAVLVS ALMERICVS (for Paolo Almerico who commissioned La Rotunda, plate 13 in appendix). The first name sums to 571 and the second to 438. By tradition these numbers may be reduced to 5 + 7+1 = 13 and 4 + 3 + 8 = 15. The names thus are embodied in the ratio of the diameter of the domed hall to the length of the main room as 15 : 13 :: 30 : 26.

The Cabbalistic interpretation of the famous religious figure for Yahweh, YHVH as follows gives added meaning to the numbers 26 and 15. Any Hebrew letter stands for a particular number, thus in this way YHVH equals 72; Y means 10, H=5, V=6 and H=5 again. Put together arithmetically, Y=10, YH=15, YHV=21, YHVH=26 all which add up to 72. This indicates that there is a divine presence in the plan with the use of numbers 26 and 15 and the ratio 15:6 in the plan surrounds a host of angels. We find the use of number 72 in the ratio 72 : 26, which is employed in the elevation of La Rotunda. (Shah; Bhavesh, 'A Study in Palladian Palette of Proportions', pg 62.)

Such analytical perception of numbers in Palladio's villa plans and elevations is beyond the purview of this research. This cursory glance of Cabbalistic number theory may instigate an interesting investigation of numbers in proportional theory and its implementation from different perspective as an extension of this research.

3) In ' *Timaeus'* (sections 35B-36B) for 'the division of world-soul', Plato (427-347 B.C.) uses four even numbers (1,2,4,8) and four odd numbers (1,3,9,27) derived from the Pythagorean lambda; where number one is considered even as well as odd. He then inserts the Arithmetic Mean and the Harmonic Mean between two successive numbers to derive proportions 6:8:9: 12 from the even number set and 2:3:4:6 from the set of odd numbers. Plato remarks them to be the most perfect proportions. Thus "A Palladian gratitude : faculty : friends : fentabbulous family :: 6:8:9:12" is 'proportionally perfect' if derived through Cabbalistic number theory.

3) The word 'fentabbulous' is derived from the words fantastic and fabulous.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER ONE: AN OVERVIEW OF SUBJECT OF PROPORTION AND DISSERTATION

1.1 INTRODUCTION TO THE SUBJECT OF PROPORTION

Proportion can be said to be 'a harmonious relationship between parts, with and within the whole'. The intent of all theories of proportion is to create a sense of order among the elements in a visual construction. Proportioning systems go beyond the functional and technical determinants of architectural form and space to provide an aesthetic rationale for their dimensions. Proportional order is an underlying fact in all the nature's creations and to understand it, and decode it and to incorporate it in life has been a continuous and ongoing quest for human beings. Architectural practice has often used proportional systems to generate or constrain the forms considered suitable for inclusion in a building. In almost every building tradition there has been a system of mathematical relations which governed the relationships between aspects of the design. These systems of proportion were often quite simple; whole number ratios (such as 1:1, 2:1) or incommensurable ratios (such as the golden ratio) which were determined using geometrical methods. The goal of a proportional system is to produce a sense of coherence and harmony among the elements of a building.

1.1.1 PROPORTIONS IN NATURE

Laws of nature govern our earth and the universe. Each and every system in nature is governed by a guiding principle which maintains an equilibrium and balance. In absence of these underlying laws there would be chaos and confusion. If observed minutely, one always finds a pattern governing the systems. Whether it is the way living organisms are made like plants, animals, microbes and even the tiniest cell or non living things like atoms and crystals, there is a system of relationship between its part to the whole and whole to its part. One such system of relationship is 'proportions'. When one observes the relation between root to trunk of a tree and trunk to branches and that to leaves, the size and shape are perfectly coordinated (Fractal Geometry). It is this coordination which makes it beautiful and pleasing to look at and at the same time makes it functional.

1.1.2 PROPORTIONS BY MAN

Taking a clue from nature; man has also strived to achieve perfection in his entire endeavor to create things. He strives to create a perfect balance between functional aspects of objects and an aesthetically pleasing appearance. To achieve this whether in invention, in music, in art or in architecture, he is guided by a system of relationship, if when followed leaves a little chance of going wrong. The relationship of its components to the whole and vice a versa in terms of size is the proportion between them.

1.1.3 PROPORTIONS IN ARCHITECTURE

On realizing the existence of an underlying order which made sense to human logic and had a visual appeal, man since ages has incorporated the system of proportions in his attempt to make his dwellings and his surroundings beautiful.

Proportion is the relation between elements and a whole. The system of proportion used to create art and architecture has been inspired, observed, evolved, invented and reinvented by man all through different ages. Depending upon the relationship of building elements (be it in plan, elevation, height of building or building elements like column, pediment etc.) and to what it is compared to i.e. 'the whole', many systems of proportions have evolved in architecture. Human proportions were based on parts of human body and their relation to each other. Harmonic proportions were based on musical notes. Cosmological or astronomical proportions and orientation were based on relationship between stars, Sun, Earth and the Universe. Geometrical proportions were based on geometrical shapes such as square, rectangle, circle etc. Mathematical proportions were based on whole numbers, their ratios and unit fractions. Many jewels such as Golden proportion, Sacred Geometry, Phi', Fibonacci series, Modular etc. were discovered and theories of proportion by individuals such as Pythagoras, Plato, Vitruvius, Alberti, Palladio, Corbusier etc. were developed.

1.1.4 HISTORICAL BRIEF ABOUT DEVELOPMENTS IN PROPORTIONAL THEORY

Throughout the history of architecture, different proportioning systems have been used, either as pure system or as interchanging and interconnecting systems. Proportioning system was used as early as the Egyptian and the Mesopotamian era and was based on parts of body and their relation to each other. Unit fractions for calculations were also used. The ancient Greeks and the Romans occasionally used proportions derived from the Golden ratio (as in Parthenon in Athens) and the Pythagorean division of the musical octave. All throughout the ancient world in Persia, Rome and Egypt, Sacred Geometry based on the incorporation of proportion which relates the building to the Earth was practiced.

1.1.5 IMPORTANCE OF RENAISSANCE PERIOD IN DEVELOPMENT OF THEORY OF PROPORTIONS

All through Antiquity and the Middle ages, a deep understanding evolved of the significance of geometrical and mathematical proportion in art and architecture. However it is during the Renaissance period in the history of architecture that the study of proportion peaked. The Renaissance tried to extract and codify the system of proportions in the order as used by the ancients, believing that with analysis, a mathematical absolute ideal of beauty would emerge. 'Vitruvian Man' by Leonardo da Vinci codified Vitruvian view of the proportions of man and his book on geometric recreations titled '*De Devina proportione*' took the idea of the Golden ratios. While Bruelleschi's focus on the perception of harmony was somewhat of a break from the Pythagorean ideal of number controlling all things, Alberti's system was based on the Pythagorean division of the octave.

1.1.6 PALLADIO'S CONTRIBUTION IN DEVELOPMENT OF THEORY OF PROPORTION

It is during the Renaissance period, Andrea Palladio; an Italian architect published 'The Four books of Architecture' which suggested seven sets of the most beautiful and harmonious proportions to be used in construction of rooms which reflected musical consonances. The theory and practice of applying musical proportions to architecture during Renaissance was a way of endowing the building with cosmic harmony. Lessons on such cosmic harmony were written by Plato, Musical harmony by Pythagoras, Human proportion by Vitruvius and Alberti wrote on architectural proportions. They were all Palladio's predecessors and it is believed that Palladio was inspired by their theories of proportions which formed a background of details for his own theory. It is a kind of culmination or convergence of all these theories into one and is precise and concise tool of design grammar. The formal lessons in Palladio's theory are apparently simple, involving dimensional relationships but behind the apparent simplicity are found a range of complex planning matrix. This study is an attempt to provide an understanding of these principles governing harmony and proportion in space.

1.2 NEED FOR STUDY

Many of the insights and skills in proportional theories that peaked during Renaissance period got lost with the onset of industrialization. During last century; efforts were made by 'Le Corbusier' to develop a 'Modular system' which was based on apparently arbitrary proportions of an 'ideal man' combined with the golden ratio and Vitruvian man. However it was never popularly adopted among architects.

In today's age of contemporary cult with advance level of perplexed and haphazard growth covered under the shield of modernism with distinct lack of guiding and formulative theory of proportionate design, this study may stand out as a guiding light house. The study is undertaken to retrieve the lost treasures, find the application for it and develop them further to make them relevant in contemporary context.

Today's architecture is apparently devoid of any such set of guiding rules of proportion; functional in practice. Proportion is one such field of knowledge that can establish a guiding language for architects and hence it would be interesting to study Palladian theory of proportions to validate its relevance in contemporary context

Palladio studied theories of his predecessors, accumulated it, refined it, derived his own theory, and put to test of practice thorough extensive application in many projects that were built and demonstrated them in form of plans of book two. Palladian theory of proportions seems the only theory of proportion from renaissance period that was put to test by writer himself which his predecessors never did. This is to study a theory that is validated and tested practically though self practice. It is to study the theory of proportions (i.e. Palladian theory of proportions) that seems cumulative amalgamation and culmination of theories of ancients from era of Renaissance that witnessed the development of theory of proportions and its application at its peak in the history of architecture, an architectural axiom that seem unsurpassed through ages.

In the age of visionary bafflement this is to study a theory of proportion whose glory may be being deemed with disdain, that this is a conscious attempt to revive it centuries later. The study demonstrates skepticism about Palladio's proportional attitude and mathematical relationship between the parts not only to cause a polite stir among aspiring architects but also to conceive an image of pre-ordained mathematical harmony that skimmed as a visual alchemy. It is hoped the study sets a model for aspiration of his unique system of design for aspiring architect.

1.3 AIM:

As the title of the thesis suggests, aim of this academic exercise with theoretical research base is to develop understanding of Palladio's proportional theory in the first book of *'I Quattro Libri Dell' Architecttura'* and to develop understanding of proportional planning grammar employed in villa plans of second book of *'I Quattro Libri Dell' Architecttura'*.

1.4 OBJECTIVES:

Supplementary to the aim, the objective of this work at core is to understand theory of proportions by Renaissance architect Andrea Palladio (Italian architect). It is believed that Palladio derived his theory on the basis of theories of Pythagoras, Plato, Vitruvius and Alberti. To validate such thought or hypothesis and to observe if Palladio did infer his theory from his predecessor this research proposes to study the following. The objective is to have synoptic view of mathematical theory by Palladio's predecessors that laid foundation of Palladio's theory of proportion. To show relation between Palladian theory of practice and mathematical theory of his predecessors, this study aspires understand them.

The objectives are

A) The objective is to study the principles of proportions by Palladio's predecessors and their significance in development of Palladio's theory of proportions as stated in the first book of the *'I Quattro Libri Dell' Architecttura'*.

The research intends:

1) To study Principles of sound formation by Pythagoras.

2) To study Principles of composition of world and soul in *'Timaeus'* by Plato.

3) To study Principles of proportions based on study of human anatomy in *'De Architectura' by* Vitruvius.

4) To study Principles of proportions (ratios) for architecture based on 'means', double and triple proportions from Pythagorean Lambda in *'De Re Aedificatoria'* by Leon Battista Alberti.

B) To understand the Palladian theory of proportion as a whole and examine its similarity from the theories of his predecessors.

C) To examine the implementation of Palladio's theory of proportion in house plans of second book of *'I Quattro Libri Dell' Architecttura'*. To derive the ratios from the dimensions mentioned by Palladio in his plans and to understand these ratios (as Prescribed room ratio, Derived room ratio and Non theoretical room ratio).

D) To morph Palladian plans using his ratios and the construction technology relevant in contemporary context (of Ahmedabad) to understand its adaptation in today's context.

E) To device a systematic approach for the application of these proportions in contemporary context. To study and show implementation of Palladian theory of seven room ratio in modern planning of residence; keeping in view contemporary; general construction methods of brick masonry and RCC frame structure as adopted today in Ahmedabad, Gujarat, India.

F) Though not at centre of the study, to generate synoptic and comparative overview with ancient and modern theory of proportions as adopted or practiced in Ahmedabad.

i) To overlay Palladian theory of proportion on plans of two residences from Ahmedabad those are designed by Le Corbusier on basis of his proportional theory 'Modulor' (as modern theory of proportion). This is to comparatively see similarity between Palladian theory of proportion and 'Modulor'

ii) The objective is to comparatively study Vastu Shastra (as ancient Indian theory of proportion) and Palladian theory of proportion.

G) To analyze and derive various room dimensions on basis of Palladio's five out of seven prescribed ratios (excluding 1:1, square that is dependent on only one dimension; which being congruent to other. While circle is dependent on diameter and does not have second computing side as in rectangular polygon) in tabular form to render as ready reference for aspiring designers.

H) To reach a conclusion about its adaptation in modern day planning grammar

1.5 SCOPE:

As world view of theory of proportion, it may be vast subject of study, but the scope of this work is limited to Palladio's proportional theory and its implementation in theory demonstrative villa or residential plans from second book of *'I Quattro Libri Dell' Architecttura'*.

1.6 LIMITATION:

Analysis of this study will be based on the literature (that is, drawings and description in book two of *'I Quattro Libri Dell' Architecttura'*) and therefore not on the buildings, with the assumption that the proportional designs are fundamentally theoretical and Palladio's villa plans of book two are theory demonstrative, that is; the plans are structured on the theory and drawn to show the structure of theory. Therefore the study will subscribe to the measures and the attributes from the buildings only when it was appropriate, for instance, for an obvious typographical error in the plate. The study will not rely on surveyed building measurements as they; to general belief are not reliable as the act of surveying involves too many variances and is likely to produce variable results. Furthermore, the finished building, due to compounded errors, may deviate from the intended dimensions of the proportional design. And as history holds, some of the plans of *'I Quattro Libri Dell' Architecttura'*, book two were never built which Palladio instrumentalises to demonstrate his theory and some structures have failed to stand the test of time to be studied physical realm.

This study will only delve to interpret and analyze application of Palladio's theory at plan level and refrain from critical analysis of elevations and sections shown in second book of *'I Quattro Libri Dell' Architecttura'*

The case studies of contemporary applications is a limited set of four examples, all are constituted with adaptation of only pure Palladian proportions (of seven room ratios) as moral guiding datum without deviating to derived room ratios (except at few places as residual ratios in circulation areas and not in planning of main rooms) or adopting to any other theory of proportions, which would be beyond the scope of this work or otherwise would make the study and interpretations limitless. The research limits scope of area for test application for Palladio's and modern theory of proportion to Ahmedabad, Gujarat, India. Where one cites adaptation of Palladian theory in practice along with residential examples built on basis of modern theory of proportions, placing them on one comparative dais of climatic and seismic zone; with same construction material and same wall thickness that may affect planning grammar conceptually.

1.7 METHODOLOGY:

1.7.1 Methodology for historical part of study:

The study being theoretical in nature will employ 'interpretive research strategy', a research method which summarized by Linda Groat and David Wang in 'Architectural Research Methods'(pg 14) as ***'interpretive research strategy typically draws upon evidence derived from archival or artifactual sources. This is usually because the research question focuses on a setting or circumstance from the past.'*** The main source of information on the authenticity of the subject matter and primordial philosophical text will be *'I Quattro Libri Dell' Architecttura'* Translated into English as THE FOUR BOOKS ON ARCHITECTURE. For their respective superiority on concern matter, this study subscribes to translation by Tavernor; Robert and Schofield; Richard for its clarity on commentary from book one and Adolf K. Placzek's translation for its plates from book two. The text on the theories of predecessors and Palladio are taken in original form from the source to keep intact its flair and grip of the subject that the original author or the translator may have intended. As the theories of predecessor were written by different individual in different era with varied subject and style; it may appear to lack continuity in style and content of writing. The quoted text is distinctly demarcated with bold italic Arial font (while regular text and interpretations in the work are set to Times New Roman font) to discriminate it from running text, comments and analysis. As major part of reference of old text is long narration from the original text, references are mention along with it to make it more relevant. The references are made narrative and integral part of text to make it more contextual.

1.7.2 Methodology for Palladian theory of proportion:

As adopted in Methodology for historical part of study, this segment of study too shows quoted text from *'I Quattro Libri Dell' Architecttura'* in bold and italic text to differentiate it from running comment or interpretation of it. Graphical representation and interpretation of theory is adopted for better and clear understanding of various theories and aspects of proportions

1.7.3 Methodology for analysis of Palladian villa plans:

As explained in Abstract of the dissertation; analytical study is divided into four parts and adopts the following methodology:

The analysis of plan is divided into four parts.

1. First part sets all Palladian Villa plan plates to one of the ten selected set of scale as per the spread of the structure for comparative overview.
2. Second part redraws plates to set parameters of wall thickness, door and window size to minimize and overcome inconsistencies of wood cut prints of plates in book two. This gives us insight to evaluate and estimate missing dimensions and at the same time can identify typographical errors in the plates.
3. To arrive at proportional design; part three of analysis sets schematic line diagrams. This helps us understand combination and juxtapositions of sub ratios or individual room ratios to generate a complete whole.
4. The section four of analysis is to regenerate and reconstruct Palladian villa plans on the assumption of modern day construction technologies of this part of the world (Ahmedabad City, Gujarat state, India) to rekindle planning grammar of Palladio for contemporaries.

1.7.4 Methodology for test applications:

To show practical adaptation of Palladian theory of seven room ratios in contemporary context using contemporary construction methods; four case studies of test applications are analyzed with aid of schematic line diagrams. This is to bring out understanding of ratios employed in planning.

The study through different chapters, where needed, subscribes to redraw drawings from the source by adding analytical data to understand and validate the point of study in focus and at times to decipher missing dimensions.

1.8 RESEARCH IDEOLOGY:

As described in preamble (page 1) and clause R 16 "Thesis Evaluation" and its sub clause 3 (a) (pg 18) of "Ordinances and regulations for the Degree of Doctor of Philosophy" constituted by the institute (Indian Institute of Technology, Roorkee) in 2006 AD, this thesis tends to impute point number two of set of three as quoted hereunder;

"The research work shall be

i) an original work characterized either by the discovery of facts, or

ii) by a fresh approach towards the interpretation and application of facts, or

iii) development of equipment making a distinct advance in instrument technology."

CHAPTER TWO: HISTORICAL BACKGOUND

2.1 PROPORTIONS AND SIGNIFICANCE OF PROPORTIONS

'Beauty' has been a quality which all the makers of building have strived to achieve. Since ages the parameters with which 'beauty' is judged varies from person to person and era to era. The 'beauty' in architecture was to create a perfect building. But what was a 'perfect building'? The search to find a clue has driven man to observe nature, study it and even imitate it. In his search; man discovered certain underlying laws which governed the making of everything that exists in nature. These laws were based on the interrelationship between parts at both micro and macro level. When translated into a word is 'proportions' as we call it today.

"***Proportions are relation of one part to another or to the whole with respect to magnitude, quantity or degree***" (pg 557, The Merriam–Webster Dictionary)

Each civilization attached their own significance to 'proportions' and every branch of science and philosophy had their own meaning of it. Astronomers found proportions in relationship of Universe and stars, the distance between them and so on, whereas musician discovered it in harmony of musical consonances. Botanist related parts of plant to its whole and mathematician found it in numbers. Sometimes it was all about numbers and at times had symbolic value and mystical significance. Plato found proportions in making of Universe and its cosmic harmony whereas Alberti found it dictating 'Concinnitas'.

In architecture; 'proportions' has been an important parameter to judge 'beauty' since ages. Proportioning systems used were varied which evolved over a period of time. The source of proportioning system has also been different. Be it from mathematical equation or geometry, from music or from anatomy of human body, from modules to multiplication. However, 'proportions' had been central in creation of beauty. One finds mention of proportions by Vitruvius while defining 'symmetry', by Alberti while defining 'Concinnitas' and by Palladio in his concept of 'beauty'.

Vitruvius states: ***"Proportions is a correspondence among the measures of the members of an entire work and of the whole to a certain part selected as standard. From this results the principles of symmetry."*** (*'De Architectura',* Book III, Chapter I, Section I. Morris Morgan translation).

Alberti states: ***"Beauty is that reasoned harmony of all the parts within a body, so that nothing may be added, taken away or altered, but for the worse"*** (*'De Re Aedificatoria',* Book VI, Chapter II).

Palladio states: ***"Beauty will derive from a graceful shape and the relationship of the parts among themselves and to the whole because building must appear to be like complete and well-defined bodies, of which one member matches another and all the members are necessary for what is required"*** (*'I Quattro Libri Dell' Architecttura',* Book I, Chapter I)

Thus 'proportions' have a significant role in shaping architecture and this study would cover different proportioning systems derived by Palladio and his predecessors in following chapter.

2.2 ESTABLISHING LINAGE IN DEVELOPMENT OF PALLADIAN THEORY OF PROPORTION.

References mentioned hereunder are to establish linage of theory of proportion for Palladio from Pythagoras to Plato to Vitruvius to Alberti to Palladio.

2.2.1 VITRUVIUS ON PYTHAGORAS AND PLATO

Following narrations by Vitruvius, Alberti and Palladio sets the lineage.

"But the daily teachings of Pythagoras, Democritus, Plato, Aristotle, and other thinkers, elaborated as they were by unbroken application, furnish ever-fresh and flowering harvests, not only to their fellow-citizens but also

to all mankind. Those who from tender years are satisfied thence with abundance of knowledge, acquire the best habits of thought, institute civilized manners, equal rights, laws without which no state can be secure. Since, therefore, such boons have been conferred on individuals and communities by wise writers, not only do I think that palms and crowns should be awarded to them, but that triumphs also should be decreed and that they should be canonized in the mansions of the gods. I will propose, as examples taken from a great number, several conceptions of a few thinkers which have helped the furnishing of human life, in order that the consideration of these may lead mankind to confess that honours should be conferred upon their inventors". (Vitruvius, *'De Architectura',* Book IX, Preface, Section II and III).

2.2.2 ALBERTI ON PYTHAGORAS, PLATO AND VITRUVIUS:

Alberti's scatter mentions of Pythagoras, Plato and Vitruvius in "De Re Aedificatoria' sets a link in chain of linage of theory.

Alberti refers to Pythagoras as under:

"For us, the outline is a certain correspondence between the lines that define the dimensions; one dimension being length, another breadth, and the third height. The method of defining the outline is best taken from those objects in which Nature offers herself to our inspection and admiration as we view and examine them. I affirm again with Pythagoras: it is absolutely certain that Nature is wholly consistent. That is how things stand." "De Re Aedificatoria' (Book IX, Chapter V).

Alberti begins chapter nine referring to Plato as follows ***"I notice that the most prudent and modest of our ancestors much preferred frugality and parsimony in building as in any other matter, public or private, judging that all extravagance on the part of the citizen ought to be prevented and checked, and that both admonitions and laws were issued to this end with the utmost vigor and persistence. Plato in his writings therefore praises***

those responsible for the decree, mentioned elsewhere, that no one should produce a picture more splendid than was kept by his ancestors in their temples; it was forbidden for the temple to be adorned with more than one picture, which one painter might take one day to complete." "De Re Aedificatoria' (Book IX, Chapter I).

On other instance; at the end of chapter four of book six; Alberti is seen referring to Plato ***"Plato also gives some useful advice: a grand name will lend a place great dignity and authority."***

In the beginning of books six, Alberti writes about Vitruvius ***"For I grieved that so many works of such brilliant writers had been destroyed by the hostility of time and of man, and that almost the sole survivor from this vast shipwreck is Vitruvius, an author of unquestioned experience, though one whose writings have been so corrupted by time that there are many omissions and many shortcomings."***

2.2.3 PALLADIO ON VITRUVIUS AND ALBERTI

As foreword to first book, Palladio writes ***".... I had observed in those structures and read about in Vitruvius and Leon Battista Alberti and other excellent writers who came after Vitruvius, and also from those which I myself built recently ..."*** Braviko Mitrovic in 'Learning from Palladio' writes ***"The oldest written document discussing the Great Theory is probably Plato's Timaeus"*** and ***"Wittkower's interpretation derived from a physical law whose discovery was traditionally ascribed to Pythagoras and which was widely known in the Renaissance".***

2.2.4 CONCLUDING NOTE

The references quoted demonstrates interlinked, derivative and propagative lineage of theory of proportions from Pythagoras to Plato to Vitruvius to Alberti to Palladio. It sets an outline of inheritance of Palladio from his predecessors From references mentioned above one can formulate a hypothesis that Renaissance era theory of proportions by Palladio was formed on the basis of theories of his predecessors Pythagoras, Plato, Vitruvius and Alberti.

2.3 INTRODUCTION TO THE STUDY OF HISTORICAL BACKGROUND

This chapter discusses the historical background about Palladio and his predecessors and their theories of proportion. The study aims at highlighting only those systems which are deemed adopted and modified by Palladio in his theory.

2.4 METHODOLOGY FOR STUDY OF HISTORICAL BACKGROUND

The study for proportional theories of Palladio's predecessors would include:

1) Source of study material.
2) A historical context within which theory was developed.
3) Overview about important theories by respective authors.
4) Theory in detail with narrative (depicted and demarcated with bold italic Arial font, while regular text and interpretations in the work are set to Times New Roman font) and its interpretation.
5) The summery of theory.

2.5 PYTHAGORAS: PRINCIPLES OF MUSIC

This part of the chapter is to develop mathematical understanding of proportions in music.

2.5.1 SOURCE OF STUDY

No written texts by Pythagoras are known to have survived. Ancient Pythagoreans quoted their master's doctrines with the phrase "auto eph" meaning 'he himself said' which emphasized the essentially oral nature of his teaching. The study done here is based on class notes by Prof. Lionel March and Dr. Shin during my post graduate program at UCLA. (UCLA, University of California at Los Angles served as prominent centre on Palladian studies in North America at the time of my post graduate studies there. UCLA houses some of the rarest five centuries old original manuscripts of

Palladio. The department and a separate dedicated museum is conceived and fostered by Prof. Lionel March who is considered authority on the subject.)

2.5.2 HISTORICAL CONTEXT WITHIN WHICH PYTHAGORAS'S THEORY DEVELOPED

Pythagoras (born between 580 and 572 BC, died between 500 and 490 BC) was an Ionian Greek mathematician and founder of the religious movement called Pythagoreanism. He belonged to an era where inquiry was made about the nature of things in Universe and an attempt was made to provide a rational for it. Pythagoras stands at the beginning of it. It is believed that Pythagoras might have learned about some geometric principles in Egypt and he saw the study of mathematics as a purifier of the soul and music as purifying. He saw numbers in everything and was convinced that the Divine principles of Universe, though imperceptible to the senses; can be expressed in terms of relationships of numbers. He connected music with mathematics to derive at musical ratios which were analogues to harmonics within the Universe with Earth at its center and seven planets producing 'music' of spheres corresponding to its distance from Earth.

2.5.3 OVERVIEW OF THEORIES DEVELOPED BY PYTHAGORAS

Pythagoras associated numbers with form; relating arithmetic to geometry and his greatest contribution; the proposition about right angled triangle; known as 'Pythagorean theorem' was developed from that line of thought. The theorem in geometry states that in a right angle triangle the area of square on the hypotenuse is equal to sum of the areas of squares of the other two sides i.e. $a^2 + b^2 = c^2$. The most common example of such triangle with sides 3:4:5 came to be known as 'Pythagorean triangle'

Pythagoras spoke of both square ($a^2 = a * a$), cubic ($a^3 = a * a * a$), double ($a * 2 = b$, $c = b * 2$ and so on) and triple numbers ($a * 3 = b$, $c = b * 3$ and so on). They were represented in form of a Greek letter 'Lambda'; it was known as 'Pythagorean Lambda' which could be represented as follows where left side series holds double numbers and right side series holds triple numbers.

1	
2	3
4	9
8	27

One of Pythagoras's major accomplishment was the discovery that music was based on proportional intervals (properties of string length) of the numbers one through four. He believed that the number system and the Universe system were based on the sum of these numbers: ten (1+2+3+4).

Based on this discovery, the next part of chapter is to develop mathematical understanding of proportions in music by Pythagoras.

2.5.4 PYTHAGOREAN ASPECTS OF MUSIC

According to legend, the way Pythagoras discovered that musical notes could be translated into mathematical equations was when one day he passed blacksmiths at work and thought that the sounds emanating from their anvils being hit were beautiful and harmonious and he decided that whatever scientific law caused this to happen must be mathematical and could be applied to music. He went to the blacksmiths to learn how this had happened, and by looking at their tools he discovered that it was because the anvils were "simple ratios of each other, one was half the size of the first, another was 2/3 the size, and so on." Probably this laid the foundation for his mathematical understanding of music that led to the formation of theory of proportions.

2.5.5 THE CONSTITUENTS OF MUSIC

After experimenting with plucked strings the Pythagoreans discovered that the intervals that pleased people's ears were

Octave	1 : 2
Fifth	2: 3
Fourth	3 : 4

and we can add the two Greek composite consonances,

Octave plus fifth	1 : 2 : 3
Double Octave	1 : 2 : 4

2.5.6 MATHEMATICS AND MUSIC

In regards to music, Pythagoras is credited with developing our understanding of the harmonic series, the overtone series. It seems that Pythagoras was perhaps the first person to define the "consonant", acoustic relationships between strings of proportional lengths. Specifically, strings of equal tension (regardless of their material, gut, steel, rope, etc.) of proportional lengths create tones of proportional frequencies when plucked.

For example, a string that is two (2) feet long will vibrate x times per second (Hertz). While a string that is one (1) foot long (x/2) will vibrate twice as fast, 2x. And furthermore, those two frequencies create a perfect octave.

If string vibrates at fundamental pitch x Hertz, then

x/2 -- An Octave Higher (2/1 the Fundamental Frequency)

x/3 -- An Octave plus a Perfect Fifth (3/1 the Fundamental Frequency)

x/4 -- An Octave plus a Perfect Fifth plus a Perfect Fourth (= Two Octaves) (4/1 the Fundamental Frequency)

x/5 -- Two Octaves plus a Major Third (5/1 the Fundamental Frequency)

In dividing the length in this manner, Pythagoras exposed the first four overtones which create the common intervals which have become the primary building blocks of musical "harmony", an octave, A Perfect 5^{th}, A Perfect 4^{th} and A Major 3rd

Pythagoras also acknowledged these intervals, not only as they relate to the fundamental frequency, but to each other and found these ratios:

1:1 = Unison

2:1 = Octave

3:2 = Fifth

4:3 = Fourth

5:4 = Major Third

Pythagoras acknowledged that twelve (12) was the "most divisible" small number and that these basic ratios can be expressed in regards to the number twelve (12).

12:12 (unison)

12:6 (octave)

12:8 (fifth)

12:9 (fourth)

He therefore summarized that twelve (12) was the most ideal musical number.

It is believed that although Pythagoras laid foundation to musical analogy he was slightly wrong. The correct solution was worked out by Galilei (the father of the famous Galileo Galilei) who concluded that the best frequencies were in the proportions.

do	re	mi	fa	so	la	ti	do
1	9/8	5/4	4/3	3/2	5/3	15/8	2

Which may be represented as whole number proportions as

24	27	30	32	36	40	45	48

These proportions are called the just intonation music scale and are the most pleasing proportions. The differences from Pythagoras are small, so that mi is 5/4 (=1.250) rather than 81/64 (=1.266).

It is interesting to look at the ratios between the notes. do-mi-so are 24-30-36 which can cancel to 4:5:6. This same proportion links the notes fa-la-do which are 32-40-48 cancelling to 4:5:6. Again, so-ti-re (re from the next octave) gives 36-45-54 which cancels to 4:5:6 again. So every note is linked to "do" by three major chords which have ratios of 4:5:6.

2.5.7 SUMMARY OF PYTHAGOREAN THEORY

To Pythagoras music was one of the dependencies of the divine science of mathematics, and its harmonies were inflexibly controlled by mathematical proportions. The Pythagoreans averred that mathematics demonstrated the exact method by which the good established and maintained its Universe. Number therefore preceded harmony, since it was the immutable law that governs all harmonic proportions. Pythagoras is suggesting following ratios who's implementation in Palladian plans will be noticed through chapter five; analysis of Palladio's proportional designs. Through derivation from musical notes Pythagoras mentions 1:1, 2:1, 3:2, 4:3, and 5:3.

Pythagoras dealt with commensurable numbers, but his theorem led to the discovery of incommensurables and the concept of irrational numbers was not known at his time. These incommensurables numbers were explored by Plato.

The intellectual tradition from Pythagoras; that was referred by Plato in 'Timaeus' provides comments on Palladio's mathematical perspective that had a significant influence on Renaissance architecture. Next section of chapter investigates Plato's 'Timaeus'.

2.6 PLATO: PRINCIPLES OF COMPOSITION IN *'TIMAEUS'*

This chapter is to decipher mathematical relationships (Arithmetic mean, Geometric mean, Harmonic mean and Pythagorean Lambda) that Plato describes as basis of cosmic order in *'Timaeus'*

2.6.1 SOURCE OF STUDY

Plato was a Greek philosopher whose work has been edited by John M. Cooper and complied as 'PLATO COMPLETE WORKS'. Plato's complete works includes dialogues on varied subject and Timaeus is one of his works which described the formation of the Universe. It is in this work that we find the reference of Plato's theories of proportions.

2.6.2 ABOUT TIMAEUS

Timaeus sets out the foundations of the sciences of astronomy, physics, chemistry, and physiology, including the physiology and psychology of perception, ending with a classification of the diseases of body and soul and provisions for their treatment. The discourse unfolds in three main stages: the first sets out the achievements of Intellect (Sections 29d–47e), the second gives an account of the effects of Necessity (Sections 47d–69a), and the third shows how Intellect and Necessity cooperate in the production of the psychophysical constitution of human beings (Sections 69a–92c).

There has been considerable discussion on *Timaeus*; however this study will consider overview of part that may seem related to core subject of the research discarding philosophical debate of *Timaeus*. Included here are the relevant sections (depicted hereunder with bold and italic text) from John Cooper's edited work on *Timaeus* and discuss them as running commentary followed by its interpretation.

2.6.3 HISTORICAL CONTEXT WITHIN WHICH PLATO'S THEORY DEVELOPED

Plato was a Greek philosopher (427-347 BC). He shared similar view with Pythagoras about the nature of Universe. They believed that certain numerical relationships manifest the harmonic structure of the Universe and the seven numbers in the musical scale express the harmony of the world. Pythagoras associated the most basic musical scale to numbers 1:2:3:4 and Plato extended it by virtue of double and triple series starting with unity in form of Lambda. Though after almost two hundred years since Pythagoras; mathematics was still given the divine status and was considered as basic for cosmic order where aesthetic perfection achieved by extensive use of mathematics was a way to seek the will of God.

2.6.4 OVERVIEW OF THEORIES DEVELOPED BY PLATO

In the *Timaeus* Plato presents an elaborately wrought account of the formation of the Universe; deeply impressed with the order and beauty he observes in the Universe. In his discourse about the composition of Universe, formation of world and soul and its relationship; Plato considers Universe to be made up of parts (elements like Earth, fire, water and air) and are bound together through certain proportions to create an integrated whole. Platonic theory of proportions thus hints at the following in the 'account of world view':

1) Numerical / arithmetical ratios based on musical harmony with commensurable numbers.
2) Geometrical proportions.
3) Distinction between harmonic, arithmetic and geometric proportions.
4) Extension of Pythagorean Lambda as double and triple intervals.
5) Formation of Platonic solids.
6) Sphere as most complete shape

One finds the mention of Platonic solids in *Timaeus* but the study here focuses on the study of the 'mean' and 'lambda' which deals with proportional theory and not on allied field of mathematics and geometry.

The following part of the chapter presents the narration in *Timaeus* which hints at these proportional theories and is followed by interpretation.

2.6.5 COMPOSITION OF UNIVERSE

The Universe as Plato proposes is the product of rational, purposive, and beneficent agency. The governing explanatory principle of the account is teleological: the Universe as a whole as well as its various parts are so arranged as to produce a vast array of good effects. It strikes Plato strongly that this arrangement is not fortuitous, but the outcome of the deliberate intent of Intellect (*nous*), anthropomorphically represented by the figure of the Craftsman who plans and constructs a world that is as excellent as its nature permits it to be.

Sections 31C to 32C mentions composition of body of Universe as ***"Now that which comes to be must have bodily form, and be both visible and tangible, but nothing could ever become visible apart from fire, nor tangible without***

something solid, nor solid without Earth. That is why, as he began to put the body of the Universe together, the god came to make it out of fire and Earth. But it isn't possible to combine two things well all by themselves, without a third; there has to be some bond between the two that unites them. Now the best bond is one that really and truly makes a unity of itself together with the things bonded by it, and this in the nature of things is best accomplished by proportion. For whenever of three numbers which are either solids or squares the middle term between any two of them is such that what the first term is to it, it is to the last, and, conversely, what the last term is to the middle, it is to the first, then, since the middle term turns out to be both first and last, and the last and the first likewise both turn out to be middle terms, they will all of necessity turn out to have the same relationship to each other, and, given this, will all be unified. So if the body of the Universe were to have come to be as a two dimensional plane, a single middle term would have sufficed to bind together its conjoining terms with itself. As it was, however, the Universe was to be a solid, and solids are never joined together by just one middle term wit always by two. Hence the god set water and air between fire and Earth, and made them as proportionate to one another as was possible, so that what fire is to air, air is to water, and what air is to water, water is to Earth. He then bound them together and thus he constructed the visible tangible Universe. This is the reason why these four particular constituents were used to beget the body of the world, making it a symphony of Proportion."

Interpretation:

The two extreme elements fire and Earth are connected by middle element (water and air) as mean, i.e. Fire : (mean) = (mean) : Earth, a:b = b:c, i.e. Fire: air = air : water = water : Earth. This could be interpreted as a simple proportionate progression or Geometric Mean. In a Geometrical Mean the first amount is in proportion to the second amount as the second is to the third, 'a' is to 'b' as 'b' is to 'c'. Or a:b = b:c. An example of that which satisfies Plato's requirements of section 32A of *Timaeus*, might be that of 2;4 and 8. So 2:4::4:8 (the first term is to the middle what the middle is to the last, the last is to middle what middle is to the first); 4:2::8:4 or 4:8::2:4 (the middle term turns out to be first and last and the first and last terms turn out to be middles).

2.6.6 DIVISION OF WORLD AND SOUL

In sections 35A to 36 B *Timaeus* talks about division of world and soul

The components from which he made the soul and the way in which he made it were as follows: In between the Being that is indivisible and always changeless, and the one that is divisible and comes to be in the corporeal realm, he mixed a third, intermediate form of being, derived from the other two.

Similarly, he made a mixture of the Same, and then one of the Different, in between their indivisible and their corporeal, divisible counterparts. And he took the three mixtures and mixed them together to make a uniform mixture, forcing the Different, which was hard to mix, into conformity with the Same. Now when he had mixed these two together with Being, and from the three had made a single mixture, he re-divided the whole mixture into as many parts as his task required, each part remaining a mixture of the Same, the Different, and of Being.

This is how he began the division: first he took one portion away from the whole, and then he took another, twice as large, followed by a third, one and a half times as large as the second and three times as large as the first. The fourth portion he took was twice as large as the second, the fifth three times as large as the third, the sixth eight times that of the first, and the seventh twenty-seven times that of the first. After this he went on to fill the double and triple intervals by cutting off still more portions from the mixture and placing these between them, in such a way that in each interval there were two middle terms, one feeding the first extreme by the same fraction of the extremes by which it was exceeded by the second,

and the other exceeding the first extreme by a number equal to that by which it was exceeded by the second. These connections produced intervals of 3/2, 4/3, and 9/8 within the previous intervals. He then proceeded to fill all the 4/3 intervals with the 9/8 interval living a small portion over every time. The terms of this interval of the portion left over made a numerical ratio of 256/243. And so it was that the mixture, from which he had cut off these portions, was eventually completely used up.

Interpretation:

In first paragraph Plato seems to hint at Arithmetic mean as:

"In between the Being (that is 'A') that is indivisible and always changeless, and the one that is divisible and comes to be in the corporeal realm (that is 'B'), he mixed a third (that is 'C'), intermediate (as A+B / 2) form of being, derived from the other two (as A+B)." To conclude C= A+B /2 which is Arithmetic mean. In an Arithmetic Mean, the second amount exceeds the first by the same amount as the third exceeds the second, as in 2:3:4. Three exceeds two by the same amount that four exceeds three. We substitute extreme values of the example (i.e. 2 and 4) in the formula to find the middle value (i.e. 3) so as to validate the formula conceived.

AM = (2+4)/2

AM = 6/3

AM = 3

It seems Plato is implying at Harmonic Mean in second paragraph as:

"Similarly, he made a mixture of the Same (that is 'S'), and then one of the Different (that is 'D'), in between their indivisible and their corporeal (that is 'C'), divisible counterparts. And he took the three mixtures and mixed them together to make a uniform mixture, forcing the Different, which was hard to mix, into conformity with the Same (that is D*S as mixed them together forcefully). Now when he had mixed these two together with Being (that is D+S), and from the three had made a single mixture, he re-divided the whole mixture into as many parts as his task required (that is D+S / D*S), each part remaining; a mixture of the Same, the Different, and of Being. (that is D*S)".

To conclude; D*S (a remaining part as mixture of Same and Different) = D+S / D*S (as division of the whole mixture into as many parts as his task required).

i.e. D*S = D+S / D*S

2(D*S) = D+S

2(D*S)/ D+S = C which is Harmonic mean.

Harmonic Mean is the mean exceeding one extreme, and being exceeded by the other, by the same fraction of the extremes. For example of 12:8:6 mean 8 exceeds the smaller extreme 6 by a third of the smaller extreme which is 2; just as it (the mean) is itself exceeded by the same fraction (a third) of the larger extreme 12 which is 4. We substitute extreme values of the example (i.e. 12 and 6) in the formula to find the middle value (i.e. 8) so as to validate the formula conceived.

HM = 2 (12*6) / (12 +6)

HM = 2 (72) / 18

HM = 144/ 18

HM = 8

The third paragraph could be interpreted as Pythagorean Lambda as follow:

He began the division as: first He took one portion (1) away from the whole, and then he took another, twice as large (2 as 1+1), followed by a third, one and a half times as large as the second (3 as 2 + 1 i.e. one and half times 2) and three times as large as the first (3 as 1*3). The fourth portion he took was twice as large as the second (4 as 2*2) , the fifth three times as the third (9 as 3*3), the sixth eight times that of the first (8 as 8*1), and the seventh-twenty seven times that of the first (27 as 1*27). Triangular figure of numbers in the shape of the Greek letter lambda is the Tetrad of Pythagoras. It is a set of numbers whose relationships with each other seemed to summarize all the inter-dependent harmonies within the Universe of space and time.

$$
\begin{array}{ccccccc}
 & & & 1 & & & \\
 & & 2 & & 3 & & \\
 & 4 & & & & 9 & \\
8 & & & & & & 27
\end{array}
$$

The ratio 256:243 could be understood as extension of Pythagorean Lambda as follows:

A) The double interval series (powers of 2)

$2^0 = 1, 2^1 = 2, 2^2 = 4, 2^3 = 8, 2^4 = 16, 2^5 = 32, 2^6 = 64, 2^7 = 128, 2^8 = 256$

B) The triple interval series (powers of 3)

$3^0 = 1, 3^1 = 3, 3^2 = 9, 3^3 = 27, 3^4 = 81, 3^5 = 243$

$$
\begin{array}{ccccccccccccccccc}
 & & & & & & & & 1 & & & & & & & & \\
 & & & & & & & 2 & & 3 & & & & & & & \\
 & & & & & & 4 & & & & 9 & & & & & & \\
 & & & & & 8 & & & & & & 27 & & & & & \\
 & & & & 16 & & & & & & & & 81 & & & & \\
 & & & 32 & & & & & & & & & & 243 & & & \\
 & & 64 & & & & & & & & & & & & & & \\
 & 128 & & & & & & & & & & & & & & & \\
256 & & & & & & & & & & & & & & & &
\end{array}
$$

2.6.7 SPHERE AS MOST COMPLETE SHAPE

Plato describes the formation of Universe and attributes a spherical shape to it considering it most complete. Plato narrates:

"This is why he concluded that he should fashion the world as a single whole, composed of all wholes, complete and free of old age upon it and so causes it to waste away. And he gave it a shape appropriate to the kind of thing it was. The appropriate shape for that living, thing that is to contain within itself all the shapes there are. Hence he gave it a round shape, with its center equidistant from all directions. This of all shapes is the most complete and most like itself, which he gave to it because he believed that likeness, is incalculably more excellent than unlikeness." (*Timaeus,* sections 33B and C)

Interpretation:

Plato considers sphere with its centre equidistant from its extremes in all direction most complete and most like itself. Circle a two dimensional form of sphere has been given a significant place in creation of works of art and architecture throughout history. Its relevance in proportional system will be studied as proposed by Vitruvius, Alberti and more significantly by Palladio who prescribes circle as one of the seven main ratios proposed by him.

2.6.8 SUMMARY OF PLATO'S THEORY

Plato is emphasizing mathematical relationships as the basis for cosmic order. Plato's theory seems symbolic association of first ten numbers. As Dr. Shin says "These ten numbers are considered "divine numbers". That is, they are conceptual, immaterial; pre existed in God's mind and contain all the properties of the Universe. Plato's discussion is limited to physiological study and no proportional analogy is made specifically to it in terms of arithmetic or geometry. It might be because only the soul, being immortal and incorruptible, deserves to be organized according to the concepts of arithmetic and geometry, and not the body, for it is mortal and corruptible. Vitruvius, however, in order to take the measures from the human body and apply them to buildings finds it necessary to demonstrate the perfection of the body as well. (Lecture, Dr. Hyunho Shin, UCLA, Fall 1996). Such numbers from Pythagorean Lambda do find references in Palladio's work which will be see in analysis. Through description of cosmic division of Universe, Plato states following ratios which on close observation through analysis are found to be adopted by Palladio in Villa Plans. 2:1, 3:2, 4:3, 9:8.

Vitruvius writes about it in chapter one of book three of his book *'De Architectura'* and is dealt in next section of chapter.

2.7 VITRUVIUS: PRINCIPLES OF PROPORTIONS IN *'DE ARCHITECTURA'*

This is to understand theory of proportion and the aspect of numerology in architecture and formation of human body as in Vitruvius's *'De Architectura'*

2.7.1 SOURCE OF STUDY

Vitruvius Pollio authored the oldest and most influential work on architecture in existence *'De Architectura'* translated into English as 'Ten Books On Architecture'. *'De Architectura'* is divided in to ten books. Book one treats of town planning, architecture in general, and of the qualifications proper in an architect; the second of building materials, the third and the fourth of temples and orders; the fifth of other civic buildings; the sixth of domestic buildings; the seventh of pavements and decorative plaster work; the eight of water supplies; the ninth of geometry, astronomy etc; the tenth of machines, civil and military. Vitruvius presents the concept of symmetry and proportion in the first chapter of the third book. One also find mention of proportions in most of the building types classified and described by Vitruvius in his third, fourth, fifth and sixth books.

The study includes here; the relevant sections (depicted hereunder with bold and italic text) from Frank Granger's translated work for its clarity on text and discuss them as running commentary. The study has also referred to English translation with partial text in Greek by Morris Morgan for supporting illustrations (that the study redraws with added analytical data) which the first translation lacks.

2.7.2 HISTORICAL CONTEXT WITHIN WHICH VITRUVIUS'S THEORY DEVELOPED

Marcus Vitruvius Pollio, a Roman architect and engineer was from the first century B.C. During that period, Greek architecture was governed by rules of geometry and symmetry. Classical orders (Ionic, Doric and Corinthian) were developed and applications of proportions were necessary for creation of perfect building. Proportions of human body and ratios derived from musical harmony (1:2:3:4) ruled during Greek period with use of foot, palm, cubit and finger as units of measurement.

As against Greek, Roman architecture was more about spatial configuration and articulation with surface decorative elements and it looked upon Greek buildings for their system of proportions. Though there were subtle differences in form and style of architecture, there was similarity of proportions used by the Greeks and the Romans.

A lot of Vitruvius's work is based on the Greek orders and proportioning system and his book of architecture dealing with temple and orders in architecture can be termed as his interpretation of the Greek proportioning system along with his own inputs.

2.7.3 OVERVIEW OF THEORIES DEVELOPED BY VITRUVIUS

"The architect should be equipped with knowledge of many branches of study and varied kinds or learning, for it is by judgment that all work done by other arts is put to test. Let him be educated, skilful with the pencil, instructed in geometry, know much history, have followed the philosopher with attention, understand music, have knowledge of medicine, know the opinion of jurists and be acquainted with astronomy and the theory of the heavens"). (*'De Architectura',* Book I, Chapter I, Section I and III).

Vitruvius seemed to be well-versed in all the above fields he mentions and were essential in architecture. His theory; also called 'Vitruvian Canon' laid the foundation for renaissance architecture.

According to Vitruvius, a structure must exhibit the three qualities of Firmitas, Utilitas and Venustas, that is it must be strong or durable, useful and beautiful.

The relation of whole to the part and part to the whole had great significance in Vitruvian theory of proportion. Vitruvius interpreted architecture of antiquity and proposed different systems; which can be broadly classified as under (given in chronological order as in *'De Architectura'.)*

1) Concept of proportion and symmetry.
2) Vitruvian Man and Proportions of human body.
3) Perfect numbers and its relation to human proportions.
4) Classification of temple's elementary forms based on column position and numbers.
5) The proportions of intercolumniation and of column.

6) 'Orders' in architecture and their proportions in temple architecture.. (Ionic, Doric, Corinthian and Tuscan).
7) Length to breadth ratios in forum and basilica.
8) Proportions in dwelling units.

The study of above theories would give a matrix of ratios which are of significance as they are based on varied methods of proportioning (i.e. human proportions, harmonious proportions, number ratios etc.). The next part of the chapter presents the narrations from the text *'De Architectura'* and is followed by its interpretations.

2.7.4 VITRUVIAN CONCEPT OF SYMMETRY AND PROPORTION

According to Vitruvius, architecture depends on fundamental principles namely Order, Arrangement, Eurhythmy (Proportions), Symmetry, propriety and Economy. Vitruvius emphasizes the whole to part and part to whole relationship with Order, Arrangement, Eurhythmy and Symmetry together defining his view of proportions and Symmetry. Vitruvius states ***"Order is the balanced adjustment of the details of the work separately and, as to the whole, the*** **arrangement** ***of the proportion with a view to a symmetrical result. This is made up of Dimension, which in Greek is called*** **posoies.** ***Now Dimension is the taking of modules from the parts the work; and the suitable effect of the whole work arising from the several subdivisions of the parts. Arrangement, however, is the fit assemblage of details, and, arising from this assemblage, the elegant effect of the work and its dimensions, along with a certain quality or character. The kinds of the arrangement (which in Greek are called*** **ideue)** ***are these: ichnography (plan); orthography (elevation); scenography (perspective) Proportion implies a graceful semblance; the suitable display of details in their context, this is attained when the details of the work are of a height suitable to their breadth, of a breadth suitable to their length; in a word, when everything has a symmetrical correspondence. Symmetry also is the appropriate harmony arising out of the details of the work itself; the correspondence of each given detail among the separate***

details to the form of the design as a whole." (*'De Architectura',* Book I, Chapter II, Section II to IV).

Interpretation:

It could be interpreted as Order gives measure to members, Arrangement gives it proper placement, Eurhythmy gives proportion to its members (i.e. length to width to height) and Symmetry is placement of each member in proportion to the whole. In the first chapter of the third book Vitruvius presents the concept of symmetry as *symmetria* and of proportion as *analogia.* As Dr. Shin remarks 'Vitruvius's term symmetria is derivable from the combined Greek word 'syn + metria' which can be translated in English as 'with + measure". Unlike the contemporary concept of symmetry as geometrical disposition of elements which is encoded as dihedral or cyclic symmetry, the Vitruvian concept of symmetry was based on establishment of various measures or modules. Vitruvius's theory of proportion is concerned with establishment of relations of measures that is of the parts as well as of the parts and whole.

2.7.5 PROPORTIONS OF HUMAN BODY

Human body was held up as the most perfect manifestation of natural form and proportion having divine harmony. Just as the member (i.e. parts) of human body are proportioned to the frame (body) as a whole, the different members of the building must be in exact symmetrical relation to the whole in a perfect building.

For proportions in human body he says, ***'for nature has so planned the human body that the face from the chin to the top of the forehead and the roots of the hair is the tenth part; also the palm of the hand from the wrist to the top of the middle finger is as much; the head from the chin to the crown, an eight part; from top of the breast with the bottom of the neck to the roots of the hair, a sixth part; from the middle of the breast to the crown, a fourth part; a third part of the height of the face is from the bottom of the chin to the bottom of the nostrils to the line between the brows, as much; from that line to the roots of the hair, the forehead is given as the third***

part. The foot is a sixth of the height of the body; the cubit a quarter, the breast also a quarter. The other limbs also have their own proportionate measurements. And using these, ancient painters and famous sculptors have attained great and unbound distinction.' (*'De Architectura'*, Book III, Chapter I, Section II).

Interpretation:

His theory of symmetry and proportion confirms the perfection of human body in terms of arithmetic and geometry. He establishes measures of symmetria from Pythagorean number theory and measures derived from human body.

Vitruvius here focuses on four fraction by four consecutive even numbers as 1/4, 1/6, 1/8 and 1/10. One would see it being adopted by Palladio in his design grammar as square and fourth, square and one sixth in coming chapters. If one converts these fractions to whole numbers, one can derive some proportional relations as follows which too were adopted by Palladio in his planning. On removing fractions by least common multiple of 4, 6, 8 and 10 we have 120 and whole numbers as 120 x 1/4 = 30, 120 x 1/6 = 20, 120 x 1/8 = 15 and 120 x 1/10 = 12. From these numbers 30, 20, 15 and 12 we can decipher following proportions. 3:2 (30:20), 2:1 (30:15), 4:3 (20:15), 5:4 (15:12), 5:3 (20:12) and 5:2 (30:12). (Refer figure 2.6.1 to 2.6.5: Proportions of human body according to Vitruvius.)

Figure 2.6.1 illustration of Vitruvian human proportions (1/10 scale) considering male human height as six feet

- The distance from the hairline to the bottom of the chin is one-tenth of a man's height
- The length of the hand is one-tenth of a man's height

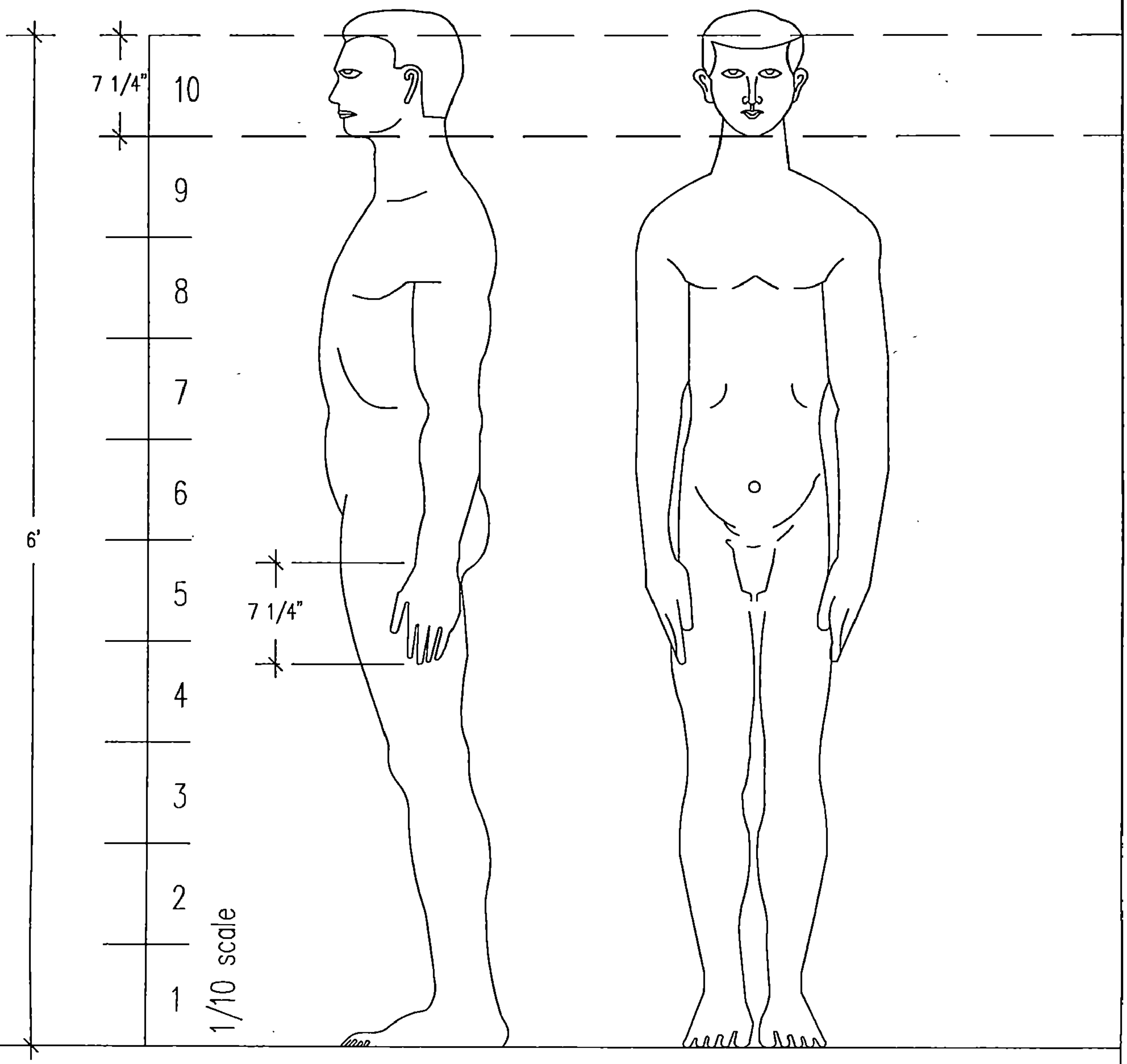


Figure 2.6.2 illustration of Vitruvian human proportions (1/8 scale) considering male human height as six feet

- The distance from the top of the head to the bottom of the chin is one–eighth of a man's height
- The distance from the elbow to the armpit is one–eighth of a man's height

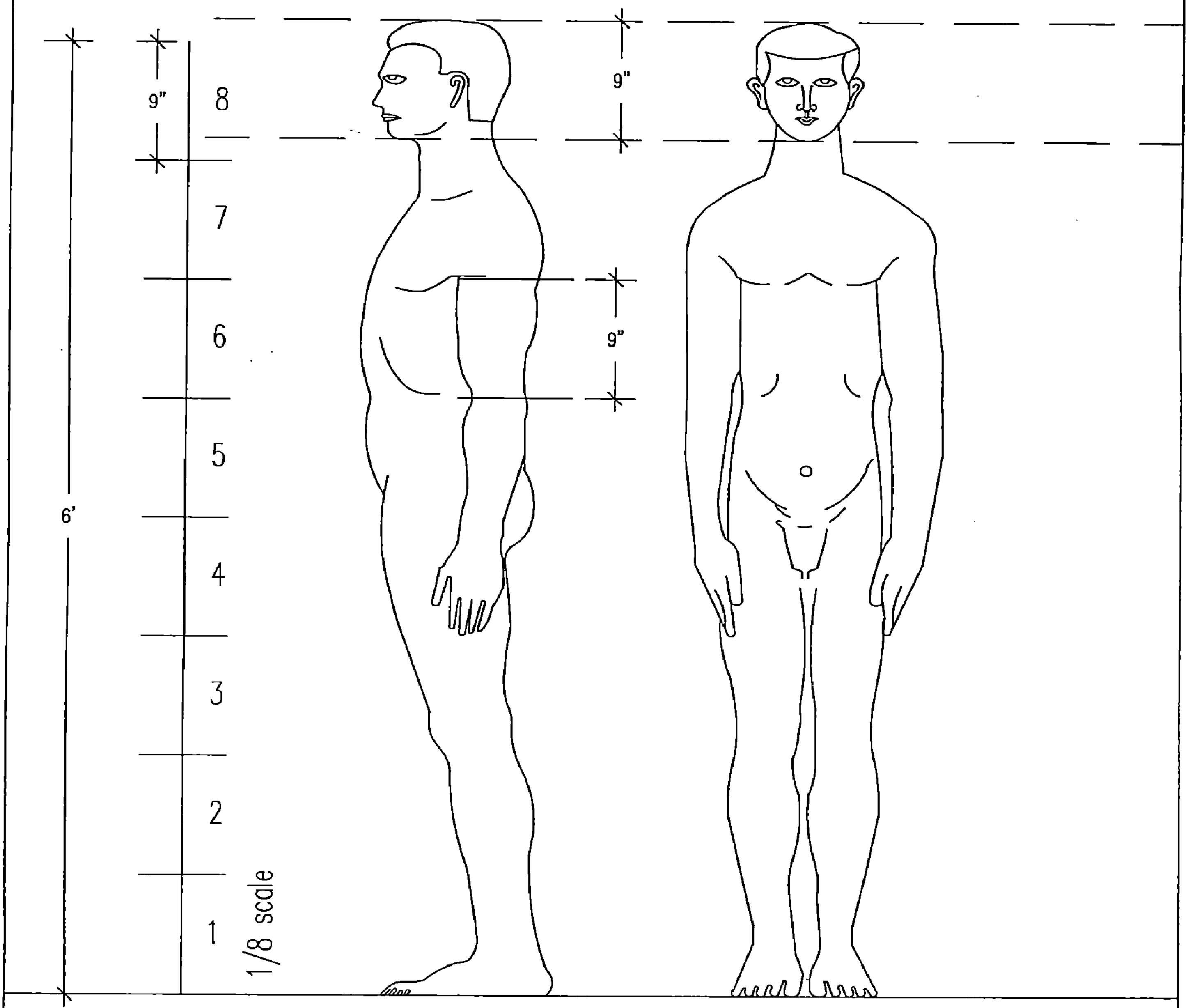


Figure 2.6.3 illustration of Vitruvian human proportions (1/6 scale) considering male human height as six feet

- The distance from the bottom of the neck to the hairline is one-sixth of a man's height
- The length of a man's foot is one-sixth of his height

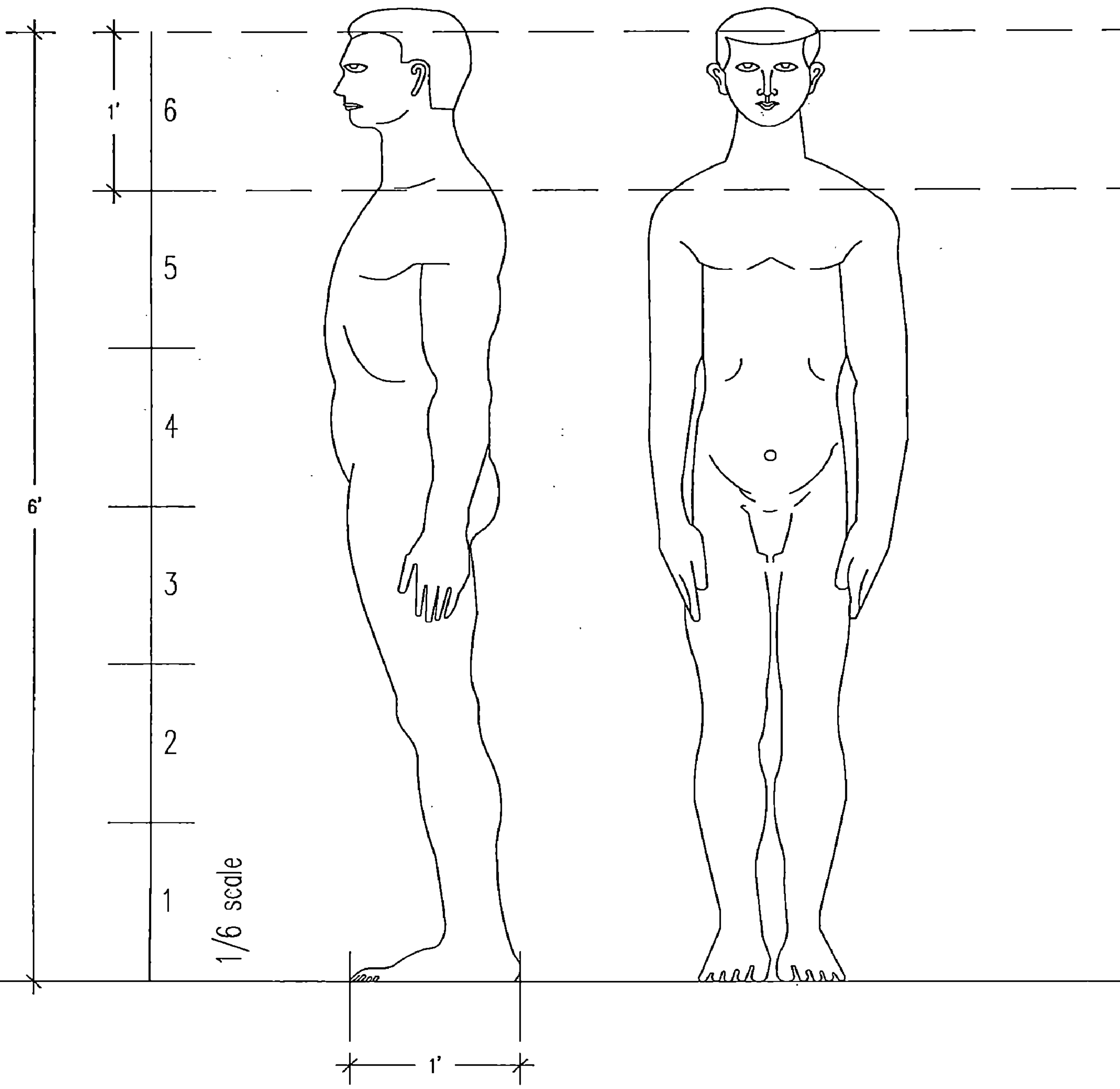


Figure 2.6.4 illustration of Vitruvian human proportions (1/4 scale) considering male human height as six feet

- The maximum width of the shoulders is a quarter of a man's height
- The distance from the middle of the chest to the top of the head is a quarter of a man's height
- The distance from the elbow to the tip of the hand is a quarter of a man's height

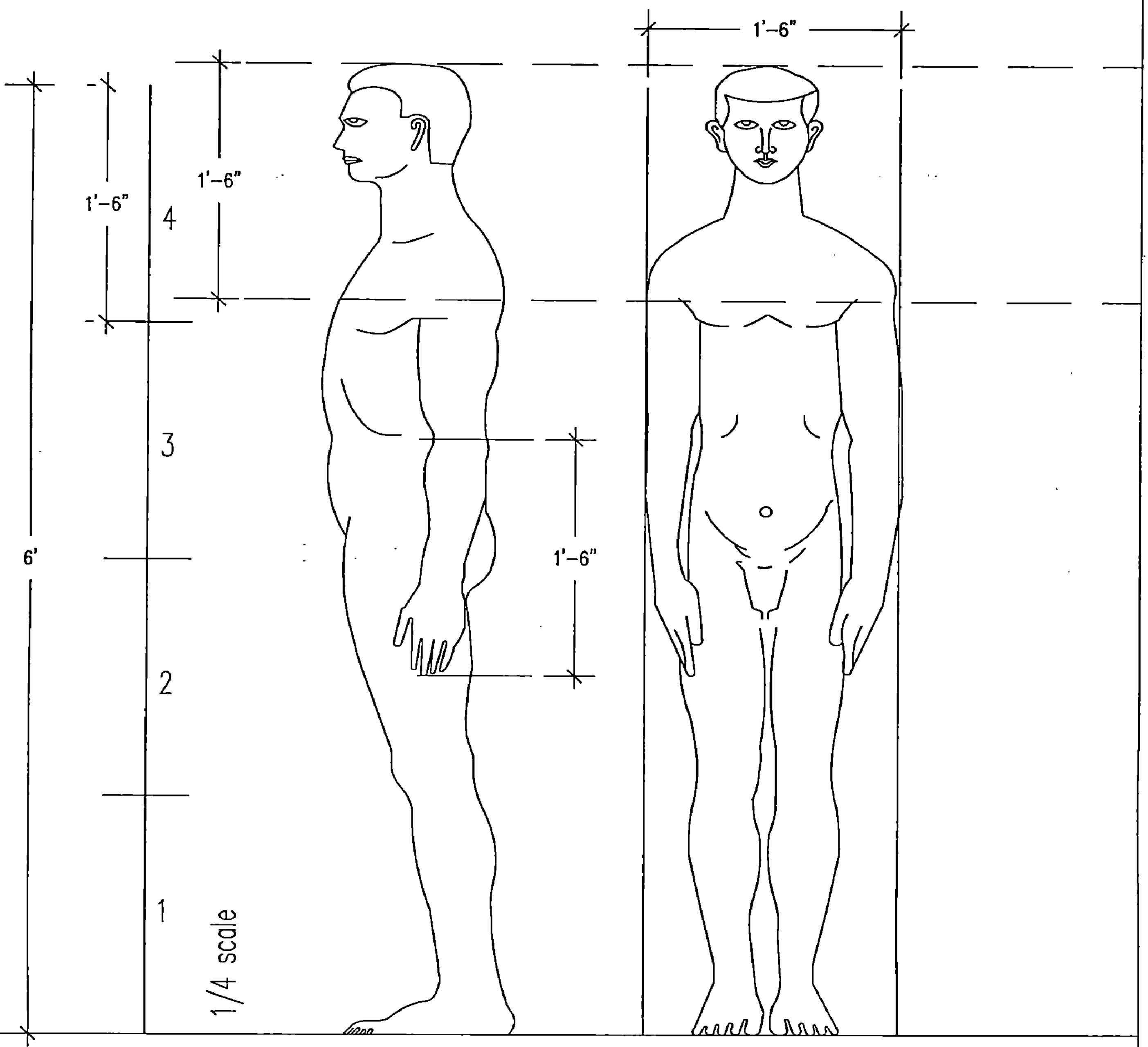
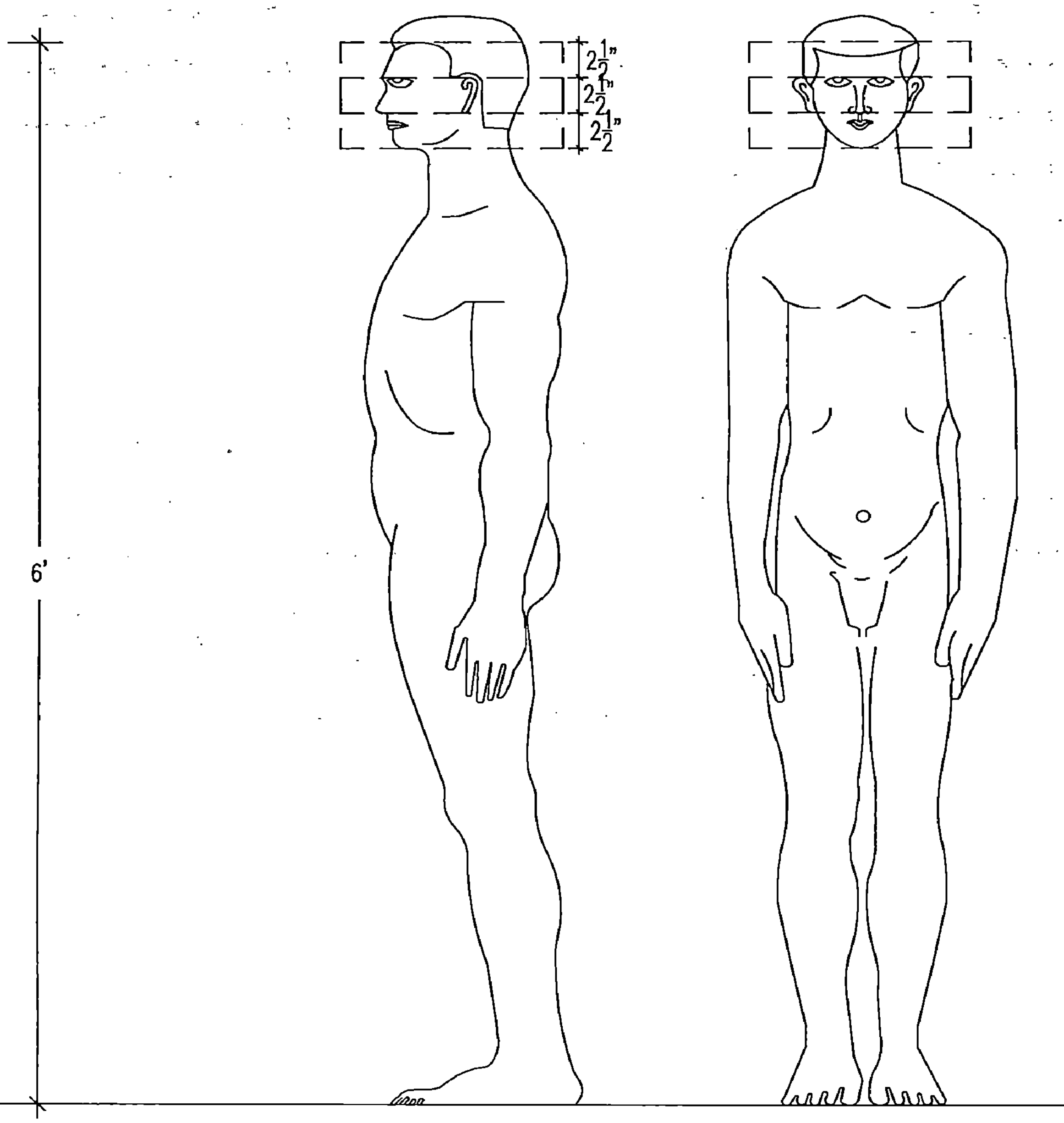


Figure 2.6.5 illustration of Vitruvian human proportions (1/3 scale) considering male human height as six feet

- The distance from the bottom of the chin to the nose is one–third of the length of the head
- The distance from the hairline to the eyebrows is one–third of the length of the face
- The length of the ear is one–third of the length of the face



2.7.6 CONCEPT OF 'VIRTUVIAN MAN'

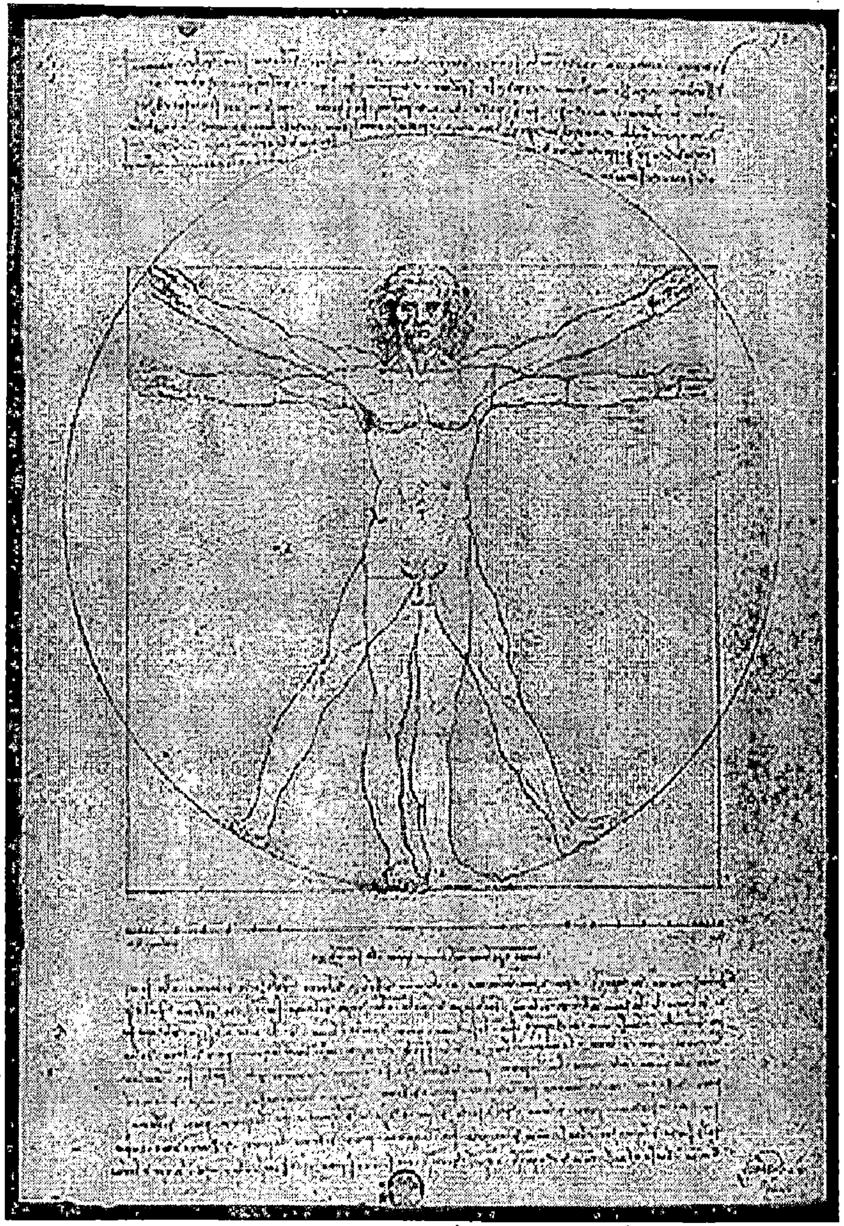
Architecture is an imitation of nature and understanding proportions of the greatest work of art: the human body led Vitruvius to definition of his 'Vitruvian Man'.

'In like fashion the members of temples ought to have dimensions of their several parts answering suitably to the general sum of their whole magnitude. Now the navel is naturally the exact centre of the body." For if a man lies on his back with hands and feet outspread, and the centre of a circle is placed on his navel, his figure [fingers] and toes will be touched by the circumference. Also a square will be found described within the figure, in the same way as a round figure is produced. For if we measure from the sole of the foot to the top of the head, and apply the measure to the outstretched hands, the breadth will be found equal to the height, just like sites which are squared by rule.' (*'De Architectura',* Book III, Chapter I, Section III).

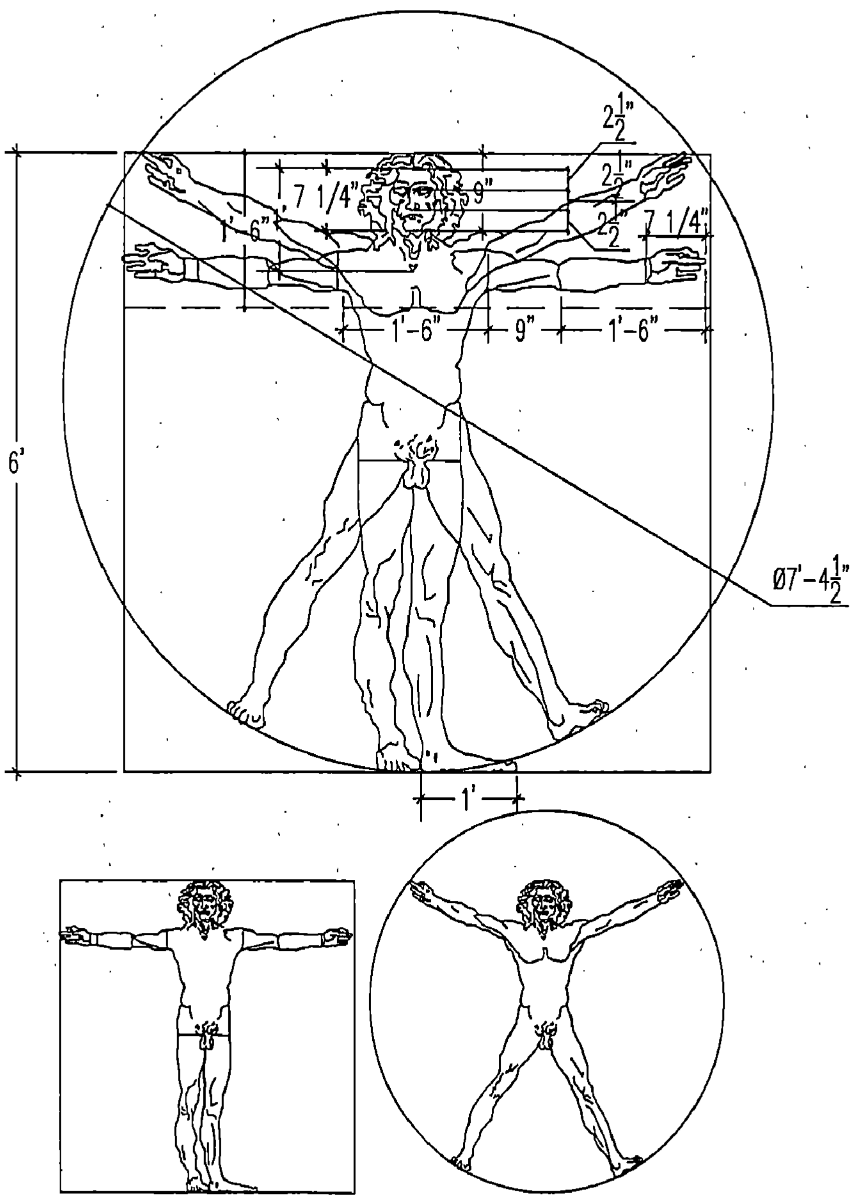
Interpretation:

Vitruvius hereby describes the famous 'Vitruvian Figure' or 'Vitruvian Man' that shows that out stretched human body could be place in circle and a square which was considered as the fundamental geometric patterns of the cosmic order and thus geometrically perfect. Vitruvius confirms the perfection of the human body in terms of arithmetic and geometry. Symmetry and proportion of the human body are organized in terms of simple numbers of arithmetic. And the configuration of the human body is related to the most basic shapes of the circle and the square.(Refer figure 2.6.6: Study of Vitruvian human proportions in Leonardo Da Vinci's 'Vitruvian Man'.)

Figure 2.6.6 Study of Vitruvian human proportions in Leonardo Da Vinci's 'Vituvian Man'



Source for image of 'Vitruvian Man':
http://en.wikipedia.org/wiki/Vitruvian_Man



2.7.7 CONCEPT OF PERFECT NUMBERS (SIX, TEN AND SIXTEEN)

According to Vitruvius, the units of measure (finger, inch, palm, foot) were proportionate to human body and were used in building operations. These units were grouped together to get perfect number ten. He cites ancients and Plato to show the relevance of number ten as under.

'Now the ancient determined as perfect the number which is called ten. For from the hands they took the number of the inches; from the palm, the foot was discovered. Now while in the two palms with their fingers, ten inches are naturally complete, Plato considered that number perfect, for the reason that from the individual things which are called monades among the Greeks, the decad is perfected. But as soon as they are made eleven or twelve, because they are in excess, they cannot be perfect until they reach the second decad. For individual things are minor parts of that number. ' (*'De Architectura'*, Book III, Chapter I, Section V).

For number six Vitruvius narrates "***But mathematician, disputing on the other side, have said that the number called six is perfect for the reason that this number has divisions which agree by their proportions with number six. Not less also because the foot has sixth part of a man's height, and also because six times, that is the number six, in that it is completed by the number of feet, determined the height of the body, they fixed that number as perfect, observing that the cubit consists of six palms and twenty-four fingers".*** (*'De Architectura'*, Book III, Chapter I, Section V).

The ancients (Greeks) used these numbers in cities, coins and temples. Romans followed them till they discovered another perfect number sixteen for which Vitruvius narrates

"But afterwards they perceived that both numbers were perfect, both the six and the ten; and they threw both together, and made the most perfect number sixteen. Now of this they found the origin in the foot. For when two palms are taken from the cubit, there is left a foot of four palms, and

the palm has four fingers. So it comes that the foot has sixteen fingers, and the bronze denarius as many asses". (*'De Architectura'*, Book III, Chapter I, Section V).

Interpretation:

Pythagoras termed number ten perfect as sum of first four numbers, i.e.10= 1+2+3+4. "Vitruvius shows the perfection of the human body in terms of the 'philosophically' perfect number ten and 'mathematically' perfect number six. His analogy is based on proportional relations of four elements of measure as: Finger (or inch) 1, Palm 4, Foot 16 and Cubit 24. He says that the 'philosophically' perfect number ten is found in the sum of fingers in the two hands. While for 'mathematically' perfect number six Vitruvius says that the foot is the sixth of a man's height. He adds cubit has 6 palm or 24 fingers or inches.

2.7.8 ELEMENTARY TEMPLE FORMS BASED ON COLUMN POSITION & NUMBERS

Temples for immortal Gods were considered permanent and hence needed utmost precision. To achieve perfect building, members work as separate part and the whole design were so arranged achieve a harmony in their proportion & symmetry. Based on number of columns & their position in respect to the walls which enclose the cella, Vitruvius mentions seven types of elementary temple forms, described as follows

"***It is from the plan of a temple that the effect of its design arises. And first in antis, which in Greek is called naos en parastasin; next, prostyle, amphiprostyle, peripteral, pseudodipteral, hypaethral. The designs of these are formulated in the following manner. A temple will be in antis when it has in front, pilasters terminating the walls which enclose the shrine, and in the middle, between the pilasters, two columns, and above, a gable, built with the symmetry to be-set forth in this book. The prostyle has everything like the temple in antis, except two angle columns over against the pilasters; and above entablatures as in antis which return at***

the angles on either side. The amphiprostyle has everything like the prostyle, and besides has columns and a pediment at the back. The peripteral will be that which shall have six columns in front and six at the back, and on either side eleven, counting in the angle columns. Now these columns are to be so placed that there is all round a distance the width of an intercolumniation. The pseudodipteros is so planned that there are eight columns both in front and at the back, and fifteen on each side, including the angle columns. But the walls of the cella are to face the four middle columns in front and at the back. Thus there will be a space all round, from the walls to the outside rows of the columns, of two inter columniations, and the thickness of one column. The dipteros has eight columns in front and at the back but it has double rows of columns round the sanctuary. The hypaethral temple has ten columns in front and at the back. For the rest it has everything like the dipteral, except that in the interior it will have two stories of columns, at a distance from the walls all round like the colonnade of a peristyle (*'De Architectura'*, Book III, Chapter II, Section I to VII).

Interpretation:

Based on above narration one can summaries seven temple forms as:

1) *Antis* - Temples with front end wall as pilasters and two columns in front.

2) Prostyle - Temples with columns only in front. (4 columns)

3) *Amphiprostyle* - Temples with columns on the front and back. (4 columns)

4) *Peripteral* - Temples with columns (11 x 6) all around

5) *Pseudodipteral* - Temples with columns (15 x 8) all around set at a distance from the temple walls.

6) *Dipteral* - Temples with two sets of columns (15 x 8) all around the temple

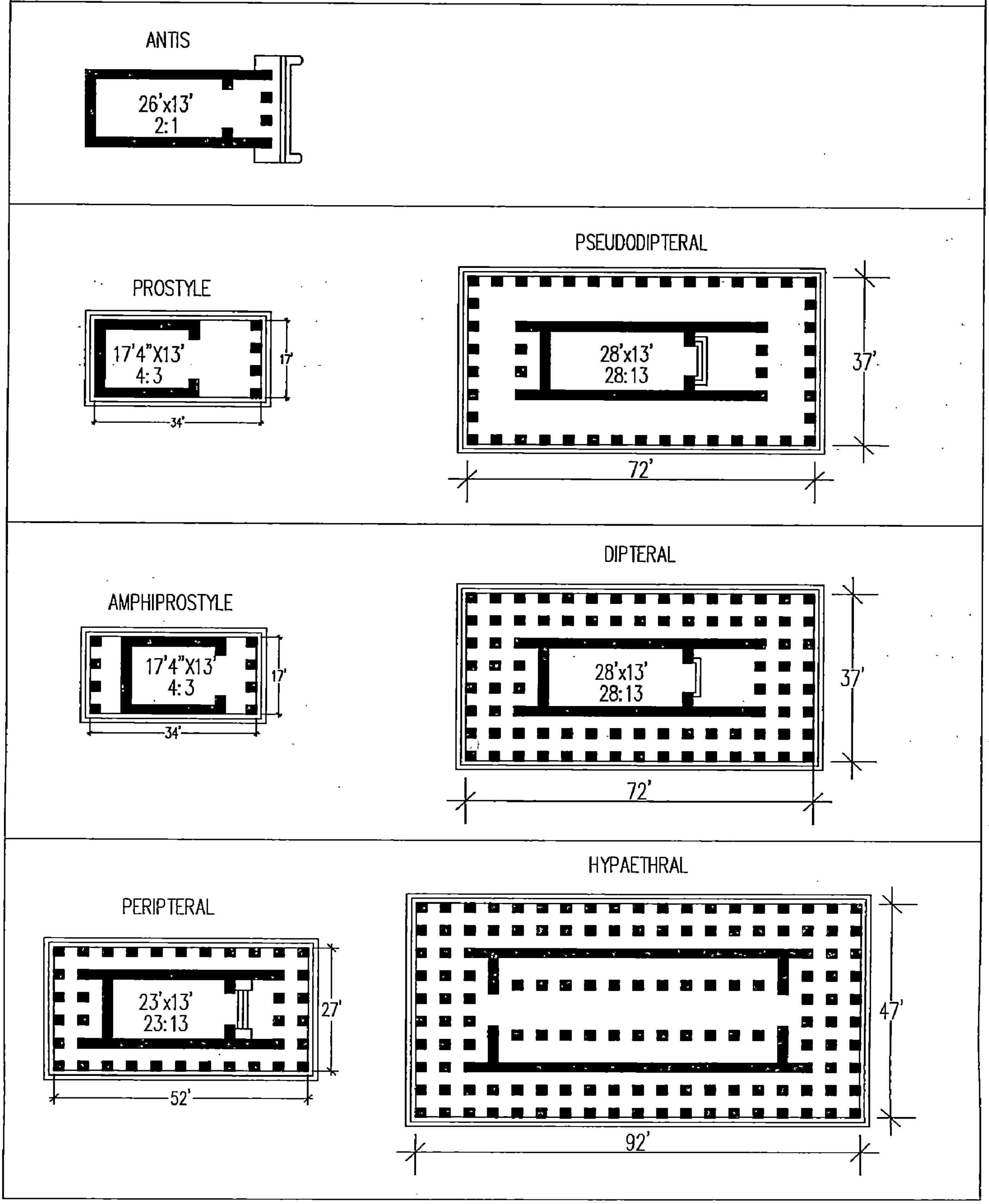
7) *Hypaethral* - Temples with two sets of columns all around temple with additional columns in interiors which is open to sky (19 x 10 columns). Refer figure 2.6.7: Different types of temple plan as stated by Vitruvius.

From definition and description of Hypaethral style by Vitruvius it has to be 10 columns in front and 15 on sides for dipteral arrangement has 15. But the example in Morris Morgan's translation shows 19 x 10 columns. Morris Morgan's illustration seems valid as it confirms to another description of intercolumniation for Periptral arrangement by Vitruvius in *'De Architectura'*, Book III, Chapter IV, section III.

Vitruvius considers intercolumniation as governing the proportions of temple and not the number of columns. As an explanation Vitruvius in (*'De Architectura'*, Book III, Chapter IV, Section iii). states that "***But let the columns be so disposed in peripteral temples that the intercolumniations on the sides are twice as many as on the front. For then the length of the work will be twice the breadth. For those who made double the number of the columns seem to be at fault because in the length one more inter-columniation than is necessary seems to occur.***"

This marks the deviation from Alberti's theory which is dealt later in the chapter.
The four forms (*Peripteral*, *Pseudodipteral, Dipteral*, *Hypaethral*) having 6 or more columns have length to breadth ratio of 2:1 which could be derived at as follows:
With 11 by 6 columns (*Peripteral*) Vitruvius is implying 10 by 5 intercolumniation; which is 2:1. Similarly with 15 by 8 columns (*Pseudodipteral and Dipteral*) Vitruvius is implying 14 by 7 intercolumniation; which again is 2:1. 19 x 10 columns (*Hypaethral*) would have 18 by 9 intercolumniations which is 2:1. One would see in chapters to follow it being adopted by Palladio in his theory.

Figure 2.6.7 Variation Of The Antis Temple Style Temple Plan
As Per Intercolumnation By Vituvius



2.7.9 THE PROPORTIONS OF INTERCOLUMNIATIONS

Based on the distance between two columns i.e. proportions of intercolumniations, Vitruvius proposed five classes of temples namely Pycnostyle, Systyle, Diastyle, Araestyle and Eustyle. Vitruvius proposed to take one of the parts (length, breadth, column, intercolumniation) as module and in temple classification the thickness of the column was be equal to one module. The intercolumniation could be in multiple ratio of the diameter of the column. And the column height could also be defined by its multiple. As narrated by Vitruvius the temples are classified as under:

"There are five elevations of temples, of which the names are as follows: Pyenostyle, that is with close columns Systyle, with the spaces of the intercolumniations a little more open, Diastyle, wider still; with intercolumniations more open than they should be, Araeostye; Eustyle, with the just distribution of intervals. Pycnostyle is that in the intercolumniations of which the thickness of a column and a half can be interposed. The Systyle also is that in which the thickness of two columns can be placed in the intercolumniations, and the plinths of the bases are equally great with the space between two plinths, Of the Diastyle, the arrangement is as follows: when we can interpose the thickness of three columns in the intercolumniation. In Araeostyle buildings it is not given to use stone or marble architraves, but continuous wooden beams are to be employed. The Eustyle, which is specially to be approved, and has proportions set out for convenience, beauty and strength. For in the intervals the width of two and a quarter columns is to be made, and the middle intercolumniation, one in the front and one in the back, is to be three columns wide. For so the building will have both a graceful appearance in its configuration, and a convenient approach." (*'De Architectura'*, Book III, Chapter III, Section I).

Interpretation:

On basis of various intercolumniations Vitruvius classifies temple elevations in five kinds (*'De Architectura',* Book III, Chapter III), namely

1) *Pycnostyle* (1.5 times column diameter as intercolumniation)
2) *Systyle* (2 times column diameter as intercolumniation)
3) *Diastyle* (3 times column diameter as intercolumniation)
4) *Araeostyle* (4 times column diameter as intercolumniation)
5) *Eustyle* (2.25 times column diameter as intercolumniation)

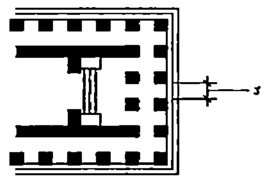
He takes column diameter as one module to describe above mentioned styles as 1 1/2, 2, 2 1/4 and 3 or 6:8:9:12 respectively. In terms of ratio between intercolumnation and column diameter they are:

1) *Pycnostyle* 3:2
2) *Sy style* 2:1
3) *Diastyle* 3:1
4) *Araeostyle* 4:1
5) *Eustyle* 9:4

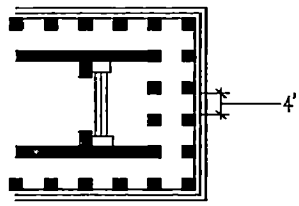
Refer figure 2.6.8: Different types of intercolumniation by Vitruvius

Figure 2.6.8 Diffrent Types Of
As Per Intercolumnation By Vituvius

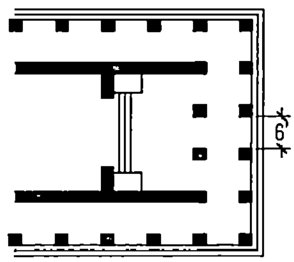
PYCNOSTYLE
Intercolumnation 1.5 diameter



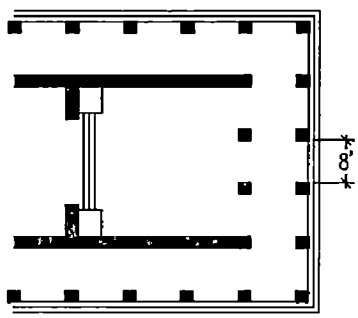
SYSTYLE
Intercolumnation 2.0 diameter



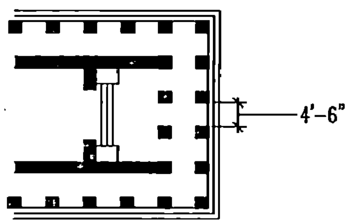
DIASTYLE
Intercolumnation 3.0 diameter



ARAEOSTYLE
Intercolumnation 4.0 diameter



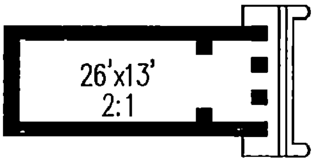
EUSTYLE
Intercolumnation 2.25 diameter



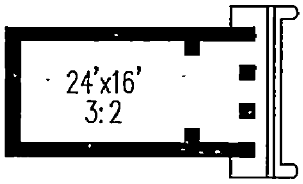
On the basis of these seven different types of temples and five different types of intercolumniations defined by Vitruvius, the study has tried to develop 35 different temple plans (7x5) to study overall proportion that may be underlying principal of temple planning by Vitruvius. (Refer figure numbers 2.6.9 to 2.6.15: Variation of temple plans as per intercolumniation by Vitruvius.).

Figure 2.6.9 Variation Of The Prostyle Temple Style Temple Plan
As Per Intercolumnation By Vituvius

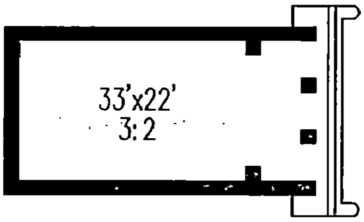
PYCNOSTYLE
Intercolumnation 1.5 diameter



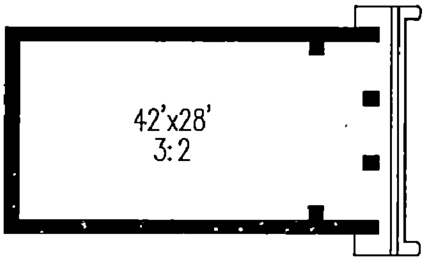
SYSTYLE
Intercolumnation 2.0 diameter



DIASTYLE
Intercolumnation 3.0 diameter



ARAEOSTYLE
Intercolumnation 4.0 diameter



EUSTYLE
Intercolumnation 2.25 diameter

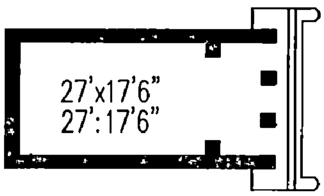
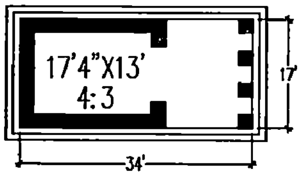
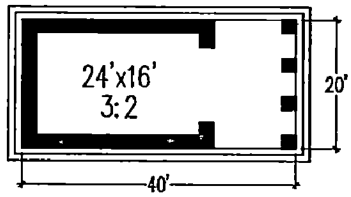


Figure 2.6.10 Variation Of The Prostyle Temple Style Temple Plan
As Per Intercolumnation By Vituvius

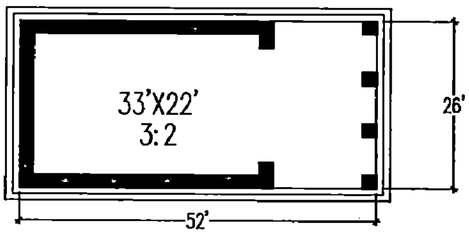
PYCNOSTYLE
Intercolumnation 1.5 diamete



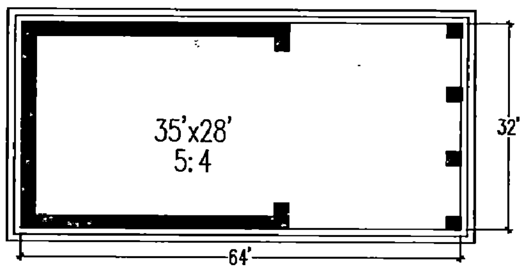
SYSTYLE
Intercolumnation 2.0 diameter



DIASTYLE
Intercolumnation 3.0 diameter



ARAEOSTYLE
Intercolumnation 4.0 diameter



EUSTYLE
Intercolumnation 2.25 diameter

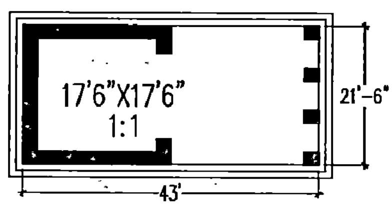
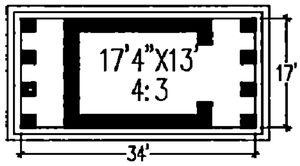
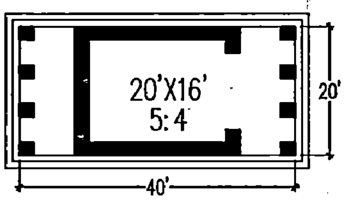


Figure 2.6.11 Variation Of The Amphiprostyle Temple Style Temple Plan
As Per Intercolumnation By Vituvius

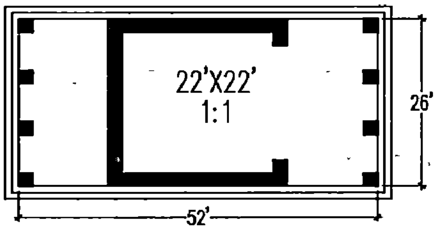
PYCNOSTYLE
Intercolumnation 1.5 diamete



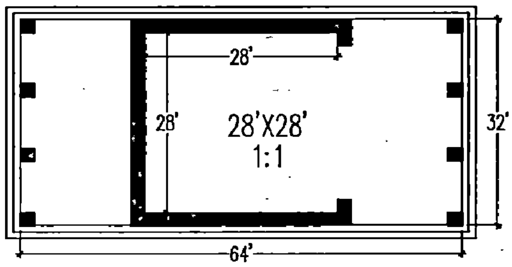
SYSTYLE
Intercolumnation 2.0 diameter



DIASTYLE
Intercolumnation 3.0 diameter



ARAEOSTYLE
Intercolumnation 4.0 diameter



EUSTYLE
Intercolumnation 2.25 diameter

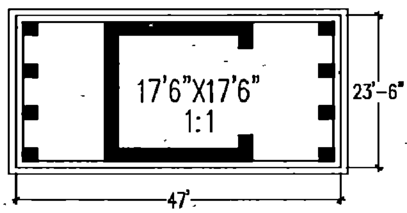
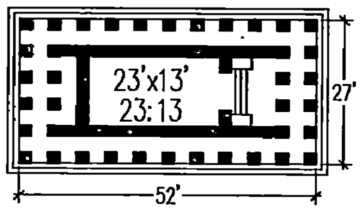
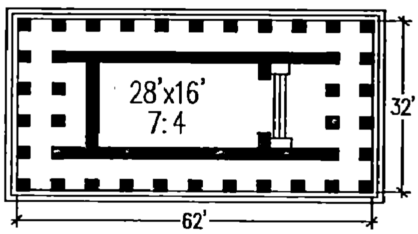


Figure 2.6.12 Variation Of Peripteral Style Temple
Plan
As Per Intercolumnation By Vituvius

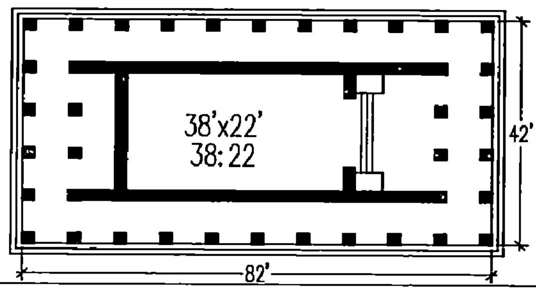
PYCNOSTYLE
Intercolumnation 1.5
diameter
width to breath ratio 1.92



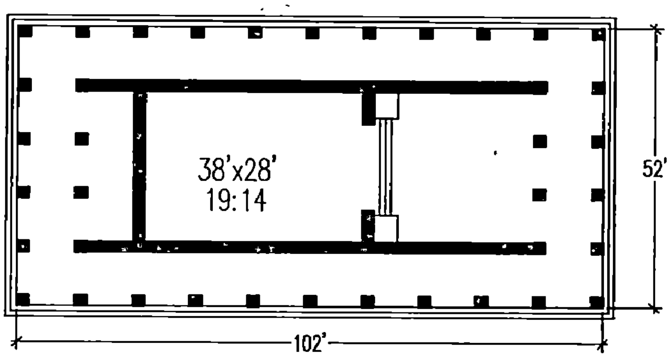
SYSTYLE
Intercolumnation 2.0 diameter
width to breath ratio 1.93



DIASTYLE
Intercolumnation 3.0 diameter
width to breath ratio 1.95



ARAEOSTYLE
Intercolumnation 4.0 diameter
width to breath ratio 1.96



EUSTYLE
Intercolumnation 2.25 diameter
width to breath ratio 1.94

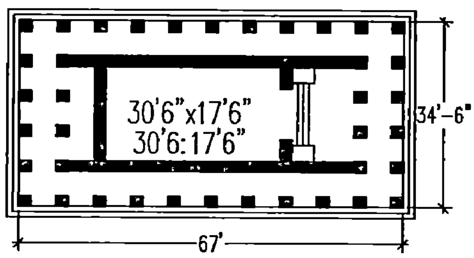
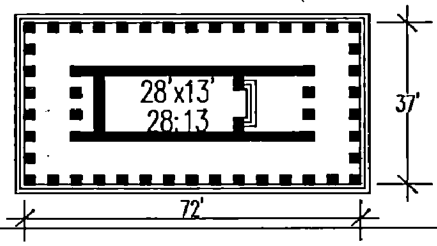
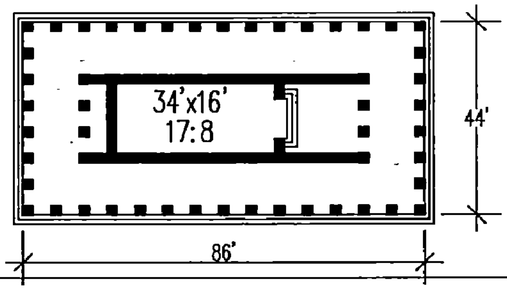


Figure 2.6.13 Variation Of Pseudodipteral Style Temple Plan
As Per Intercolumnation By Vituvius

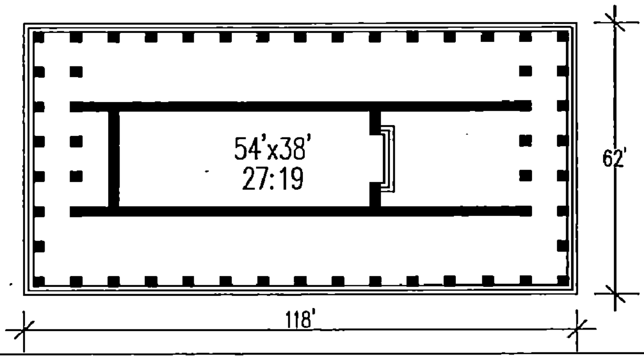
PYCNOSTYLE
Intercolumnation 1.5 diameter
width to breath 1.94



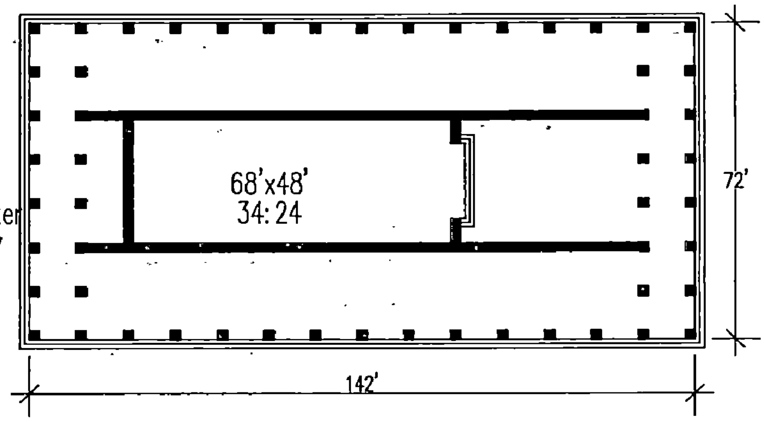
SYSTYLE
Intercolumnation 2.0 diameter
width to breath ratio 1.95



DIASTYLE
Intercolumnation 3.0 diameter
width to breath ratio 1.90



ARAEOSTYLE
Intercolumnation 4.0 diameter
width to breath ratio 1.97



EUSTYLE
Intercolumnation 2.25 diameter
width to breath ratio 1.95

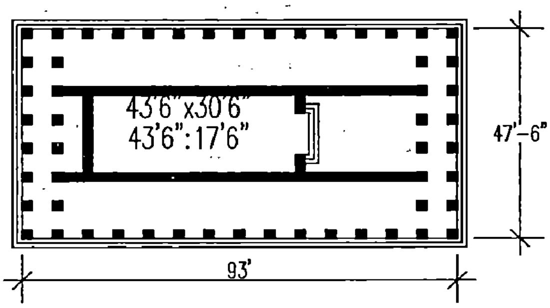
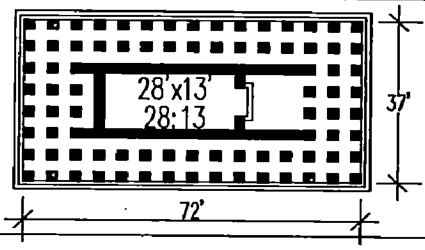
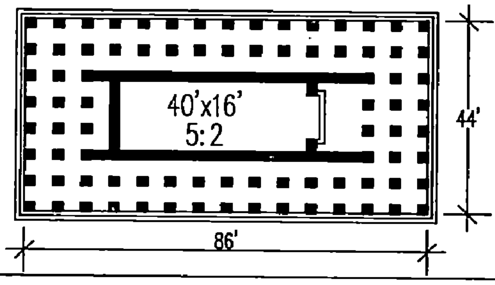


Figure 2.6.14 Variation Of Dipteral Style Temple Plan
As Per Intercolumnation By Vituvius

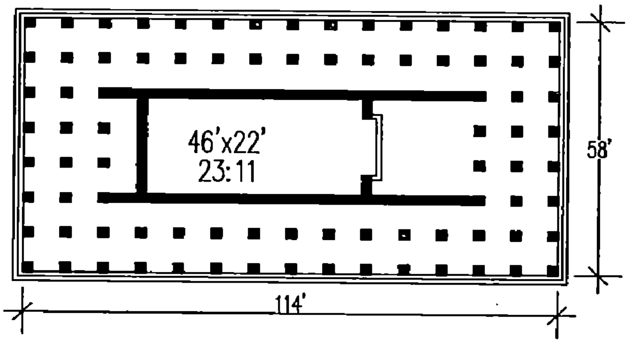
PYCNOSTYLE
Intercolumnation 1.5 diameter
width to breath ratio 1.94



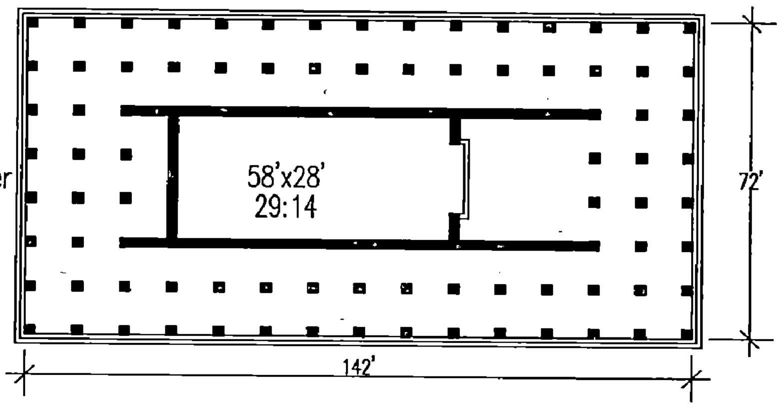
SYSTYLE
Intercolumnation 2.0 diameter
width to breath ratio 1.95



DIASTYLE
Intercolumnation 3.0 diameter
width to breath ratio 1.96



ARAEOSTYLE
Intercolumnation 4.0 diameter
width to breath ratio 1.97



EUSTYLE
Intercolumnation 2.25 diameter
width to breath ratio 1.95

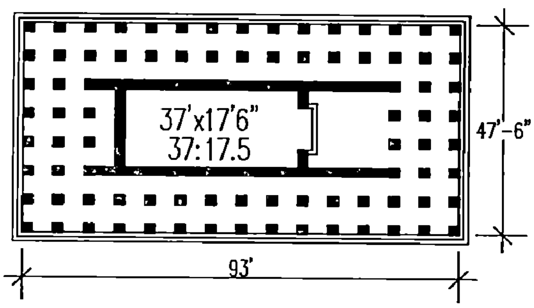
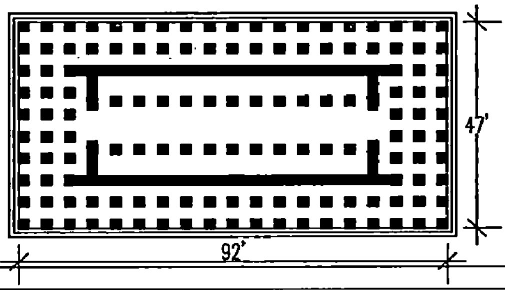
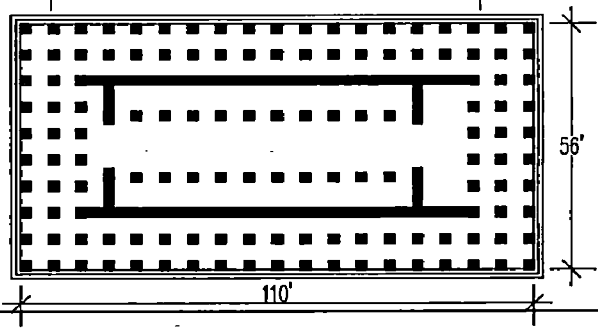


Figure 2.6.15 Variation Of The Hypaethral Temple Style Temple Plan As Per Intercolumnation By Vituvius

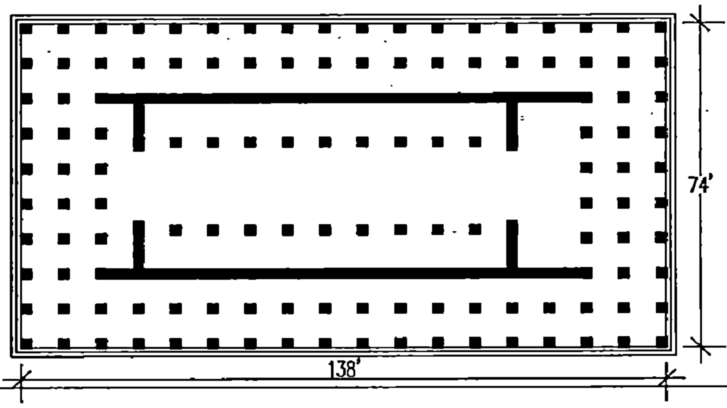
PYCNOSTYLE
Intercolumnation 1.5 diameter
width to breath ratio 1.95



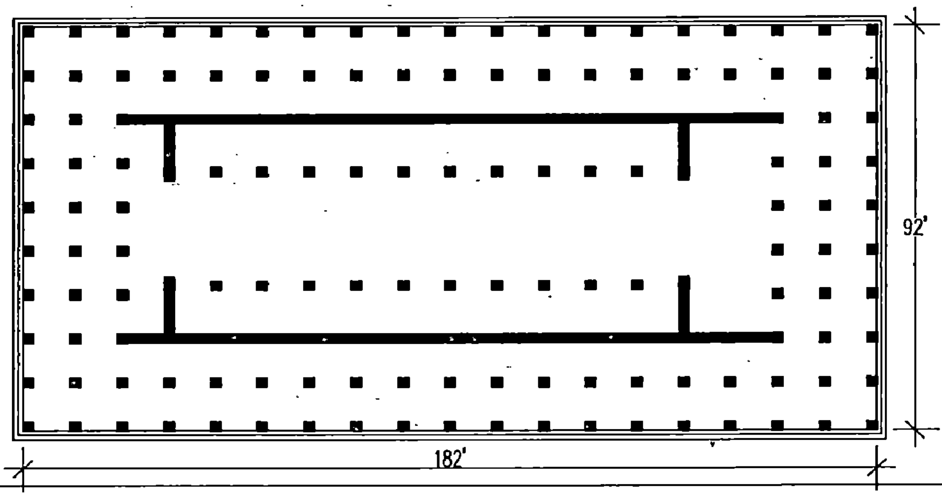
SYSTYLE
Intercolumnation 2.0 diameter
width to breath ratio 1.96



DIASTYLE
Intercolumnation 3.0 diameter
width to breath ratio 1.86



ARAEOSTYLE
Intercolumnation 4.0 diameter
width to breath ratio 1.97



EUSTYLE
Intercolumnation 2.25 diameter
width to breath ratio 1.96

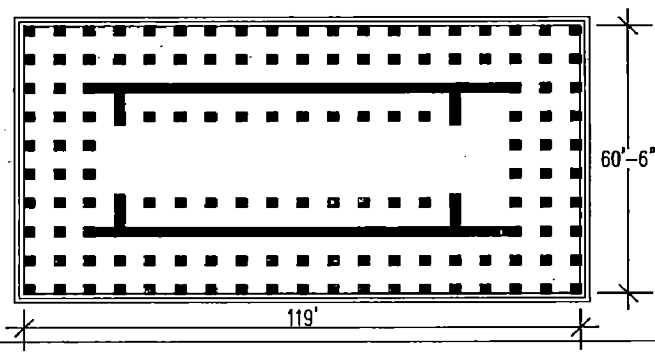
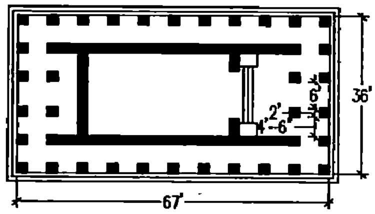
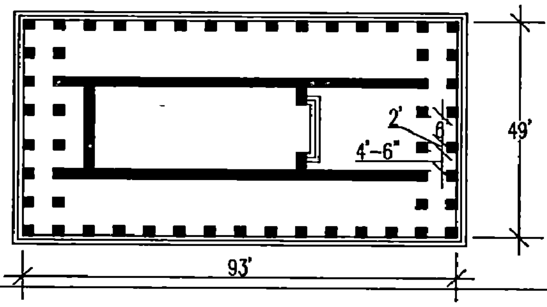


Figure 2.6.16 Different Types Of Temple Plan As Statd By Vitruvius

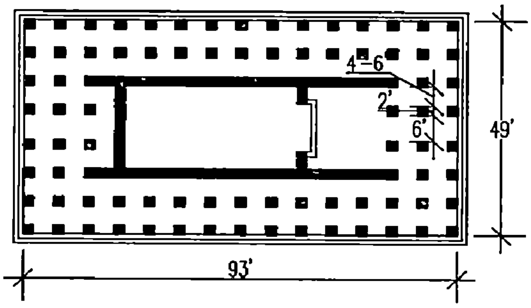
THE PERIPTERAL ARRANGEMENT
width to breath ratio 1.86



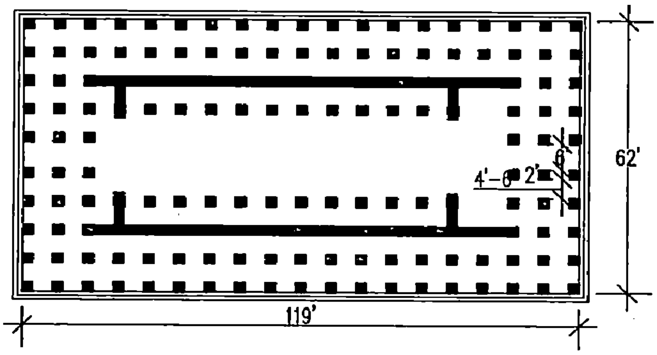
THE PSEUDODIPTERAL ARRANGEMENT
width to breath ratio 1.89



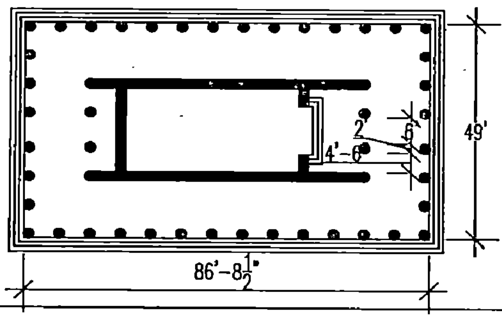
THE DIPTERAL ARRANGEMENT
width to breath ratio 1.89



THE HYPAETHRAL ARRANGEMENT
width to breath ratio 1.94

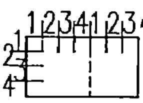


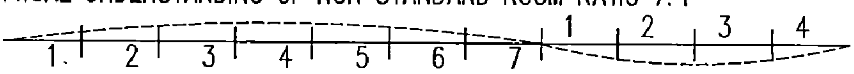
THE SMINTHEUM ARRANGEMENT
width to breath ratio 1.76



ANALYTICAL UNDERSTANDING OF NON STANDARD ROOM RATIO 7:4

7:4





$\frac{7}{4} = 1.75$

The study considers temple arrangements with columns on all four sides to determine length and width of temple on the basis of intercolumniation; namely *Peripteral Pseudodipteral, Dipteral, Hypaethral and Smintheum.* One can decipher width to length average ratios for intercolumniations as follows:

Peripteral: 1.94

Pseudodipteral:1.942

Dipteral: 1.95

Hypaethral: 1.94

Smintheum:1.82

This leads to assumption that Vitruvius did imply 2:1 as preferable ratio for temple planning.

2.7.10 ON EUSTYLE (9:4 intercolumniation ratio)

Vitruvius writes in praise of *Eustyle* (*'De Architectura'*, Book III, Chapter III, Section VI) ***"We must now render an account of the Eustyle, which is specially to be approved, and has proportions set out for convenience, beauty and strength. For in the intervals the width of two and a quarter columns is to be made, and the middle intercolumniation, one in the front and one in the back, is to be three columns wide. For so the building will have both a graceful appearance in its configuration, and a convenient approach; and the walk round the sanctuary will have dignity."***

Interpretation:

Though Vitruvius suggest 9:4 as ratio for Eustyle, on close observation thorough figurative analysis it is observed to be closer to 1:1.75 or 7:4 which could be understood as rational convergent of root 3 as explained in other chapter. Refer figure 2.6.16: variation of Eustyle in different temple plan arrangement.

2.7.11 PROPORTIONS OF COLUMN

Though the thesis does not deal with study of proportions in elevation, the height to width ratio of columns proposed by Vitruvius are mentioned here to understand the wider range of ratios proposed by him that may be used by Palladio in designs of his plans. Depending upon intercolumniation style, the thickness of column is derived from its height so that the column looks proportionate with the increase of distance between them. For proportions of column; Vitruvius narrates ***"For Araeostyle temples, the columns are to be so made that their diameters are one-eighth the height. Also in the Diastyle, the height of the column is to be measured out into eight and a half parts, and let the diameter of the column be of one part. In the Systyle let the height be divided into nine and a half parts, let one of those be given for the diameter of the column. Also in the Pycnostyle, the height is to be divided into ten, and of that one part is to be made the diameter of the column. Now of the Eustyle temple, as of the Systyle, let the height be divided into nine and a half parts, and of that let one part be set up for the diameter of the bottom of the shaft. In this way the relation of the intercolumniations will be observed proportionately."*** (*'De Architectura',* Book III, Chapter III, Section X)

Interpretation:

With this it is to be understood that Vitruvius; in simple is words stating ratios like 10:1, 9.5:1, 8.5:1 and 8:1, which are graphically show in following figures 2.6.17 and 2.6.18. In first plate, to have idea of varying column diameter, the study tries to derive them keeping the height of the column same for all different temple style. The second plate is to show comparative variation in column heights of different temple styles; keeping the diameter at the base of column as constant.

figure 2.6.17 Column Proportion As Prescribed By Vitruviusby Keeping Same Height

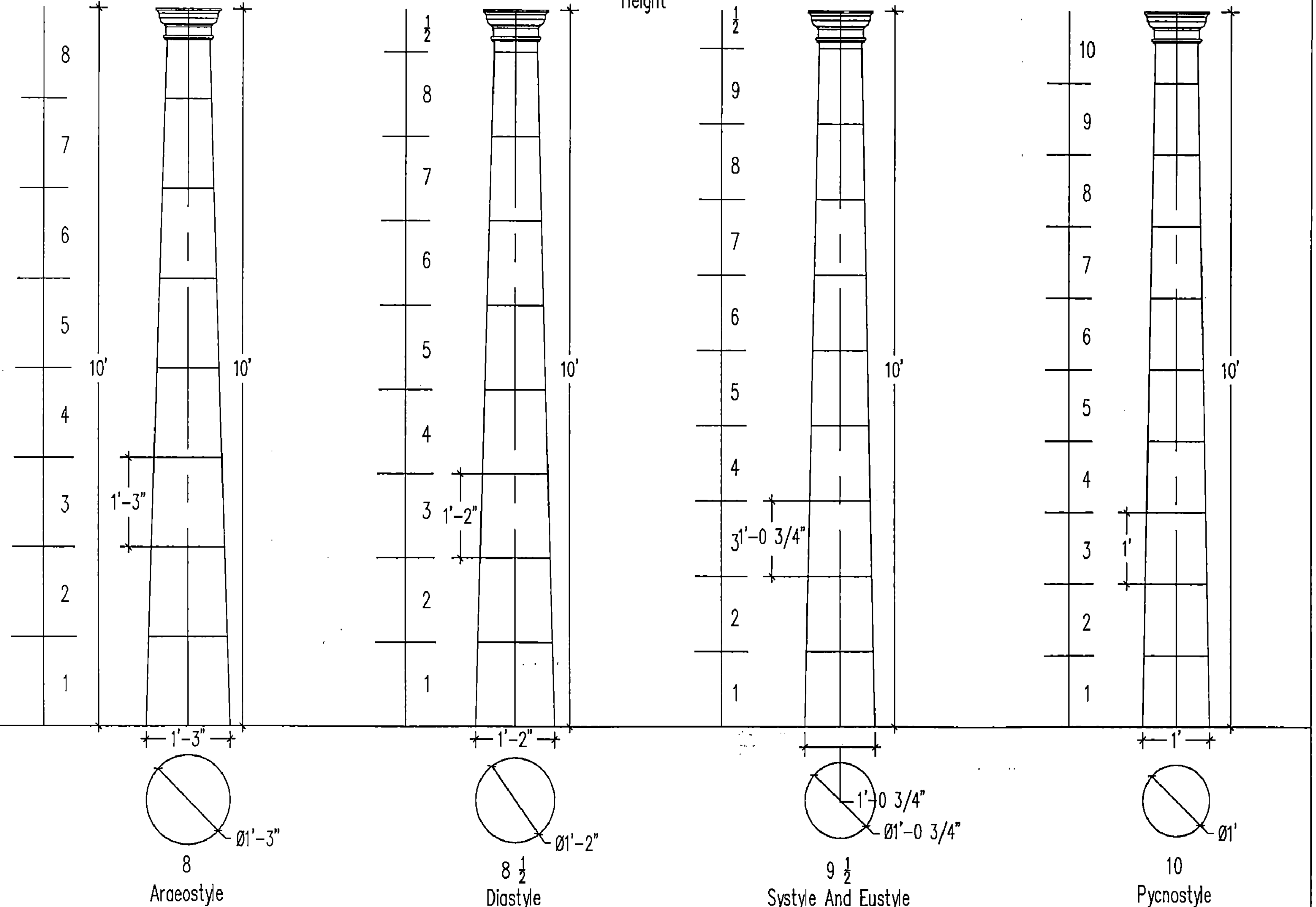
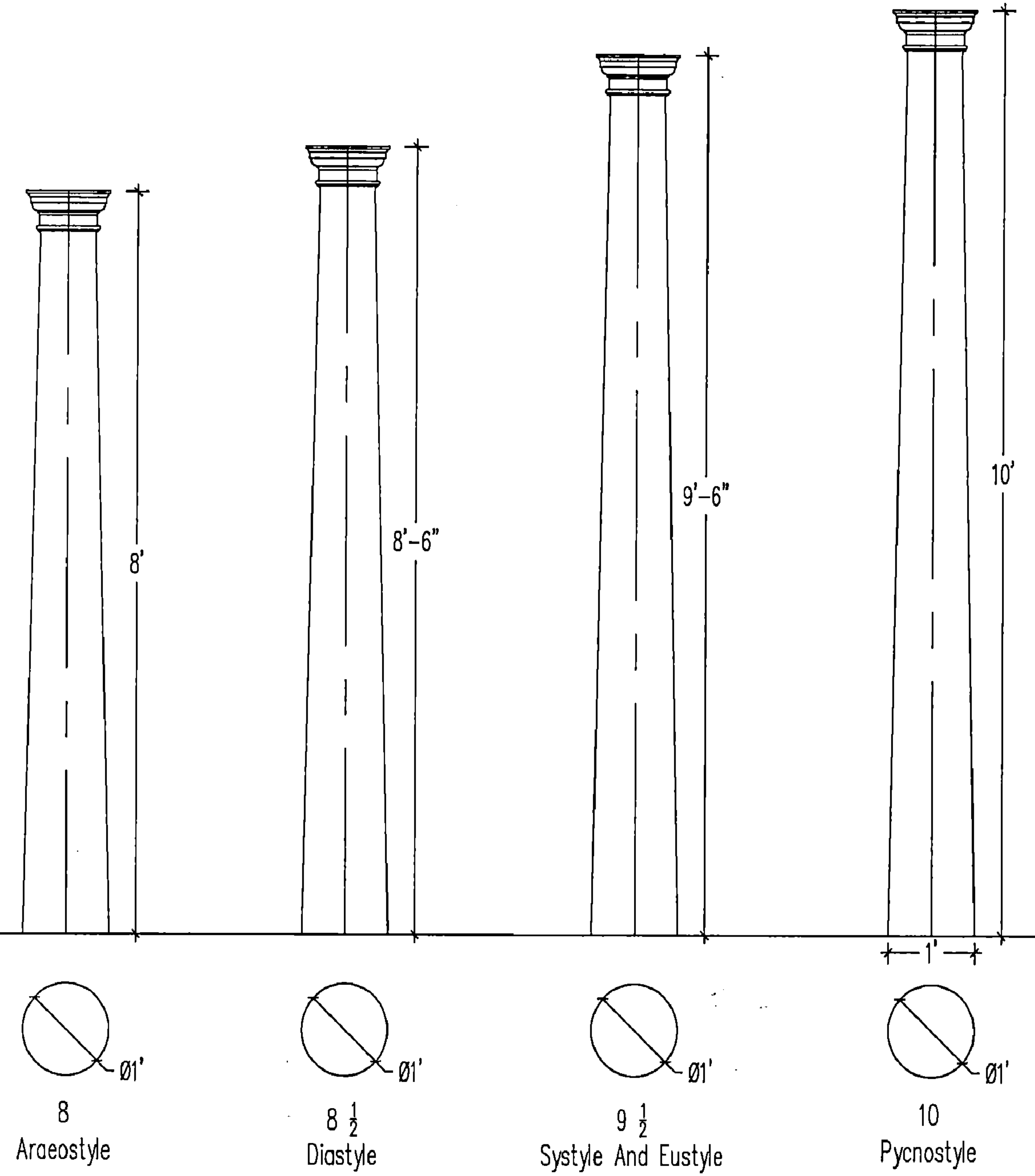


figure 2.6.18 Column Proportion As Prescribed By Vitruvius By Keeping Same Diameter At Base



Same Diameter At Base And Diffrent Height Of Column

2.7.12 ORDERS IN ARCHITECTURE

Comparison in proportioning system between Ionic, Doric and Corinthian temples verses Tuscan order.

Vitruvius describes the way Ionic, Doric and Corinthian temples are to be proportioned as under "***The length of the temple is so arranged that the breadth is half the length. The cella itself is to be a fourth part longer than its breadth, including the wall which contains the doors. The remaining three parts, that is, the portico, are to run forward to the antae of the walls. The antae ought to have the thickness of the columns. If the temple be more than 20 feet in breadth, between the two antae two columns are to be placed and these columns are to separate the portico and the pteroma.***" *('De Architectura',* Book IV, Chapter IV, Section I)

"The front of a Doric temple is to be divided along the line where columns are set, into 27 parts if it is tetrastyle, into 42 parts if it is hexastyle. Of these one part will be the module (which in Greek is called embater) and when this is determined, the distribution of all the work is produced by multiples of it. The diameter of the columns will be two modules; the height including the capital 14, the height of the capital is one module, the width two modules and a sixth." *('De Architectura',* Book IV, Chapter III, Section III)

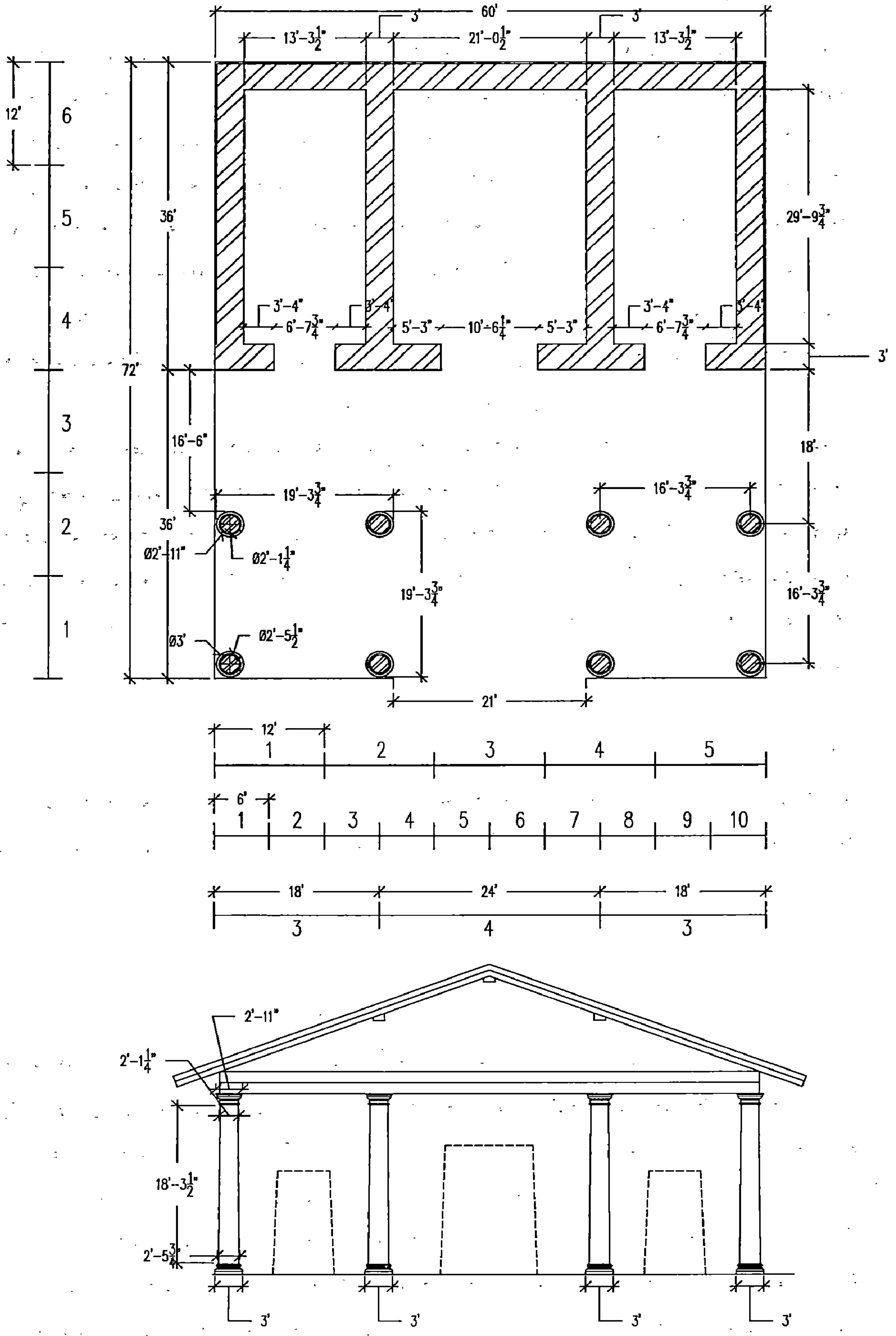
Vitruvius describes proportions in Tuscan order as "***Let the site on which the temple is to be built be six parts in length; five parts are to be assigned to the breadth. Now the length is to be divided in two. The interior half is to be marked out by the dimensions of the sanctuary; the part on the front in to be left for the portico with Its columns. Further, let the width be divided into 10 parts. Of these let three parts each on the right and left be given to the lesser sanctuaries, or alternately to the wings; the remaining four parts are to be given to the central shrine. Let the space which is before***

the sanctuaries in the forecourt be planned for the columns, in such a way that the corner columns are put opposite the pilasters, in line with the ends of the walls. The two middle columns are to be in line with the walls which are between the wings and the middle shrine. Between the pilasters and the columns in front, additional columns are to be put half way in line with them. At the bottom these are to have a diameter 1/7 of the height. (The height is to be one third of the width of the temple.) The top of the column is to be diminished 1/4 of the diameter at the bottom." *('De Architectura',* Book IV, Chapter VII, Section I and II)

Interpretation:

Vitruvius points at two different proportioning systems of Doric, Ionic and Corinthian verses Tuscan order. In first three orders, there is a module system where one module; i.e. thickness of column is fixed and all other dimensions are multiples of that module. As against them, Tuscan temple holds a relative system of proportioning where from length one derives its width (6:5), from width its height (one third width), from height; the column thickness (one seventh height). In this system, a single change in one proportion affects overall appearance of temple. In terms of proportions Vitruvius is stating 7:1, 6:5, 4:3 and 1:1. Refer figure 2.6.19: Proportions in temples of Tuscan order.

Figure 2.6.19 Proportion In Temple Of Tuscan Order



REDRAWN FROM SOURCE, VITRUVIUS., DE ARCHITECTURA , PAGE 121

2.7.13 LENGTH TO BREADTH RATIO IN FORUM

In order to study maximum number of ratios prescribed by Vitruvius in plans, the proportions in forum and basilica are studied which are narrated as follows.

"The dimensions of the forum: Now let the breadth be so determined that when the length is divided into three parts, two are assigned to the breadth. For so the plan will be oblong, and the arrangement will be adapted to the purpose of the spectacles. The upper columns are to be a quarter less than the lower ones; because the lower columns ought to be stronger for bearing weight than the upper ones. Not less one ought also to imitate the natural growth of trees, as in tapering trees, the fir, the cypress, the pine, of which everyone is thicker at the roots. Then diminishing it rises on high, by a natural contraction growing evenly to the summit. Therefore since the nature of growing plants so demands, things are rightly arranged both in height and thickness, if the higher are more contracted than the lower." (*'De Architectura'*, Book V, Chapter I, Section II and III)

Interpretation:

To begin; for forum; Vitruvius prescribes ratio of 3:2. For proportional relationships between columns on ground and first floor, Vitruvius writes that they are related as 4:3. Taking inspiration from trees; Vitruvius suggests shortening columns on first floor by one fourth of column on ground floor, i.e. 4:3.

2.7.14 LENGTH TO BREADTH RATIO IN BASILICA

"And their breadth should be fixed at not less than a third, nor more than half their length, unless the nature of the site is awkward and forces the proportions to be changed. The columns of basilicas are to be of a height equal to the width of the aisle. The aisle is to have a width one third of the nave. The columns of the upper story are to be less than those below as herein above specified. The parapet between the upper and lower columns ought to be one fourth less than the upper columns, so that

people walking on the first floor may not be seen by persons engaged in business." *('De Architectura',* Book V, Chapter I, Section IV and V)

Interpretation:

For Basilica; Vitruvius prescribes ratios 4:3 (not less than a third), 2:1 (nor more than half their length). For column height, Vitruvius prescribed 1:1. Aisle to nave are related with ratio of 4:3.

2.7.15 PROPORTIONS IN DWELLING UNIT

Vitruvius prescribes proportions of important area within the house namely atrium, alae, tablinum, peristyle and dining rooms. The proportions as narrated by him are studied to understand ratios adopted by him

2.7.15 .1 ON PLANNING OF AN ATRIUM AND ITS HEIGHT

"The length and breadth of the atrium is planned in three ways. The first arrangement is to divide the length into five parts, and to give three of these to the width; the second divides the length into three parts and assigns two to the width; in the third arrangement a square is described upon the width, and the diagonal of the square is drawn: whatever is the size of the diagonal supplies the length of the atrium. The height of the atrium to the underside of the beams is to be three quarters of the length. The remaining quarter is to be assigned as the dimension of the ceiling and of the roof, above the beams." (*'De Architectura',* Book VI, Chapter III, Section III and IV).

Interpretation:

The length and width of three types of atriums can be expressed in terms of ratios as follows

1) A square and two thirds (5:3)
2) A square and a half (3:2)
3) A rectangle derived from the diagonal of a square (that is root 2) and the side of a

square.

The clear height under the beam of atrium should be 3/4 times length, and beam depth to be 1/4 times length of atrium in other words they are related with 1:1 ratio.

2.7.15.2 WIDTH OF ALAE

"The width of the alae or wings, on the right and the left, is to be one-third of the length of the atrium when it is from 30 to 40 feet; from 40 to 50 feet the length is to be divided into three parts and a half, and one is to be given to the alae. When the length is from 50 to 60 feet, a fourth part is to be assigned to the alae. From 60 to 80 feet let the; length be divided into four parts and a half; of these one is to be the width of the alae. From 80 to 100 feet the length divided into five parts will determine the breadth of the alae. The lintel beams are to be placed so high, that, in height, the nine arc equal to their breadth." (*'De Architectura'*, Book VI, Chapter III, Section IV).

Interpretation:

Vitruvius also describes how to determine the width of alley as:

1. Width of alley should be 1/3 its width when the atrium length is between 30 and 40 feet
2. Width of alley should be 2/7 its width when the atrium length it is between 40 and 50 feet
3. Width of alley should be 1/4 its width when the atrium length it is between 50 and 60 feet
4. Width of alley should be 2/9 its width when the atrium length it is between 60 and 80 feet
5. Width of alley should be 1/5 its width when the atrium length it is between 80 and 100 feet

Manipulating these fractions with common numerator of two we have following fractions 2/6, 2/7, 2/8, 2/9 and 2/10. This gives us consecutive numbers 6, 7, 8, 9 and 10 as denominators.

2.7.15.3 PROPORTIONS OF TABLINUM

"The tablinum or alcove, if the breadth of the atrium is 20 feet, must be two-thirds in width. If the breadth of the atrium is 30 to 40 feet, half is to be given to the alcove. When the breadth is from 40 to 60, two-fifths are to be assigned to the alcove.

The height of the alcove to the cornice is to be one-eighth more than its breadth. The paneled ceiling is to be raised higher than the cornices by one-third of the breadth. The main entrance for smaller atria is to be two-thirds of the width of the alcove; for larger atria, one-half. The portraits with their ornaments are to be fixed above at a height equal to the breadth of the alae." (*'De Architectura'*, Book VI, Chapter III, Section V and VI).

Interpretation:

Vitruvius also describes how to determine the width of tablinum (the middle room in front of the atrium) according the width of the atrium:

1. Width of tablinum should be 2/3 its width when the atrium width is 20 feet
2. Width of tablinum should be 1/2 when it is between 30 and 40 feet
3. Width of tablinum should be 2/5 when it is between 40 and 60 feet

Striking out common numerator two, denominators 3, 4, 5 could be understood as derived from Pythagorean Theorem ($a^2 + b^2 = c^2$) of right angle triangle with sides of three and four with hypotenuse as five. Numbers 3 and 5 again could be related to 'mathematically' perfect number six ($3 \times 2 = 6$) and 'philosophically' perfect number ten ($5 \times 2 = 10$). Same numbers are seen as extremes of ratios for width of alley. It could be deciphered that Vitruvius employs basic numbers 3 to 10 for determination of corridor width. Vitruvius prescribes 9:8 for height of alcove to cornice, 4:3 for paneled ceiling, 3:2 for entrance to smaller atria and 2:1 for door to larger atria.

2.7.15.4 PROPORTIONS OF PERISTYLE

"The peristyles lie crosswise, and should be one-third wider than they are deep. The height of the columns is to be the same as the breadth of the colonnade of the peristyle. The inter-columniations are to extend not less than three or more than four diameters of the columns." (*'De Architectura'*, Book VI, Chapter III, Section VII).

Interpretation:

For length to width ratio of peristyle, Vitruvius prescribes 4:3 and for inter columniation he writes 3:1 and 4:1

2.7.15.5 PROPORTIONS OF DINING ROOMS

"The length of triclinia, or dining-rooms, must be twice their width. The height of all apartments which are oblong must be so arranged that the length and breadth are added together; of this sum half is taken, and this gives the height. But if they shall be exedrae or square oeci, the height is to be one and a half times the width." (*'De Architectura'*, Book VI, Chapter III, Section VIII).

Interpretation:

1) Two squares for dining room (2:1).
2) A square for hall (1:1).

2.7.16 SUMMARY OF VITRUIVIAN THEORY

Vitruvius's proportional theory is derived from Pythagorean number theory. With the proportional theory he established the architectural principles, the so called "Vitruvian Canon," which served as the basis for Renaissance architecture. By his analogy between the perfect human body and the perfect temple derived from these ratios of perfect human body, Vitruvius seems to set a relationship between a human as microcosm and God as macrocosm. In architecture, however, the parts and whole relations are thought to be related to the concept of beauty. Vitruvius discusses the parts and whole relations as the basis for defining symmetry (*'De Architectura',* Book I, Chapter II, Section I). Palladio also considered the parts and whole relations (proportions and room ratios) as the main cause of beauty. (Lecture, Dr. Hyunho Shin, UCLA, Fall 1996). The study has observed Vitruvius studying human proportions, temple planning, philosophically perfect number 10, mathematically perfect number six, room ratios like 5:3, 3:2, 2:1, 1:1 and root 2. It will be seen; through analysis; the extensive use of such proportions and numbers in Palladio's work.

Alberti explores the theory of room ratios which is dealt in next section of chapter.

2.8 ALBERTI: PRINCIPLES OF PROPORTIONS IN *'DE RE AEDIFICATORIA'*

This part of the chapter deals with understanding of theory of room proportions from Alberti's *'De Re Aedificatoria'.*

2.8.1 SOURCE OF STUDY

'De Re Aedificatoria'; the pioneering text of Renaissance architecture by Leon Battista Alberti is translated into English as 'The Ten Books Of Architecture' and also as 'On The Art Of Building In Ten Books'. As the title of the translations suggest it is divided into ten books. The first book deals with lineaments; the second with materials; the third with construction; the fourth with public works; the fifth with works of individual; the sixth with ornaments in general; the seventh with ornaments proper for sacred edifices; the eighth with ornament for public secular buildings; the ninth with ornament for private buildings; the tenth with restoration of buildings. Alberti writes about theory of proportions in book nine, which is dealt in this chapter. The study includes here; the relevant sections (depicted hereunder with bold and italic text) from translation 'On The Art of Building in Ten Books' by Joseph Rykwert, Neil Leach and Robert Tavernor and discuss them as running commentary. Of all the Palladio's predecessors; Alberti has written most elaborately on theory of proportions in architecture (and to greater detail than Palladio) that is seen very close to Palladio's theory and practice. The study has covered all relevant section of his study; those pertaining to our aim and Palladio's theory of proportions.

2.8.2 HISTORICAL CONTEXT WITHIN WHICH ALBERTI'S THEORY DEVELOPED

According to Richard Padovan (Pg 178) ***"The historical break between the Imperial Age of Rome and the Middle Ages is largely unreal and the fifteen centuries that separate the 'De Architectura' of Vitruvius (c 25 BC) from the; "De Re Aedificatoria' of Alberti (c 1450 AD) can be regarded from many points of view as a continuous philosophical and artistic development, it is too long and too complex"***

After the Imperial Age of Rome, it can be safely said that classical learning from Pythagoras, Plato and Vitruvius survived through Middle Ages and Medieval builders employed simple form of geometrical and numerical proportioning. During Medieval Ages, Gothic proportions based on geometrical and irrational numbers based on 'ad quadratum' and 'ad triangulum' principles developed.

However as Padovan (Pg 179) suggests ***"There has been extensive speculation that methods based on the irrational square roots of two and three (called respectively 'ad quadratum' and 'ad triangulum') and less certainly the golden section was practiced by Medieval architects. However there was a marked progress and interest in proportioning system during Renaissance period. It was a period of revolution where attempts were made to revive the classical learning and interpret and codify the ancient proportioning system."***

Leon Battista Alberti (1404- 1472 AD) was an Italian architect, a humanist and a scholar. He belonged to the Renaissance period which sought to recover antiquity with vigor and it did achieve revolutionary results. What Plato had attributed to soul and body of universe, Renaissance architects took those proportions as model to make houses, palaces and churches.

2.8.3 THEORIES DEVELOPED BY ALBERTI

Alberti codified ancient architecture to derive at his own model which served as a precursor of how buildings of the future were to be built. As Joseph Rykwert mentions in the introduction of his book, ***"Alberti set out to project how architecture was to be ordered in future, so as to have something of a beauty, 'so ancient yet so new'. Alberti's treatise looked towards the future while Vitruvius documented the past."***

Alberti's principles were more of adaptation of Platonic and Pythagorean theory of cosmic harmony which were essentially mathematical in nature. Alberti advocates

Platonic world view of harmonious ratios existing in universe and their mean. Drawing parallel from nature, he proposes the use of same ratios (as found in nature) in architecture which formed the basis of proportioning system during the renaissance period.

Another important invention which became fundamental to Renaissance art was the development of perspective in creation of pictorial space. According to Padovan (Pg 214) Brunelleschi is credited with the discovery of Renaissance theory of perspective but the first exposition of perspective theory was given by Alberti in treatise 'Della Pittura'. Perspective revolutionized Renaissance architecture which sought to recover antiquity; creating a gulf separating it from classical architecture.

Alberti's work "On the Art of Building in Ten Books" follows chronological order of Vitruvius's ten books. While in Vitruvius's work more elaborate account of proportions in temple is given, Alberti's work in chapter four to eight gives account of works of individual dwellings, ornamentation in scared buildings and public building and deals elaborately in design concept and less in proportions. These chapters seem like documentation of ancients. However in chapter nine "ornament to private building", Alberti introduces his concept of 'Concinnitas' and deals with proportioning system in general which are applicable in use to design any building. So disregarding the chronological order in the book; the study will first understand Alberti's proportioning system in chapter nine and then briefly outline his proportioning system in dwelling units, temples, Basillica and forums to have a comparative between Alberti and Vitruvius theory.

Alberti's work on proportion begins with study of principal harmonies in music and then he translates it into architectural proportions for two dimensional space 'area' and third dimensional volume 'outline'. Alberti used simple musical ratios to composed more composite ratios and vice versa he divided compound proportions into small harmonic ratios. Throughout his work, Alberti cites nature and harmonic view to derive his own model for architecture. To comprehend Alberti's system of proportions; the study would encompass following concepts as narrated by Alberti followed by its interpretation.

1) Concept of beauty and art of building.
2) Concinnitas: the absolute and fundamental rule in nature.
3) Nature as inspiration.
4) Number: a principal component of concinnitas.
5) Outline and musical numbers.
6) Area in 'outline', music and proportions.
7) Third dimension: height in 'outline' and harmonic numbers (double, triple and quadruple).
8) Third dimension: height using cube root and square root.
9) Third dimension: height using 'means'.
10) Proportions in dwelling unit.
11) Proportions in temple planning.
12) Proportions in basilica and forum.
13) On taking liberties from rules for betterment of architecture.

2.8.4 CONCEPT OF BEAUTY AND ART OF BUILDING

"Beauty is that reasoned harmony of all the parts within a body, so that nothing may be added, taken away or altered, but for the worse" (*'De Re Aedificatoria'*, Book VI, Chapter II). Alberti talks about nature of beauty and differentiates it from ornament which according to him has the character of something attached or additional whereas beauty is perfect and is complete in every respect. Architecture is an art which has to be developed like any other art for which Alberti states ***"The arts were born of chance and observation, fostered by use and experiment and matured by knowledge and reason."*** (*'De Re Aedificatoria'*, Book VI, Chapter II). To perfect the art of building Alberti states ***"We need to be strict and meticulous in our planning, therefore and to take care that nothing is included except what is choice and well proven, and that everything fits together so well, in terms of dignity and grace that were***

you to add, change or take away anything, it would be the determent of the whole". (*'De Re Aedificatoria',* Book II, Chapter III).

According to Alberti the whole matter of building is composed of lineament and structure. By lineament he means design of building and by structure he means construction of building. He states that ***"it is the function and duty of lineaments, (design) then to prescribe an appropriate place, exact numbers, a proper scale and a graceful order for whole buildings and for each of their constituent parts, so that the whole from and appearance of building may depend on lineament alone".*** (*'De Re Aedificatoria',* Book I, Chapter I). The design manifest into a building with each part in perfect harmony with the whole to give it dignity and grace in which beauty shines full face. And this beauty is dictated by 'Concinnitas' as termed by Alberti.

2.8.5 CONCINNITAS: THE ABSOLUTE AND FUNDAMENTAL RULE IN NATURE

According to Alberti there are three main components in the theory of beauty. He coins the word 'concinnitas' which dictates the creation of beauty for which Alberti narrates. ***"From this we may conclude, without my pursuing such questions any longer, that the three principal components of that whole theory into which we inquire are number, what we might call outline, and position. But arising from the composition and connection of these three is a further quality in which beauty shines full face: our term for this is concinnitas; which we say is nourished with every grace and splendor. It is the task and aim of concinnitas to compose parts that are quite separate from each other by their nature, according to some precise rule, so that they correspond to one another in appearance.***

That is why when the mind is reached by way of sight or sound, or any other means, concinnitas is instantly recognized. It is our nature to desire the best, and to cling to it with pleasure. Neither in the whole body nor in

its parts does concinnitas flourish as much as it does in Nature herself; thus I might call it the spouse of the soul and of reason. It has a vast range in which to exercise itself and bloom—it runs through man's entire life and government, it molds the whole of Nature. Everything that Nature produces is regulated by the law of concinnitas, and her chief concern is that whatever she produces should be absolutely perfect. Without concinnitas this could hardly be achieved, for the critical sympathy of the parts would be lost. So much for this.

If this is accepted, let us conclude as follows. Beauty is a form of sympathy and consonance of the parts within a body, according to definite number, outline, and position, as dictated by concinnitas, the absolute and fundamental rule in Nature. This is the main object of the art of building, and the source of her dignity, charm, authority, and worth."
(*'De Re Aedificatoria'*, Book IX, Chapter V).

Interpretation:
Alberti considers concinnitas as beauty with grace and dignity which is derived from three basic elements of Number, Outline and Position with their composition and connection. By number it could be interpreted as quantity of parts (columns, intercolumniations etc.). Outline means dimensions of length, breadth and height and their proportions. Position means placement of parts. Alberti drawing parallels from nature's perfection talks about part to whole and vice versa with their interdependence in relationship to create an object of beauty. Both part and whole together creates Concinnitas which is fundamental rule in nature as individually the parts and the whole cannot create perfection.

2.8.6 NATURE AS INSPIRATION
To built a perfect building was a way to seek God and to achieve it nature was observed as model for nature was considered Gods creation and therefore perfect. Alberti narrates ***"All that has been said our ancestors learned through observation of***

Nature herself; so they had no doubt that if they neglected these things, they would be unable to attain all that contributes to the praise and honor of the work; not without reason they declared that Nature, as the perfect generator of forms, should be their model. And so, with the utmost industry, they searched out the rules that she employed in producing things, and translated them into methods of building. By studying in Nature the patterns both for whole bodies and for their individual parts, they understood that at their very origins bodies do not consist of equal portions, with the result that some are slender, some fat, and others in between; and observing the great difference in purpose and intention between one building and another, as we have already observed in earlier books, they concluded that, by the same token, each should be treated differently.

Interpretation:

When Alberti cites learning from nature by his ancestors, he may be hinting at Plato's cosmic harmony, Vitruvian Man and Pythagoras's rules of proportions with musical analogy from ratios of sound formation which is natural phenomenon. He also points towards evolution of 'orders in architecture' namely Doric, Ionic and Corinthian which were established after having studied nature's work and which exhibits qualities of being slender, fat and in-between.

2.8.7 NUMBER: a principal component of Concinnitas

About odd and Even number

Alberti cites numbers preferred by nature to derive at use of corresponding numbers in buildings. He narrates by example where to use odd and even numbers as follows "***They realized that numbers were either odd or even; they employed both, but the even in some places, the odd in others. Taking their example from Nature, they never made the bones of the building, meaning the columns, angles, and so on; odd in number—for you will not find a single animal that stands or moves upon an odd number of feet. Conversely, they never***

made openings even in number; this they evidently learned from Nature: to animals she has given ears, eyes, and nostrils matching on either side, but in the center, single and obvious, she has set the mouth." (*'De Re Aedificatoria'*, Book IX, Chapter V).

Interpretation:

Giving example of animals having even number of feet, Alberti suggests the use of even number of columns in building with openings to be odd in number as God has given us one mouth. Here opening could be interpreted as intercolumniation. Interestingly this is marked deviation from Vitruvius; who suggested the use of even number of intercolumniations and odd numbers of columns to derive at 2:1 ratio for temple plans with number of columns more than four.

2.8.7.1 SIGNIFICANCE OF ODD (3, 5, 7, 9) AND EVEN (4, 6, 8, 10) NUMBERS

Drawing inference from observing nature; Alberti narrates the significance of whole numbers as follows, ***"Among the odd and even numbers, some are found more frequently in Nature and are particularly favored by the wise; these have been adopted by architects when composing parts of their buildings, mainly because they have some property that distinguishes them as the most noble. That Nature is composed of threes all philosophers agree. And as for the number five, when I consider the many varied and wonderful things that either themselves relate to that number or are produced by something that contains it—such as the human hand—I do not think it wrong that it should be called divine, and rightly be dedicated to the gods of the arts, and Mercury in particular. And as for the number seven, it is clear that the great maker of all things, God, is particularly delighted by it, in that he has made seven planets to wander the heavens, and has so regulated man, his favorite creature, that conception, formation, adolescence, maturity, and so on, all these stages he has made reducible to seven. Another popular odd number was nine, that of the orbs which provident Nature has set in the sky. Then again the physicians***

are all agreed that many of the most important things in Nature are based on the fraction one ninth. For one ninth of the annual solar cycle is about forty days, the length of time, according to Hippocrates, that it takes the fetus to form in the uterus.

As for even numbers, some philosophers maintain that the fourfold is consecrated to divinity, and that the most solemn oaths should be based on it. The six fold is one of the very few which is called "perfect," because it is the sum of all its integral divisors. It is clear that the eightfold exerts a great influence on Nature. Aristotle thought the tenth the most perfect number of all; perhaps, as some interpret, because its square equals the cube of four consecutive numbers. Architects have used these numbers extensively; yet, especially in the temple, they have employed no even number greater than ten, in the case of openings, nor odd number greater than nine." (*'De Re Aedificatoria',* Book IX, Chapter V).

Interpretation:

Alberti advocates preference of whole numbers in his proportioning system showing significance of each number namely odd numbers, three, five, seven and nine and even numbers four, six, eight and ten. While describing even number four; he refers to Pythagorean oath by the holy fourfold. Number six is sum of its entire integral divisor means, i.e. 3+2+1 = 6. For number ten; its square equals to sum of cube of first four consecutive numbers and can be represented as $10^2 = 1^3 + 2^3 + 3^3 + 4^3$.

2.8.8 OUTLINE AND MUSICAL NUMBERS

Outline is one of the three components of 'Concinnitas' and Alberti describes the method through which 'Outline' can be derived. He cites Pythagoras and harmony in music to derive at the dimensions of 'Outline'. Alberti narrates names of consonants with its corresponding set numbers to derive at musical ratios.

"For us, the outline is a certain correspondence between the lines that define the dimensions; one dimension being length, another breadth, and the third height. The method of defining the outline is best taken from those objects in which Nature offers herself to our inspection and admiration as we view and examine them. I affirm again with Pythagoras: it is absolutely certain that Nature is wholly consistent. That is how things stand." (*'De Re Aedificatoria'*, Book IX, Chapter V).

"The very same numbers that cause sounds to have that concinnitas, pleasing to the ears, can also fill the eyes and mind with wondrous delight. From musicians therefore who have already examined such numbers thoroughly, or from those objects in which Nature has displayed some evident and noble quality, the whole method of outlining is derived.

We define harmony as that consonance of sounds which is pleasant to the ears. Sounds may be low- or high-pitched. The lower-pitched a sound, the longer the string that emits it; the higher-pitched, the shorter the string. From the different contrasts between these sounds arise the varying harmonies which the ancients have classified into set numbers corresponding to the relationships between the consonant strings. The names of the consonants are as follows: the diapente, also called the sesquialtera, the diatesseron, also called the sesquitertia; then the diapason, which is a double; and the diapason diapente, which is a triple; and the disdiapason, which is called the quadruple. To these they added tonus, which was also called the sesquioctavus. The relationships between the above-mentioned consonants were as follows. Sesquialtera is so called because the length of the longer string is one and a half times that of the shorter. The prefix sesqui used by the ancients we might interpret as meaning "and another," as in sesquialtera. Thus the longer string should be given the number three, and the shorter the number two. The term sesquitertia is used when the longer string is one and a third

times the length of the shorter: thus the longer string is given the number four, and the shorter the number three. In the consonance called diapason one number is double the other, such as two to one, or one to a half; in the triple, three to one, or one to a third; in the quadruple, likewise, four to one, or one to a quarter. To sum up, then, the musical numbers are one, two, three, and four; there is also tonus, as I mentioned, where the longer string is one eighth more than the lesser." (*'De Re Aedificatoria'*, Book IX, Chapter V)

Interpretation:

Alberti defines 'Outline' as lines having dimensions in length, breadth and height. He alike Pythagoras writes "all that is pleasing to ears will be pleasing to eyes". Alberti gives exposition of principal harmonies in music namely fourth, fifth and octave and their corresponding ratios based on length of string. The interpretation along with graphical representation is given as under:

1) Diapente with musical analogy as 'fifth' and numerical value 3:2, it is also called Sesquiltera (one and half times square)
2) Diatresseron (fourth), 4:3 or Sesquitertia (one and a third times square)
3) Diapason (double octave), 2:1 or Dupla (double square)
4) Diapason Diapente (triple), 3:1 or Tripla (three squares)
5) Disdiapason (double double octave), 4:1 or Quadruple (four squares)
6) Tonus (9:8) also called Sesquioctavus

He writes about architects using these numbers in most convenient manner which is apparently visible in Palladian villa plans latter in the study. Alberti reinforces use of musical ratios in architecture to create visually pleasing volumes. Except Tonus (9:8) rest all ratios finds mention in Palladio's theory of proportions.

2.8.9 AREA IN OUTLINE, MUSIC AND PROPORTION

After exposition on musical harmony and their ratios, Alberti transfers them onto architectural proportions to derive the length and breadth in 'area'. Here it needs to be mentioned that Alberti considered six elements namely: Locality, Area, Compartition, wall, roof and opening of which the whole matter of building was composed. He defines 'area' as plot of land enclosed by walls or any surface within the building on which our feet may tread. Area is essentially two dimensional. Alberti classifies 'area' into three categories: short, long and intermediate and proposes proportion for each one of them.

"We must now deal with such matters. To begin with the area, since it is determined by two dimensions: an area may be either short, long, or intermediate. The shortest of all is the quadrangle with all four sides of equal length, whose angles are all matching right angles. After this come the sesquialtera and another short area is the sesquitertia. So these three relationships, which we call "simple", apply to the short area. There are three appropriate to the intermediate area as well, the best of which is the double, followed by that composed of a double sesquialtera. This latter is constructed as follows: having established the lesser dimension of the area; for example, four construct the first sesquialtera, making the length six; to this add another, making the length nine. Thus the length is twice the width plus a further double tonus. Another intermediate area is the double sesquitertia, constructed by precisely the same method; this produces a width of nine to a length of sixteen. Thus the greater line is twice the lesser, minus one tonus. For a longer area use the following method: either the double square is enlarged by a sesquialtera to become a triple, or the double is enlarged by a sesquitertia so that the proportions are three to eight; alternatively, dimensions should be chosen to make the proportions one to four.

We have dealt with shorter area, either with equal dimensions or with proportions of, say, two to three or three to four; and we have dealt with intermediate area, where one dimension is twice the other or where the proportions are, say, four to nine or nine to sixteen. Finally we mentioned extended area, with proportions of one to three, one to four, or, say, three to eight." (*'De Re Aedificatoria'*, Book IX, Chapter VI).

Interpretation:

Alberti prescribes 'short' room ratios of simple musical consonances of Sesquiltera (3:2), Sesquiteria (4:3) and a square which is (1:1); but as Alberti considers two as real number; it can be termed as 2:2.

The intermediate area is composed by duplicating the simple ratios of 'small' plan. The first being double of square (1:1) is 2:1. For double Sesquialtera (9:4), take simple ratio 3:2; add self once making it 6:4. Again by adding basic ratio to this we get 9:6. From these two ratios i.e. 6:4 and 9:6, we have 6:4 :: 9:6 and from that we get the compound ratio of 9:4 (as 6:4 = 1 ½ :1 and 9:6 = 1 ½:1). Other intermediate number Double Sesquitertia (16:9) could be derived in similar way from its small room ratio 4:3 and can be interpreted as 4:3 + 4:3 = 8:6 + 4:3 = 12:9 + 4:3 = 16:12. 12:9 :: 16:12, i.e. 1:1 1/3 :: 1: 1 1/3 i.e. 16:9. In other way 4:3, $4^2:3^2$, i.e. 4*4 : 3*3 , i.e. 16:9.

For longer area double square is enlarged by a Sesqialtera to become a triple. A double square has ratio 4:2 and when Sesquialtera (3:2) is extended, it becomes 6:4. From this we get 4:2 and 6:4 i.e. 4:2 :: 6:4, i.e.2:1 = 3:2 and therefore 3:1 is generated (striking off common 4 from 4:2 :: 6:4 we get 6:2 which is 3:1). For second longer area the double is enlarged by a Sesquitertia (4:3) to get 8:3. When Sesquitertia (4:3) is doubled; we get 8:6 and corresponding Double Square is 6:3. From this we get 6:3 = 8:6 i.e. 3:6:8 and ratio generated is 8:3. The third longer area is given the ratio of 4:1. The explanation of this ratio (4:1) is explained explicitly by Wittkower (page 115) and is given as under

"thirdly, by doubling the double square so that the quadruple proportion 2:8 is generated from 2:4:8. Now, the double proportion 1:2 (musically an octave) is a composite of the two ratios 2:3 and 3:4 so that it is generated from 2:3:4: or 3:4:6 (musically from fifth and fourth or fourth and fifth). We can now say that, for instance, the proportion of 1:4 is generated from 2:3:4:8, or 2:3:4:6:8 (i.e. from fifth and fourth, and fifth and fourth), or 3:6:9:12, or 3:4:6:9:12 (i.e. from fifth and fourth, and fifth and fourth), etc"

We can summarize these as the following room ratios:

A) The short rooms

   a. Square (1:1)
   b. Sesquialtera (3:2)
   c. Sesquitertia (4:3)

B) Intermediate rooms

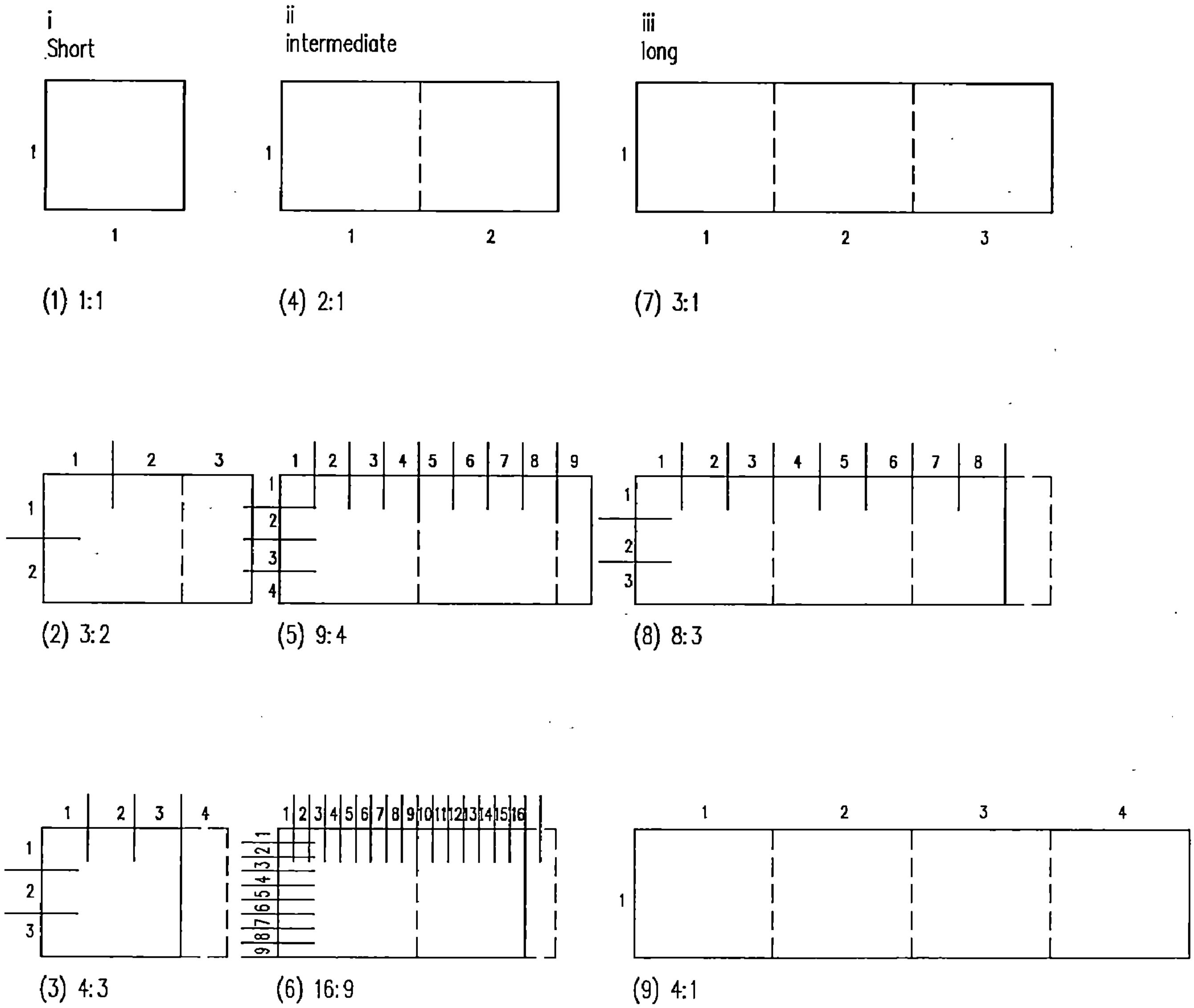
   a. Double square or Dupla (2:1)
   b. Double sesquialtera (9:4) (derived as double of 3:2 as $3^2:2^2 = 9:4$)
   c. Double sesquitertia (16:9) (derived as double of 4:3 as $4^2:3^2 = 16:9$)

C) Long rooms

   a. Sesquialtera triple or three square or Tripla (3:1)
   b. Double Sesquitertia (8:3)
   c. Diadiapason or Quadrupla or four square (4:1)

Thus we derive at Alberti's nine room ratios namely 1:1, 3:2, 4:3, 2:1, 9:4, 16:9, 3:1, 8:3 and 4:1 which can be understood in form of geometrical shape through figure number 2.7.1 Alberti's Room Ratios We can relate these numbers to Pythagorean Lambada. Even though Palladio does not mention many of these ratios in his theory of proportions, we would see many of these ratios being implemented in his works of villa plans latter during the study.

Figure 2.7.1 Alberti's Room Ratios



Source: Author 1997

2.8.10 THE THIRD DIMENSION: HEIGHT IN 'OUTLINE' AND HARMONIC NUMBERS (DOUBLE, TRIPLE AND QUADRUPLE)

The third dimension in 'outline' is the dimension of 'wall' in Alberti's six elements of building. It is the height (of wall or columns) from floor till the base onto which the roof is supported. To define the third dimension Alberti narrates ***"When working in three dimensions, we should combine the universal dimensions, as it were, of the body with numbers naturally harmonic in themselves, or ones selected from elsewhere by some sure and true method. Numbers naturally harmonic include those whose ratios form proportions such as the double, triple, quadruple, and so on. For a double may be constructed from the single by adding a sesquialtera and then a sesquitertia, as in the following example: let the lesser dimension of the double be two; to this add a sesquialtera to produce three; by adding a sesquitertia to the three, four is produced, which is itself twice the original two.***

Alternatively, let the lesser dimension be three; enlarge it by a sesquitertia to produce four; add a sesquialtera; thus you have six, which is twice the original three. Likewise a triple may be formed of a double together with a sesquialtera. Let the lesser dimension here be two; doubled this becomes four; add to this the sesquialtera and it becomes six, which is three times the original two. Alternatively, it may be produced as follows. Make the lesser dimension two, and take its sesquialtera, to make it three; then double the three: you now have six, which is three times the lesser dimension. The quadruple may be formed by a similar enlargement, by adding the sesquialtera and then the sesquitertia to the double. This may also be produced by doubling the double, known as the disdiapason, in the following manner. Let the lesser dimension be two; double it to produce the diapason, which has the proportions four to two; double it again, to produce the disdiapason, which has the proportions eight to two. The quadruple may also be constructed by adding the sesquialtera

and the sesquitertia to the double. How to achieve this will soon become clear. For the sake of clarity, take the number two, for example; by the addition of the sesquialtera this becomes three, which in turn by the addition of the sesquitertia becomes four; the four is then doubled to produce eight. Alternatively, take the number three; by doubling this, you produce six; add a further half, and you have nine; to this add a third, to produce twelve, which is four times the lesser dimension of three." (*'De Re Aedificatoria'*, Book IX, Chapter VI).

Interpretation:

Alberti proposes use of harmonic numbers as it has cosmic value. According to him, only those numbers whose ratios form proportion such as double, triple and quadruple are harmonic.

FOR DOUBLE

To construct a double 4:2, add Sesquialtera (3:2) to Sesquitertia (4:3); which means take 3:2 and then 4:3 to get 3:2::4:3, from which we derive 4:2 (striking of common 3 from both the ratio).

Example one: (2:3:4)

Let lesser dimension be 2, by adding Sesquialtera we get other dimension as 3 (for Sesquialtera is 3:2). With 3 as smaller unit we add Sesquitertia (4:3), this gives us number four which is twice of number two. i.e. 3:2 :: 4:3 = 4:2 = 2:1

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6 (which is 3 times 2 of smaller number from 3:2), by adding Sesquialtera we get other dimension as 9 (3*3 as same increment in larger number as in lesser number 2 in Sesquialtera (3:2) 3*3:2*3 = 9:6). With 9 as new smaller unit, we add Sesquitertia (4:3), this gives us (4*3 :3*3, as 9 is 3 times lesser number 3 of number Sesquitertia 4:3), this gives us 12:9. Now we have 9:6 :: 12:9 which give us 12:6 (striking of common 9 from both the ratio). 12 is twice of basic number 6.

Example two: (3:4:6)

Let the lesser number be 3, enlarge by Sesquitertia (4:3) and add Sesquialtera (3:2). 6:4 (3:2 + 3:2). ∴ 4:3 :: 6:4 = 6:3 (striking of common 4 from both the ratio). We get 6 which is double of 3 (6:3 = 2:1).

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6 (which is 3 times 2 of smaller number from Sesquitertia 4:3), ∴ we have 8:6 (4*2 : 3*2) as new value of Sesquitertia. With 8 as smaller value of Sesquialtera (3:2) we get its modified value as 12:8 (3*4:2*4) Adding Sesquialtera to self with this new value we get 12:8 + 12:8 = 24 :16. 8:6 :: 12:8. Striking of common 8 from both the ratio, we get 12:6, here 12 is double of original lesser number 6 (12:6 = 2:1).

FOR TRIPLE

First method to derive triple

Triple is derived from double together with a Sesquialtera (3:2).

Example three: (2:4:6)

If lesser number is two, its double is four. i.e. 4:2. Take Sesquialtera (3:2). On adding it (3:2) to self we get 6:4. So 4:2:: 6:4, i.e. 6:2 = 3:1 which is three times the original two.

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6, its double is 12. 6 is 3 times lesser number of Sesquialtera 3:2. This gives us modified value of Sesquialtera as 3*3:2*3 = 9:6. Adding Sesquialtera to self with this new value we get 9:6 + 9:6 = 18:12. Now we have ratios 12:6 and 18:6 ∴ we have 18:12 (striking of common 6 from both the ratio). With this we have new number 18 which is 3 times the original number 6.

Second method to derive triple

Example four: (2:3:6)

If lesser number is two, its Sesquialtera is (3:2). Double number three to get 6, which again is a triple of basic 2. So we could either take double and then add Sesquialtera (3:2) or take Sesquialtera (3:2) and then double it to form a triple.

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6, its Sesquialtera (3:2) would be 9:6 as 3*3:2*3. Double 9 to get 18 which is triple of basic number 6.

FOR QUADRUPLE

First method to derive quadruple

Add Sesquialtera (3:2) and Sesquitertia (4:3) to double.

Example five: (2:4:8)

Let the lesser number be 2 and therefore its Sesquialtera is (3:2). By converting 3:2 to Sesquitertia 4:3 we get 4 (striking of common 3 from both the ratio). Now double number 4 to get 8, which is quadruple of basic number 2.

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6, its Sesquialtera is (3:2) would be 9:6 as 3*3:2*3. Taking 9 as smaller value of Sesquitertia 4:3 we get ratio 12:9 as 4*3 : 3*3. We have ratios 9:6 :: 12:9. Striking of common 9 from both the ratio we have new number as 12 from ratio 12:6. Now double this number 12 to get 24 which is 4 times (quadruple) of basic lesser number 6.

Second method to derive quadruple

Another way of deriving quadruple would be 'doubling the double' known as Disdiapason.

Example six: (2:4:8)

Let the lesser number be 2

Double it to get 4. From diapason (2:1) we get ratio 4:2, double it to get 8:4, i.e. 8:4 :: 4:2, i.e. 8:2 which is 4:1.

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6

Double it to get 12. From diapason (2:1) we get ratio 12:6 (2:1 * 6), double it to get 24:12, i.e. 24:12 :: 12:6, i.e. 24:6 which is 4:1.

Third method to derive quadruple

The third method to form a quadruple is by adding Sesquialtera (3:2) and Sesquitertia (4:3) to the double.

Example seven: (2:4:8)

Let the lesser number be 2

From number two we get 3:2 by adding Sesquialtera. Extend it to Sesquitertia so that 3:2 :: 4:3. i.e. 4:2. (Striking of common 3 from both the ratio). Now double 4:2 to get 8:4. ∴ we have 4:2 :: 8:4. This is 8:2 where 8 is quadruple of lesser number two.

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6, its Sesquialtera (3:2) would be 9:6 as 3*3:2*3. Taking 9 as smaller value of Sesquitertia 4:3 we get ratio 12:9 as 4*3 : 3*3. We have ratios 9:6 :: 12:9. Striking of common 9 from both the ratio we have new ratio 12:6. Now double 12:6 to get 24:12. ∴ we have 12:9 :: 12:24, which is 24:9 (Striking of common 12 from both the ratio). Where 24 is quadruple of lesser number six.

Example eight: (3:6:9:12)

Second example for quadruple from quoted text for number 3.

Let the lesser number be 3.

Double it to get 6, add ½ of six to get 9 (6+3), add 1/3 of nine to get 12 (3+9),

i.e. 3:6 :: 9:12, i.e. 3:12 (if a:b :: c:d, ∴ a:d) which is 4:1

Other example to understand the theory (not from Alberti's quoted text)

Let the lesser number be 6, double it to get 12, add ½ of 12 to 12, by doing so we get 18 (6+12), add 1/3 of 18 to this new value of 12, by doing so we get 24 (6 {as 1/3 of 18} +18),

i.e. 6:12 :: 12:24, i.e. 6:24 (if a:b :: c:d, ∴ a:d) which is 4:1

Alberti directly mentions about 'ratios' and 'proportions' in first paragraph. In a descriptive way in second paragraph through a set of eight examples, he indirectly hints at various means (Arithmetic mean, Harmonic mean and Geometric mean) to find height of a room as under.

Example one: 2:3:4 as arithmetic mean, h = (w+b)/2

Example two: 3:4:6 as harmonic mean, h = (2 * w * b) / w + b

Example three: 2:4:6 as arithmetic mean, h = (w+b)/2

Example four: 2:3:6 as harmonic mean, h = (2 * w * b) / w + b

Example five, six and seven: 2:4:8 as geometric mean, h = square root of (w * b)

Example eight: 3:6:9:12 as arithmetic mean, h = (w+b)/2

Alberti narrates that double, triple and quadruple proportion must not be used randomly as under ***"These numbers which we have reviewed were not employed by architects randomly or indiscriminately, but according to a harmonic relationship. For example, anyone who wanted to build a wall around an area with a length, say, double its width would not employ the triple proportion, but only ones made up of doubles. Likewise, in an area with a length three times the width, the same proportions arc employed that make up the triple, and similarly with the quadruple, where no other proportions are used than its own. Thus in three dimensions, whatever numbers are judged most suitable for the work arc drawn from the above list."*** (*'De Re Aedificatoria'*, Book IX, Chapter VI).

Interpretation:

When 'double' proportions are to be used employ only those dimensions which follow doubles and not triple proportion or any other proportions.

Palladio does write about such theories on 'mean' to find room heights in his theory of proportions and may have implemented them in elevation design of his villas. It remains a subject of separate scrutiny if Palladio did apply this law in his villa plans.

2.8.11 HEIGHT IN 'OUTLINE' THROUGH SQUARE ROOT AND CUBE ROOT OF A NUMBER:

Alberti proposes use of square root and cube root to derive the height of a square. Alberti narrates ***"In establishing dimensions, there are certain natural relationships that cannot be defined as numbers, but that may be obtained through roots and powers. A root is the side of a squared number, whose power equals the area of that square. The cube is a projection of the square. The primary cube, whose root is one, is consecrated to the Godhead, because the cube of one remains one; it is, moreover, said to be the one solid that is particularly stable and that rests equally sure and steadfast on any of its sides. However, if one is not an actual number, but the wellspring of number, which both contains and springs from itself, we might perhaps call two the first number. From it as root you produce an area of four, which, if extended upward to a height equal to a side, will form a cube of eight. From this cube is derived the rule for outlines. First of all it provides the side of the cube, called the cube root, which generates an area of four and the full cube of eight. From this we derive that line running from the one angle of the area to the opposite angle, the straight line dividing the square into two equal parts, for which reason it is called the diameter. The numerical value not this is not known, but it is obviously the square root of eight. Next, there is the diameter of the cube, which we know for sure to be the square root of twelve. Lastly, there is the line in the right-angled triangle whose two***

shorter sides are joined by a right angle, one being the square root of four, the other the square root of twelve. The third and longest line, which is subtended by the right angle, is the square root of sixteen. Such as we have reviewed, therefore, are the natural relationships between numbers and other quantities to be used in defining the diameter. Each should be employed with the shortest line serving as the width of the area, the longest as the length, and the intermediate one as the height. But sometimes these may be modified to suit the building." (*'De Re Aedificatoria',* Book IX, Chapter VI).

Interpretation:

Alberti considers two as the first number as according to him number one is not an actual number as any square root or cube root of 'one' remains 'one'. Taking number two as side of area Alberti constructs cube using l*b*h to derive at eight (2*2*2=8). From eight, he uses cube root of eight to derive at its side. Next he constructs diameter of square which can be interpreted as diagonal of square or hypotenuse of a triangle formed by the diagonal of a rectangle or square.

In paragraph above, Alberti writes about not knowing numerical value of diameter of square as square root of two. One can infer from this that in those days when arithmetic was not developed to calculate such fractions, they employed geometrical method to derive such unknown numerical values or employed estimation value method to come to such values of square root of a number. Such method as 'rational convergent for square root of a number' has been explained in next chapter to see relevance of derived values of square root of numbers in villa plans of Palladio. However we can infer square root eight, square root twelve and square root sixteen with sides as root twelve and root four by using Pythagoras theorem as under:

$a^2 + b^2 = c^2$

$(2)^2 + (2)^2 = c^2$

$4 + 4 = c^2$

$\therefore c = \sqrt{8}$

$a^2 + b^2 = c^2$

$(\sqrt{4})^2 + (\sqrt{8})^2 = (\sqrt{12})^2$

$4 + 8 = 12$

$\therefore a = \sqrt{4}$ and $b = \sqrt{8}$

Similarly we can derive $\sqrt{12}$ as

$a^2 + b^2 = c^2$

$(\sqrt{6})^2 + (\sqrt{6})^2 = (\sqrt{12})^2$

$6 + 6 = 12$

$\therefore a = \sqrt{6}$ and $b = \sqrt{6}$

And $\sqrt{16}$ as

$a^2 + b^2 = c^2$

$(\sqrt{4})^2 + (\sqrt{12})^2 = (\sqrt{16})^2$

$4 + 12 = 16$

$\therefore a = \sqrt{4}$ and $b = \sqrt{12}$

Alberti recommends using shortest, longest and intermediate dimensions as width (e.g.$\sqrt{4}$), length (e.g.$\sqrt{16}$), and height (e.g.$\sqrt{12}$) respectively. By writing on square and cube root of numbers, Alberti is pointing at irrational number ratios, which are seen being adopted by Palladio in his work.

2.8.12 HEIGHT IN 'OUTLINE' THROUGH 'MEANS'

Alberti, having discussed the derivation of length, breadth and height through use of music and geometry, prescribes the use of Arithmetic means to arrive at the height (3rd dimensions) in spatial volume. Alberti defines 'Mean' and writes about three different means as follows ***"Rules for the composition of outlines in three dimensions may be derived from other sources, apart from harmonies and bodies; these we must now discuss. There are several methods of three-dimensional composition that are particularly suitable; these are not only drawn from music and geometry but also arithmetic, and should now be*** *examined. The philosophers have called these "means." Rules for their composition are many and varied, but the wise use three principal methods, whose object is to find, given two other numbers, an intermediate one, which will correspond to the other two by a fixed rule, or, to put it another way, by a family relationship.*

In this inquiry there are three dimensions for us to consider. One of these is termed the longest, and another the shortest; the third, the intermediate one, has a common relationship with both, that being the difference between it in the center and the other two. Of the three means principally favored by philosophers, the easiest to find is that which they call the arithmetical. Once two extreme numbers have been set, the longest being eight, for example, and the shortest, say, four, add them together, to produce twelve; divide this into two parts and take one of them: its value will be six. This number is called the arithmetical mean, being equidistant between both extremes, four and eight.

Another type of mean is the geometrical one, which is obtained as follows. Let the shortest dimension be four, for example, and the longest nine, say. Multiply these together to produce thirty-six, whose root, as it is called (that is, the dimension of the side that generates a square of equal size), fills an area of thirty-six. The root is therefore six; for six will give an area of thirty-six. This geometrical mean is very difficult to ascertain numerically, although it may be found very easily using lines; a subject that I need not discuss here.

The third mean, called "musical," is a little more laborious than the arithmetical, yet numbers define it perfectly. Here the proportion between the shortest and longest dimensions is the same as that between the shortest and the middle, and again the same as that between the middle one and the longest, as in the following example. Let the shorter number be thirty,

and the longer be sixty; one is double the other. Take the smallest possible numbers in the double: the first is one, and the other two; add them together to make three. Then take the difference between the longest number, sixty, and the shortest, thirty, and divide it into three equal parts; each of these parts will be ten; and so add one such part to the shorter limit; this equals forty. Such is the desired musical mean, its distance from the greatest number being double that from the shortest, the same proportion as that which we proposed between the greatest and smallest extremes." (*'De Re Aedificatoria'*, Book IX, Chapter VI).

Interpretation:

Alberti explains the importance of using 'means' to derive at the third dimension which will correspond to the other two in specific manner and is not random.

Alberti talks about Arithmetic mean in second paragraph, Geometric mean in third paragraph and Harmonic mean in fourth paragraph. All these 'means' are formulated and explained with the numeric values stated by Alberti as follows.

Through simple examples; Alberti here defines Arithmetic, Geometric and 'Musical' or Harmonic means. We can put his examples mathematically as under,

Arithmetic mean, h = (w+b)/2

Geometric mean, h = square root of (w * b)

Harmonic mean, h = (2 * w * b) / w + b

To validate the formulas on 'means'; values are substituted as mentioned by Alberti in examples of respective means.

Values of example one – 4:6:8

Arithmetic mean, h = (w+b)/2 = 4+8/2 = 12/6 = 6.

Values of example two – 4:6:9

Geometric mean, h = square root of (w * b) = square root of (4 * 9) = square root of (36) = 6.

For harmonic or 'musical' mean as Alberti states the following method to derive it. Let shorter number be 30 and longer number be 60. Take difference between these numbers and divide it by three to get 10; i.e. 60-30 = 30/3 = 10. Add one such part (i.e. 10) to shorter limit (i.e. 30) to get 40, which is desired 'musical' mean

Values of example three – 30:40:60

Harmonic mean, h = (2 * w * b) / w + b = (2 * 30 * 60) / 30 + 60 = 3600 / 90 = 40.

Alberti narrates the use of Arithmetic mean in derivation of column height of Ionic, Doric and Corinthian columns which is studied later in the chapter on proportions in temples. We would see in next chapter, Palladio also mentioning these means to define height of a room in his theory.

2.8.13 PROPORTIONS IN DWELLING UNITS

Alberti proposes use of proportions in dwelling units for which the study would dwell on following points.

1) Design philosophy in dwelling units
2) Proportions in two dimension (i.e. length and width)
3) Proportions in third dimension (i.e. length, width and height)
4) Proportions of openings (windows)

2.8.13.1 Design philosophy in dwelling units

Alberti distinguishes between temple and dwelling unit in the treatment and design. He advocates judicial use of material in private dwelling.

Alberti narrates ***"If I were to sum up the whole question, I would say that sacred buildings ought to be so designed that nothing further may be added to enhance their majesty or cause greater admiration for their beauty; the private building, on the other hand, must be so treated that it will not seem possible to remove anything, because everything has been put together with great dignity."*** (*'De Re Aedificatoria'*, Book IX, Chapter I)

"But in the private house modest materials should be used elegantly, and elegant materials modestly." *('De Re Aedificatoria',* Book IX, Chapter I)

2.8.13.2 Proportions in two dimension (i.e. length and width)

In dwelling unit, Alberti segregates 'area' housing different functions, according to their size and proportions into three parts, i.e. large area (for bosom- main area like atrium and portico), smaller area (closet and internal rooms) and intermediate rooms (dining room and vestibule). As already studied, Alberti ascribes their proportions to musical ratios and has mentioned additional proportions for atrium as under

"In accordance with common practice of long standing, our ancestors used to give the atrium a width of two thirds its length, or a length either five thirds or seven fifths the width. In either case it seems that the ancients raised the wall to a height four thirds the length of the area." *('De Re Aedificatoria',* Book IX, Chapter III)

"Something else I ought not to pass over here: the length of the atrium must never be more than twice the width; nor should the width of drawing rooms be less than two thirds their length. A ratio, length to width, of three, four, and so on, though no longer than six, is required for a portico." *('De Re Aedificatoria',* Book IX, Chapter III)

Interpretation:

Alberti mentions room ratios of length to breadth as 3:2, 5:3 and 7:5. For length to height ratio; Alberti states 4:3 ratio following his ancestors. As studied; we find same proportions being followed by Vitruvius in atrium planning. Adding to these proportions; Alberti advocates 3:1, 4:1, 5:1 and 6:1 ratios for portico, 2:1 and 3:2 for atrium and drawing rooms. The drawing room should have 2:1 as upper limit of room ratio and 3:2 as lower limit for drawing room.

2.8.13.3 Proportions in third dimension (i.e. length, width and height)

Alberti proposes the height of room depending upon the type of roof and room size. According to him the size of area is determined by the roof and the size of roof by the length of beams required to span it. Alberti mentions proportions of height to length and width in three sizes, namely 'medium' size, 'large' and 'even larger' roofs, for two types of roofs, namely timber construction and vault roof.

For medium size roof,

"If the length of the area is twice the width, with a timber roof the height should be one and a half times the width. With vaulted roofs, the height of the wall will be the same as the width to which a third is added. So much for medium-sized roofs." (*'De Re Aedificatoria'*, Book IX, Chapter III)

Interpretation:

Medium room

For room ratio 2:1

Vaulted height would be width plus 1/3, i.e. 4:3

and height for timbered roof would be width * 1.5, i.e. 3:2. Refer figure 2.7.2

For large size roof,

"In a large building, if the roof is vaulted, the height [of a room] from top to bottom will be five times a quarter of the width, and if the roof is of timber construction, seven times a fifth. But if the roof is of timber construction and the length of the area is three times the width, let the height be three quarters more than the width; if the roof is vaulted, let the height be one half more than the width. But if the length is four times the width, the height of the wall will take up half the length in the case of a roof of timber construction, and seven quarters of the width with vaulting. If the length is five times the width, the height of the wall will be one sixth more than it is for an area with a length four times the width. If the length is six times the width, the same applies, except that it is one fifth rather

than one sixth more. With vaults, if the area is equal-sided, the ratio between height and width is the same as when the length is three times the width, but with trabeated roofing, the height remains the same as the width." (*'De Re Aedificatoria'*, Book IX, Chapter III)

Large room

Alberti mentions room heights for various room ratios for vaulted and timbered roof.

For room ratio 3:1

Vaulted height would be 1 ½ x width = 3:2.

and height for timbered roof would be width plus 3/4, i.e. 7:4 Refer figure 2.7.2.

For room ratio 4:1

Vaulted height would be seven quarters of width, i.e. 7:4

and height for timbered roof would be half the width, i.e. 2:1. Refer figure 2.7.2.

For room ratio 5:1

Vaulted height would be 1/6th more than that in 4:1, i.e. approximately 2.041 :1

and height for timbered roof would be 1/6th more than that in 4:1, i.e. 7:3.

Refer figure 2.7.3.

For room ratio 6:1

Vaulted height would be 1/5th more than that in 4:1, i.e. approximately 2.099 :1

and height for timbered roof would be 1/5th more than that in 4:1, i.e. approximately 2.4 :1. Refer figure 2.7.3.

For room ratio 1:1

Vaulted height would be same as in 3:1, i.e. 3:2

and height for timbered roof would be equal to width, i.e. 1:1. Refer figure 2.7.3.

For larger size roof,

"With rooms of an even larger area, the height may be reduced, so that the width is one quarter more than the height. Where the length is one ninth greater than the width, the height is likewise one ninth greater than the width, but only when the roof is trabeated. When the roof is of timber construction and the length is four times a third of the width, raise the wall to a height one sixth more than the width; but if it is vaulted, increase the height further to equal the width plus a sixth of the length. With roofs of timber construction, when the length is one and a half times the width, the height is one seventh more than the width; with vaulting, however, add a seventh of the longer line of the larger dimension to the height. If finally, the relationship of the lines is such that one equals 5 and the other 7. or one 3 and the other 5, and so on, as local constraints, variety of invention, or the method of ornament demand, make the height half the sum of their two dimensions." (*'De Re Aedificatoria'*, Book IX, Chapter III)

Larger room

For room with length four times one third width, i.e. 10:9

Vaulted height would be 1/9 th more than width, i.e. approximately 1.11 :1.

and height for timbered roof would be 1/9th more than width, i.e. approximately 1.11 :1. Refer figure 2.7.4.

For room with length four times one third width, i.e. 4:3

Vaulted height would be width plus 1/6th of length, i.e. approximately 1.55 :1

and height for timbered roof would be width plus 1/6th, i.e. 7:6. Refer figure 2.7.4.

For room with length one and half times width, i.e. 3:2

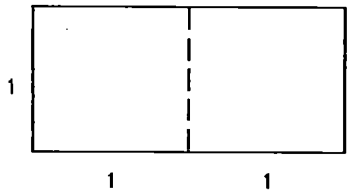
Vaulted height would be width plus 1/7th of length, i.e. approximately 1.71 :1

and height for timbered roof would be width plus 1/7th, i.e. 8:7

For ratios 7:5 and 5:3 Alberti proposes the use of arithmetic mean to derive its height. it could be understood Alberti is prescribing 7:4, 2:1, 7:3, 2.4:1, 3:2, 1:1, 1.55:1, 1.66:1, 1.71:1 and 1.42:1.

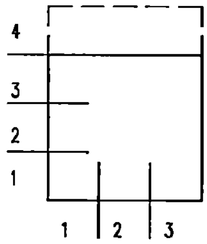
Figure 2.7.2 Atrium Height For Atrium Room Proportions Of 2:1, 3:1 And 4:1 As Prescribed By Alberti

Atrium Plan 2:1



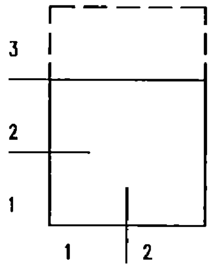
ATRIUM HEIGHT AS PER
Arithmetic Mean=h=(w+b)/2=1.5
Geometric Mean=h=square root of (w*b)=1.41
Harmonic Mean=h=2(w*b)/(w+b)=1.33

Atrium Height for vaulted roof



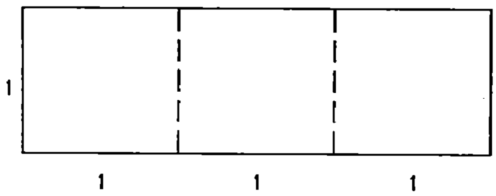
H=Width + 1/3rd
i.e. 4:3 =1.33

Atrium Height for timbered roof



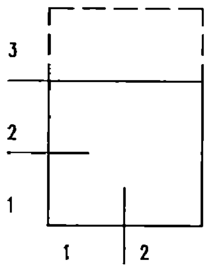
H=1.5 times Width
i.e. 3:2 = 1.5

Atrium Plan 3:1



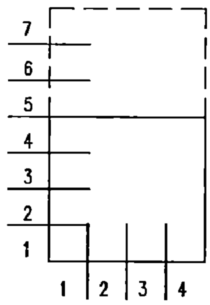
ATRIUM HEIGHT AS PER
Arithmetic Mean =2
Geometric Mean =1.73
Harmonic Mean =1.5

Atrium Height for vaulted roof



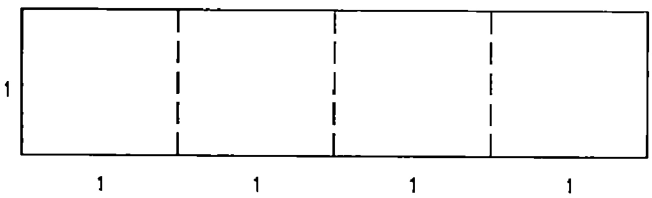
H=1.5 times Width
i.e. 3:2 = 1.5

Atrium Height for timbered roof



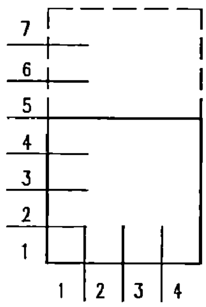
H=Width + 3/4
i.e. 7:4 =1.75

Atrium Plan 4:1



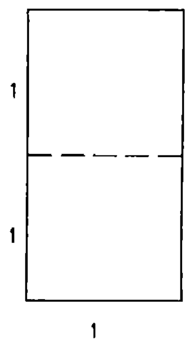
ATRIUM HEIGHT AS PER
Arithmetic Mean =2.5
Geometric Mean =2.0
Harmonic Mean =1.6

Atrium Height for vaulted roof



H=7 quaters of width
i.e. 7:4 =1.75

Atrium Height for timbered roof

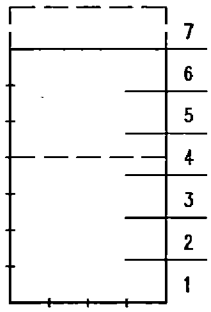


H= Half the length
i.e 2:1=2

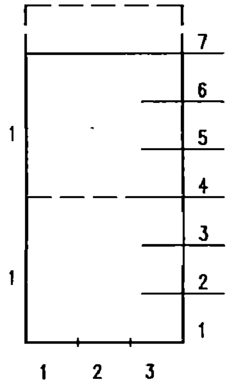
Figure 2.7.3 Atrium Height For Atrium Room Proportions Of 5:1, 6:1 And 1:1 As Prescribed By Alberti

Atrium Plan 5:1

Atrium Height for vaulted roof



Atrium Height for timbered roof

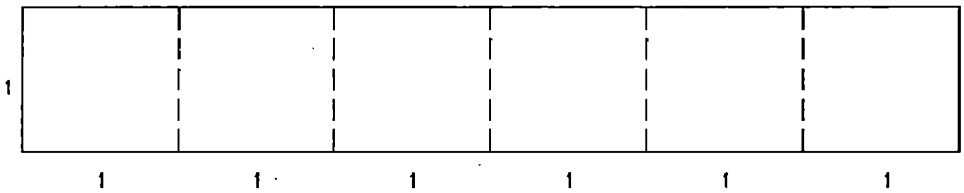


ATRIUM HEIGHT AS PER
Arithmetic Mean=h=(w+b)/2=3
Geometric Mean=h=square root of (w*b)=2.23
Harmonic Mean=h=2(w*b)/(w+b)=1.66

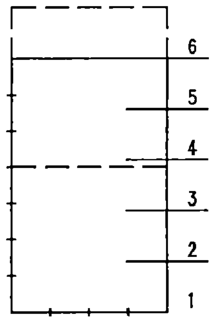
H= 1/6 more than that in 4:1
i.e approximately =2.041

H= 1/6 more than that in 4:1
i.e 7:3=2.33

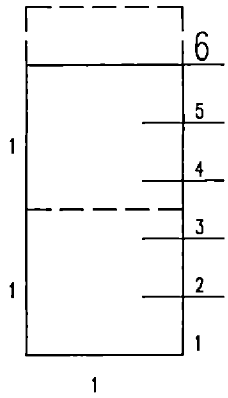
Atrium Plan 6:1



Atrium Height for vaulted roof



Atrium Height for timbered roof

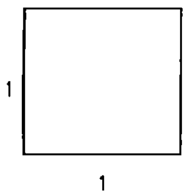


ATRIUM HEIGHT AS PER
Arithmetic Mean =3.5
Geometric Mean =2.44
Harmonic Mean =1.71

H= 1/5 more than that in 4:1
i.e approximately =2.099

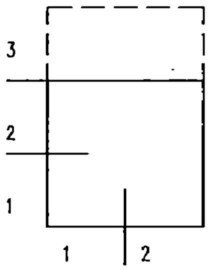
H= 1/5 more than that in 4:1
i.e approximately =2.40

Atrium Plan 1:1



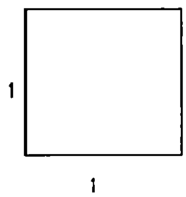
ATRIUM HEIGHT AS PER
Arithmetic Mean =1.0
Geometric Mean =1.0
Harmonic Mean =1.0

Atrium Height for vaulted roof



H=same as in 3:1
i.e. 3:2 = 1.5

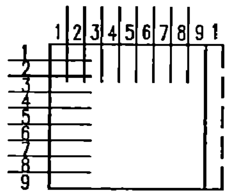
Atrium Height for timbered roof



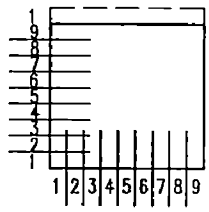
H= same as width
i.e 1:1=1

Figure 2.7.4 Atrium Height For Other Atrium Room Proportions As Prescribed By Alberti

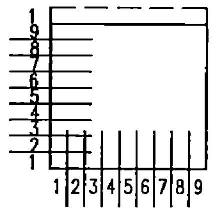
Atrium Plan with length $\frac{1}{9}$th more than of width i.e. 10:9



Atrium Height for vaulted roof



Atrium Height for timbered roof

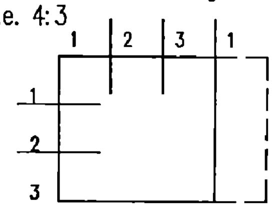


ATRIUM HEIGHT AS PER
Arithmetic Mean=h=(w+b)/2=9.5
Geometric Mean=h=square root of (w*b)=9.48
Harmonic Mean=h=2(w*b)/(w+b)=9.47

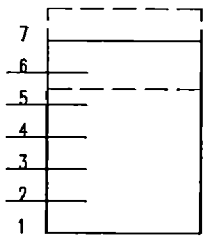
H= $\frac{1}{9}$ more than width
i.e approximately =1.11

H= $\frac{1}{9}$ more than width
i.e approximately =1.11

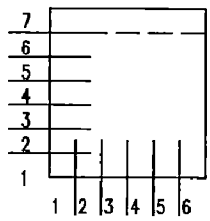
Atrium Plan with length 4 times 1/3 of width i.e. 4:3



Atrium Height for vaulted roof



Atrium Height for timbered roof

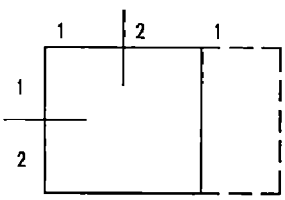


ATRIUM HEIGHT AS PER
Arithmetic Mean=h=(w+b)/2=3.5
Geometric Mean=h=square root of (w*b)=3.46
Harmonic Mean=h=2(w*b)/(w+b)=3.42

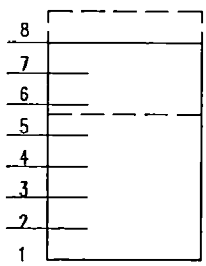
H= width +1/6 of length
i.e approximately =1.55

H= 1/6 more than width
i.e 7:6=1.166

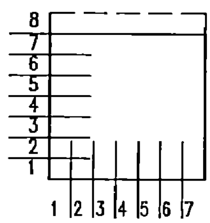
Atrium Plan with length 1.5 times of width i.e. 3:2



Atrium Height for vaulted roof



Atrium Height for timbered roof



ATRIUM HEIGHT AS PER
Arithmetic Mean =2.5
Geometric Mean =2.44
Harmonic Mean =2.4

H= 1/7 more than length
i.e approximately =1.71

H= 1/7 more than width
i.e 8:7 = 1.42

2.8.13.4 Proportions of openings (windows)

To have holistic idea of development of theory of Alberti and to increase the palette of ratios prescribed by him, the study enlists the proportions of openings.

For size of windows ***"Within the wall there should be openings for both windows and doors. Window openings along the width of a wall (which is naturally shorter than the length) should number no more than one. This should have either a height greater than its width or a width greater than its height, the latter version being known as a "reclining" window. When the width is narrower, as it is with a door, then make the opening, from right to left, no more than a third and no less than a quarter the overall internal width of the wall. Let the base of the opening itself be no more than four ninths and no less than two ninths of the overall height above floor level. The height should be one and a half times the width. These are the proportions for the opening whose width is less than its height. But if the opening is broader from right to left, and squatter from top to bottom, make the width of the opening no less than half and no more than two thirds the overall width of the wall. Equally, its height should be half its width, or two thirds that dimension. Two colonnades may be added to support the lintel.***

If the longer wall is to contain windows, they should be more frequent, and their number odd. The ancients, I notice, preferred to make them three. Let them be as follows. Divide the overall length of the wall into no more than seven and no less than five parts; take three of these, and give each a window. Make the height of the opening seven quarters or nine fifths its width. But if more windows are needed, seeing as the work now assumes the character of a portico, their dimensions should be borrowed from the portico (especially that in a theater), as described above in the appropriate place". (*'De Re Aedificatoria'*, Book IX, Chapter III).

Interpretation:

Alberti in first paragraph suggests having only one window on shorter side of room. For this he prefers horizontal window (with window width more than its height) to vertical windows where height is more than its width. On width of vertical windows, Alberti states that it (width) should not be more than 1/3 the width of the room (i.e. room width and window size are related to each other with ratio 3:1) and not be less than quarter of the width of room, i.e. if room width is one; minimum width of window would be 0.25 (i.e. they are related as 4:1). For openings whose width is less than its height, Alberti relates width of such openings on ground floor and first floor as follows. He states that the width of related openings on ground floor should not be more than 4 x 1/9 the overall height of floor above and not less than 2 x 1/9 the overall height of floor above. For height of the window he writes it should be 1.5 times width which could be understood as 3:2. For window opening that is wider than its height; Alberti writes that width of such window should be not more than 2/3 width of room and height to be either ½ width of room or 2/3 width of room. Thus he once again implies ratios 3:2 and 2:1.

Alberti then continues with number of windows in a wall and its width in paragraph two. He states to have odd number of windows on longer side of the room with room width to window width ratio as 7:3 or 5:3 and height as seven quarters (7:4) or nine fifths (9:5).

2.8.14 PROPORTIONS IN TEMPLE

"No aspect of building requires more ingenuity, care, industry, and diligence than the establishment and ornament of the temple. I need not mention that a well-maintained and well-adorned temple is obviously the greatest and most important ornament of a city; for the gods surely take up their abode in the temple." (*'De Re Aedificatoria'*, Book VII, Chapter III).

Temple was considered as the most important building type as they were abode of God and required utmost care in planning. A temple consisted of a portico and a Cella inside.

At times tribunals were added to it. The portico had columns. To understand Alberti's proportion in temple planning the study would encompass following points

1) Circle as most preferred shape by nature
2) Temple proportions of ancients
3) Etruscan temple proportions
4) Proportions of tribunal
5) Proportions and shape of portico
6) Column spacing, inter columniation and number of columns
7) Proportions of columns (ionic, Doric and Corinthian)
8) Wall thickness

2.8.14 .1 Circle as most preferred shape by nature

Alberti taking clue from nature narrates about temple plans. ***"It is obvious from all that is fashioned, produced, or created under her influence, that Nature delights primarily in the circle. Need I mention the earth, the stars, the animals, their nests, and so on, all of which she has made circular? We notice that Nature also delights in the hexagon. For bees, hornets, and insects of every kind have learned to build the cells of their hives entirely out of hexagons."***(*'De Re Aedificatoria'*, Book VII, Chapter IV).

Interpretation:

Circle was the most preferred shape by Alberti in temple planning as they are abode of Gods and had to be perfect. Alberti also mentions the shape of hexagon citing nature. Ancients like Plato, Vitruvius also considered circle as perfect and Palladio also prescribed circle for one of his most preferred seven room ratios.

2.8.14.2 Temple proportions of ancients

Alberti narrates ***"The round plan is defined by the circle. In almost all their quadrangular temples our ancestors would make the length [of the plan] one and a half times the width. Some had a length one and a third times***

their width, and others a length twice their width. It is a considerable defect in a four-sided plan if the angles are not exact right angles.
For many-sided plans, the ancients would use six, eight, or even ten angles. The corners of all such plans must be circumscribed by a circle. Furthermore, they may be plotted exactly using the circle."(*'De Re Aedificatoria',* Book VII, Chapter IV).

For room shape Alberti in chapter four of book nine writes, ***"In addition, circles, semicircles, and other geometric shapes that are favored in the plans of buildings can be modeled out of laurel, citrus, and juniper when their branches are bent back and intertwined."*** (*'De Re Aedificatoria',* Book IX, Chapter IV).

Interpretation:
Alberti seems not to limit his room shapes and ratios to basic musical or whole number ratios but besides adding semi-circle and 'other geometric shapes' to his vocabulary of room shapes; he enhances his palate with inspiration from nature. Alberti might be hinting at generating interwoven plan with interwoven ratios and over layering of room shapes and geometry. This foresight of Alberti seems very ideal for contemporary planning grammar.

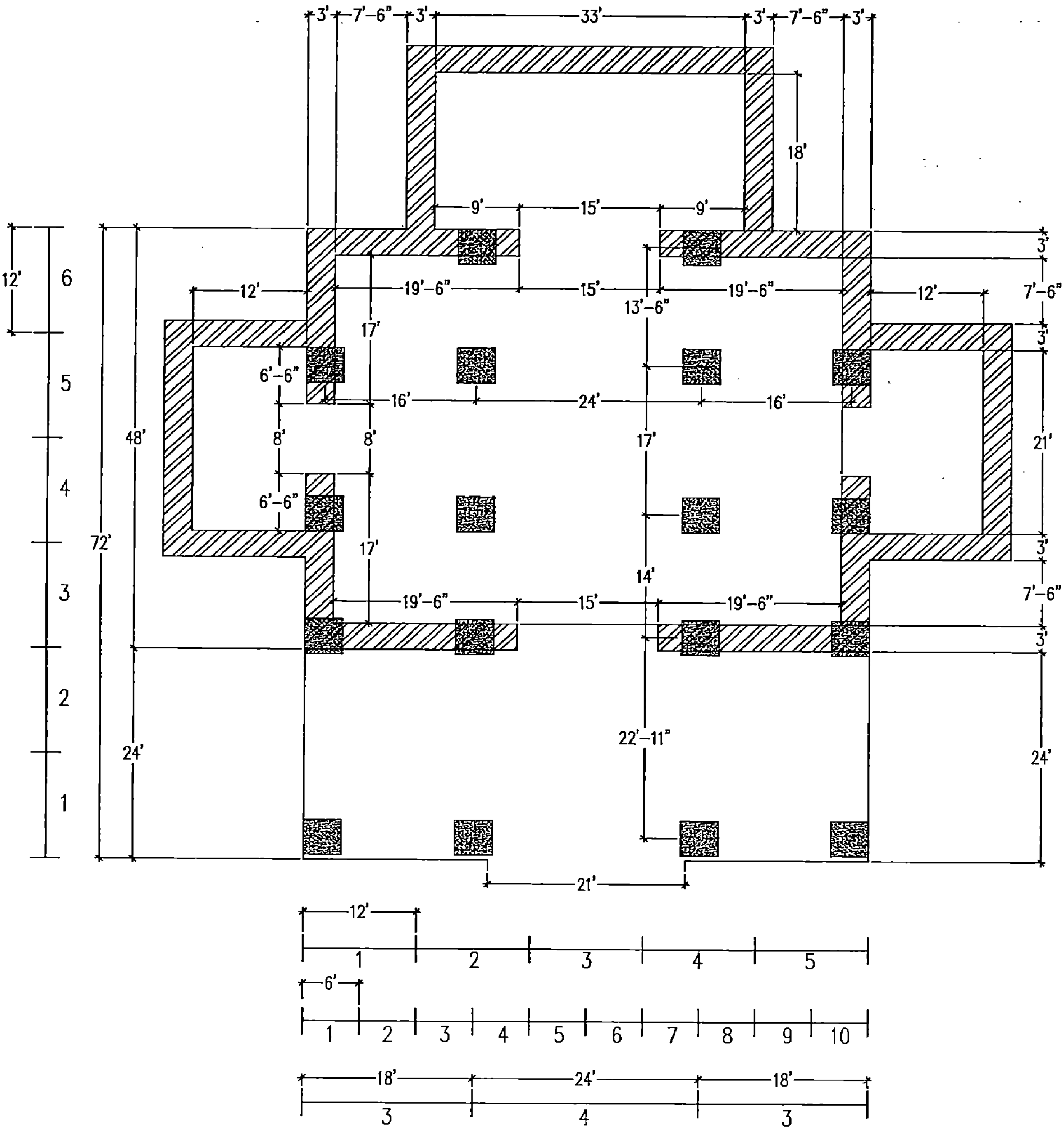
2.8.14.3 Etruscan temple proportions
Alberti narrates proportions of small temples following Etruscan custom as follows
"Here and there are temples that, following ancient Etruscan custom, have small chapels along the walls on both sides, instead of a tribunal. These temples are laid out as follows: In plan, their length, divided into six, is one part longer than their width. A portico, serving as the vestibule to the temple, takes up two parts of that length; the remainder is divided up into three, to give the width of each of the three chapels. Then the width of the temple is divided into tenths, three of which were given to the chapels on the right, and likewise the left, and the four remaining were

taken up by the nave in the center. A tribunal was added to the head of the temple, and to the middle chapel on either side. The width of the wall at the openings to the chapels was one fifth the intervening gap". (*'De Re Aedificatoria',* Book VII, Chapter IV).

Interpretation:

Alberti's Etruscan temple proportions are comparable to proportion for temples of Tuscan order by Vitruvius. Though modeled on same proportion for length to width ratio as 6:5, there is difference in proportions for Cella to portico. Alberti points proportion of 4:2 i.e. 2:1 when he narrates that "portico takes up two parts of that length (2 parts of 6 dividing 6 as 4:2)". This is deviation from Vitruvius's proportion where the portico is half its length, 3:3 i.e. 1:1. Other divisions are same as Vitruvius with addition of vestibules in back and side of the temple. Refer figure 2.7.5: Alberti's Etruscan temple.

Figure 2.7.5 Alberti Plan Etruscan Of Temple



Redrawn From Source, Alberti; Leon Battista., De Re Aedifictoria, Page 198

2.8.14.4 Proportions of tribunal

Tribunals are side chapels which are added to the main temple. Alberti narrates the following proportion for chapels

"With quadrangular temples there is almost invariably one at the further end, opposite the door, where it is immediately obvious to anyone entering. With a quadrangular plan, tribunals along the side look best when they are twice as long as they are wide; on each side there should preferably be only one tribunal, but if more are required, they should be odd in number" (*'De Re Aedificatoria'*, Book VII, Chapter IV).

Interpretation:

Alberti proposes length to width ratio of tribunal as 2:1. For its relationship with temple, i.e. width of temple to length of tribunal; Alberti proposes to use either 2:1 (i.e. from 4 parts take 2 part for tribunal, 2:1) or 3:2 (from six parts take four, i.e. 6:4 :: 3:2). These ratios are a Double (octave) and Sesquialtera respectively which are among nine main ratios prescribed by Alberti.

2.8.14.5 Proportions and shape of portico

The portico is a space outside cella with cella wall on one side and colonnade on other. In quadrangular temple, it may be attached to either front or both front and back or it may be wrapped around the whole cella.

Alberti narrates following proportions for portico with reference to the temple

"Porticoes on the front of quadrangular temples must never be shorter than the whole width of the temple, and never wider than a third of the length [of the temple]. Porticoes along the sides should have columns the same distance apart as they are from the wall of the interior. Those to the rear may take either form, according to preference.

Round temples should either be completely encompassed with a portico or have one only on the front. In either case the width should be

calculated as with a quadrangular temple. But a portico on the front must always be quadrangular: its length should either equal the width of the whole interior or be between one eighth and as much as one quarter less." (*'De Re Aedificatoria'*, Book VII, Chapter V).

Interpretation:

Alberti proposes length of portico to width of temple to be 1:1 in ratio and depth as 1/3rd, i.e. 3:1. For porticos of round temples, Alberti proposes length to width ratio of minimum 1/8th less i.e. Tonus (9:8) and maximum one quarter less i.e. 4:3.

2.8.14.6 Column spacing, inter columniation and number of columns

Alberti defines the spacing between the columns in portico and suggests inter columniation ratio in proportion to thickness of column and narrates as under:

"There were therefore five degrees of spacing, which we might term as follows: the wide, the close, the elegant, the not-so-wide, and the not- so-close." (*'De Re Aedificatoria'*, Book VII, Chapter V).

"The number of gaps between columns should be odd, the number of columns always even; make the central opening, opposite the door, more generous than the rest; where the spaces between the columns must be narrower, make the columns more slender; use thicker columns where the spaces are wider. Thus the thickness of the columns was restrained by the intercolumniation, and the inter- columniation by the columns, usually according to the following rules: in "close-set" colonnades, the intercolumniation should be no less than one and a half times the thickness of the columns; in "wide-set" colonnades, it should be no more than three and three-eights the thickness of the columns; in "elegant" colonnades, it should be two and a quarter; in the "not-so- close-set," two; and in the "not-so-wide-set," three. The central gap in the row should be a quarter part wider than the rest. This, then, was their advice". (*'De Re Aedificatoria'*, Book VII, Chapter V).

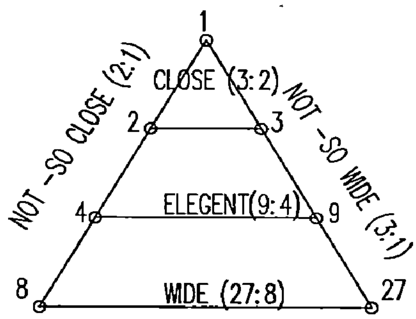
Interpretation:

Alberti, after mentioning five types of column spacing, emphasizes the use of even number of columns and odd number of gaps (inter columniation) in-between. As discussed this is deviation from Vitruvius's temple planning with odd number of columns and even number of inter columniation. Column to inter columniation ratio as suggested by Alberti can be interpreted as follows which is graphically shown in figure2.6.7 Alberti's measure of intercolumniation.

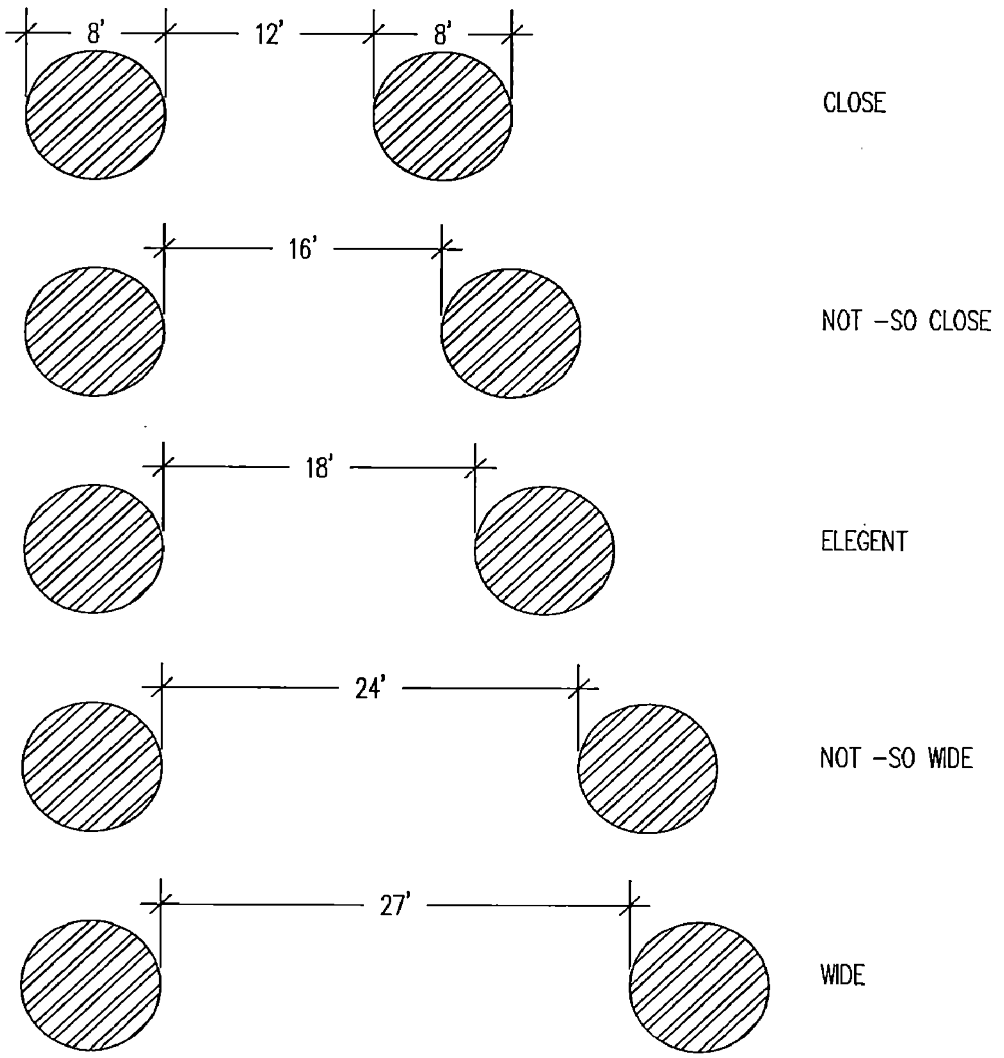
1) Close (3:2)
2) Elegant (9:4)
3) Wide (27:8)
4) Not-so-close (2:1)
5) Not-so-wide (3:1)

All the numbers in the above ratios belong to Pythagorean Lambda and we find its use in Palladio's proportioning system.

Figure 2.7.6 Alberti's Measure Of Intercolumnation



Taking basic diameter of column as 8 units these ratios could be interpreted as:



Source: Author 1997

2.8.14.7 Proportions of columns (Ionic, Doric and Corinthian)

According to Alberti the ancients derived proportions based on study of human body and employed them to make column. He describes the proportions of three kinds of columns namely Ionic, Doric and Corinthian and explains how they were derived as follows

"The shapes and sizes for the setting out of columns, of which the ancients distinguished three kinds according to the variations of the human body, are well worth understanding. When they considered man's body, they decided to make columns after its image. Having taken the measurements of a man, they discovered that the width, from one side to the other, was a sixth of the height, while the depth, from navel to kidneys, was a tenth. The commentators of our sacred writings also noted this and judged that the ark built for the Flood was based on the human figure.

The ancients may have built their columns to such dimensions, making some six times the base, others ten times. But that natural sense, innate in the spirit, which allows us, as we have mentioned, to detect concinnitas suggested to them that neither the thickness of the one nor the slenderness of the other was suitable, so that they rejected both. They concluded that what they sought lay between the two extremes. They therefore resorted first to arithmetic, added the two together, and then divided the sum in halt; by this they established that the number that lay midway between six and ten was eight. This pleased them, and they made a column eight times the width of the base, and called it Ionic.

The Doric style of column, which suited squatter buildings, they established in the same way as the Ionic. They took the lesser of the two previous terms, which was six, and added the intermediate term of the Ionic, which was eight; the sum of this addition was fourteen. This they divided in half to produce seven. They used this number for Doric

columns, to make the width of the base of the shaft one seventh of the length. And again they determined the still more slender variety, which was called the Corinthian, by adding the intermediate Ionic number to the uppermost extreme and dividing the sum in half: the Ionic number being eight, and the uppermost extreme ten, the two together came to eighteen, half of which was nine. Thus they made the length of the Corinthian column nine times the diameter at the base of the shaft, the Ionic eight times, and the Done seven. So much for this." (*'De Re Aedificatoria'*, Book IX, Chapter VII).

Interpretation:

Ancients derived 1/6 and 1/10 ratio on studying human body and used these to derive the height of column with respect to its base as 6:1 and 10:1. From numbers 6 and 10, using arithmetic mean, proportions of Ionic, Doric and Corinthian columns were derived as under.

Ionic column

For Ionic column = add two extreme and divide it by half.

$\therefore$ height of Ionic column = (10+6)/2 = 16/2= 8

$\therefore$ height of Ionic column = 8 times width at base.

Doric column

For Doric column = add two extreme and divide it by half.

With lesser number as 6 and intermediate number as 8 (from Ionic column)

$\therefore$ height of Doric column = (6+8)/2 = 14/2= 7

$\therefore$ height of Doric column = 7 times width at base.

Corinthian column

For Corinthian column = add intermediate of Ionic with uppermost extreme and divide it by half.

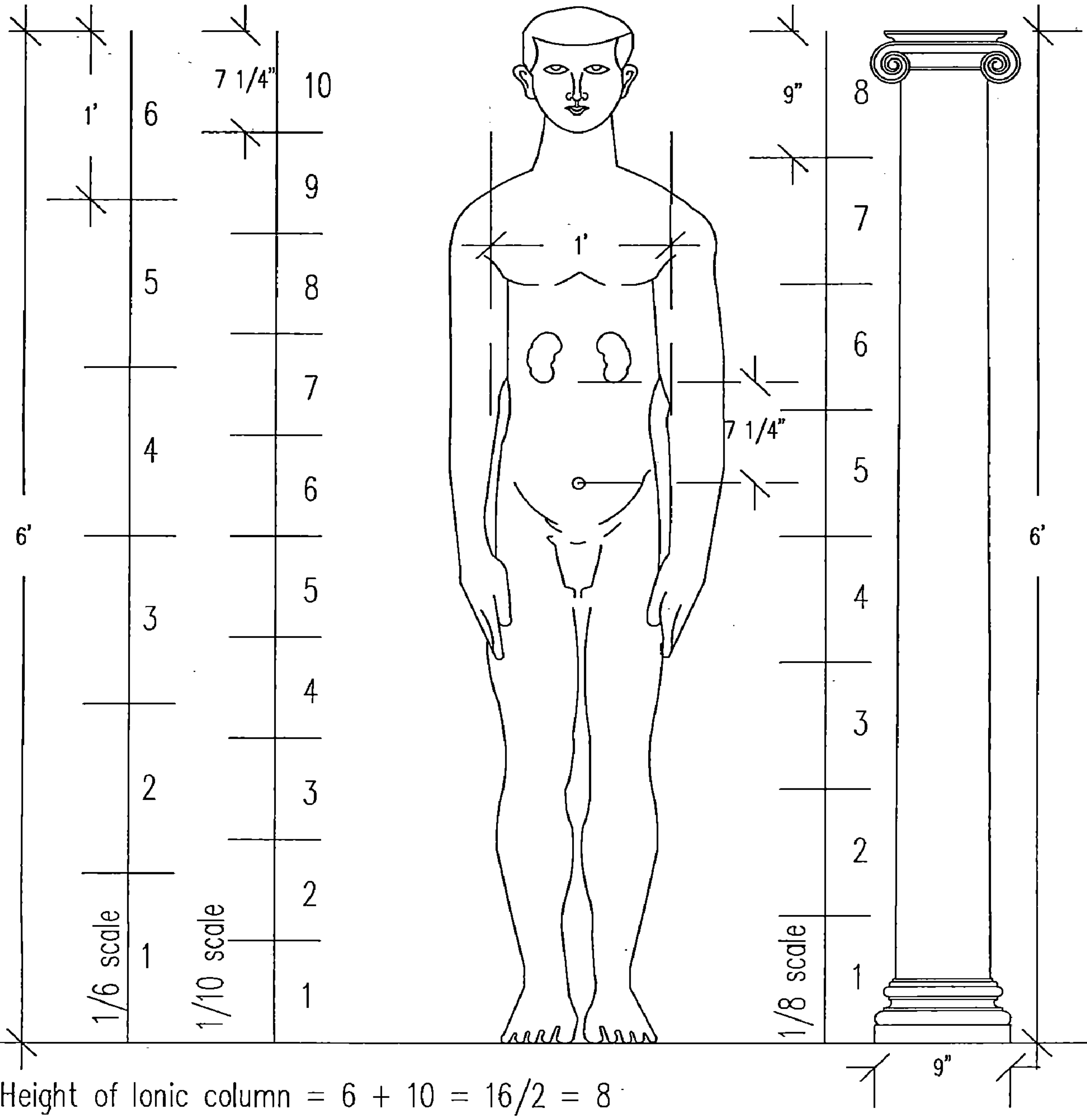
$\therefore$ height of Corinthian column = (8+10)/2 = 18/2= 9

$\therefore$ height of Corinthian column = 9 times width at base.

(Refer figure 2.7.7 to 3.4.82.7.10 Human Proportions according to Alberti and structure of Ionic, Doric and Corinthian columns)

Figure 2.7.7 Illustration Of Human Proportions According To Alberti And Structure Of Inonic Column

- The maximum width of the shoulders is one sixth of a man's height
- The distance from naval to kidney is one-tenth of a man's height

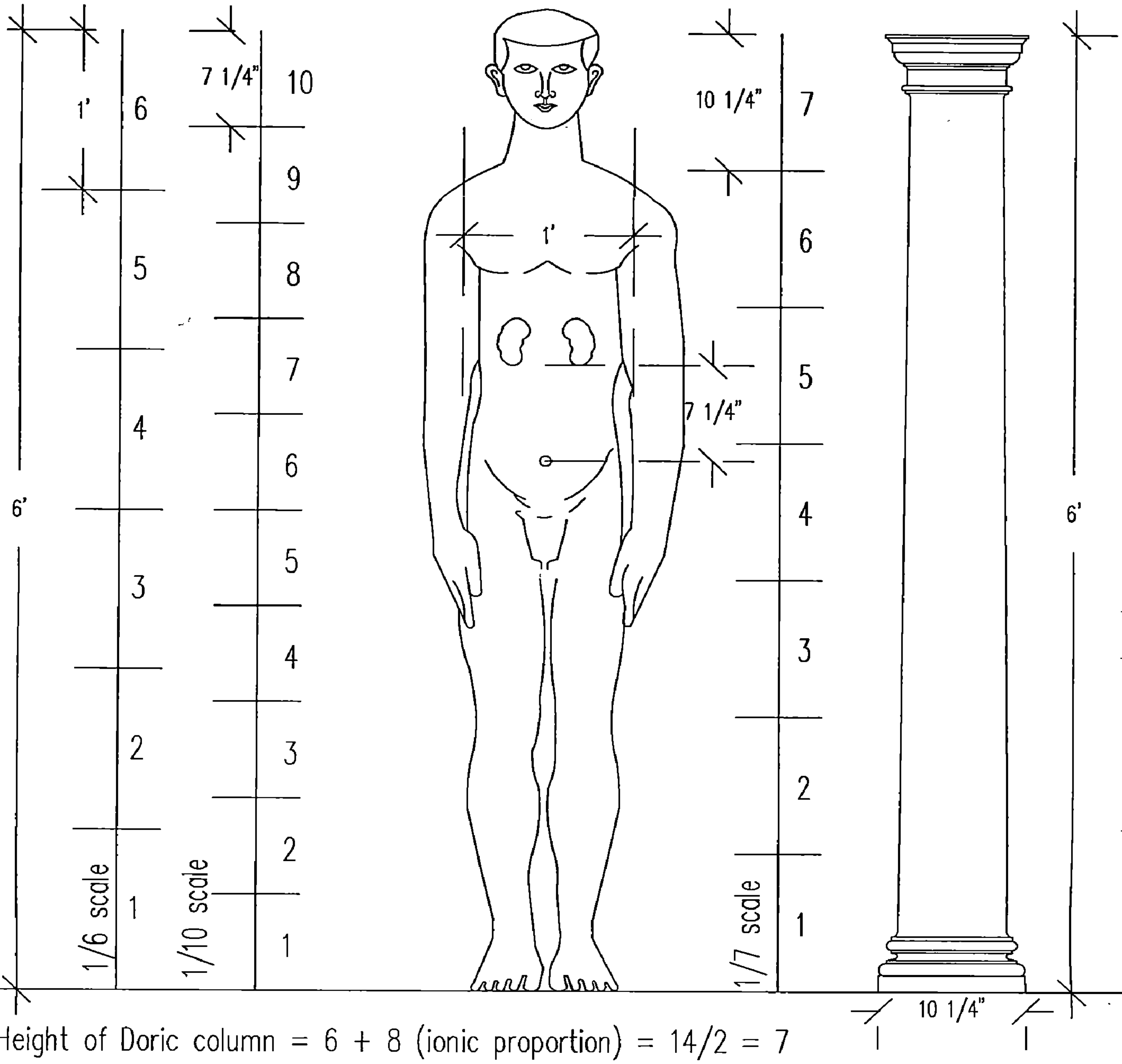


Height of Ionic column = 6 + 10 = 16/2 = 8

Therefore height of Ionic column was prescribed as 8 times its diameter at base

Figure 2.7.8 Illustration Of Human Proportions According To Alberti And Structure Of Doric Column

- The maximum width of the shoulders is one sixth of a man's height
- The distance from naval to kidney is one-tenth of a man's height

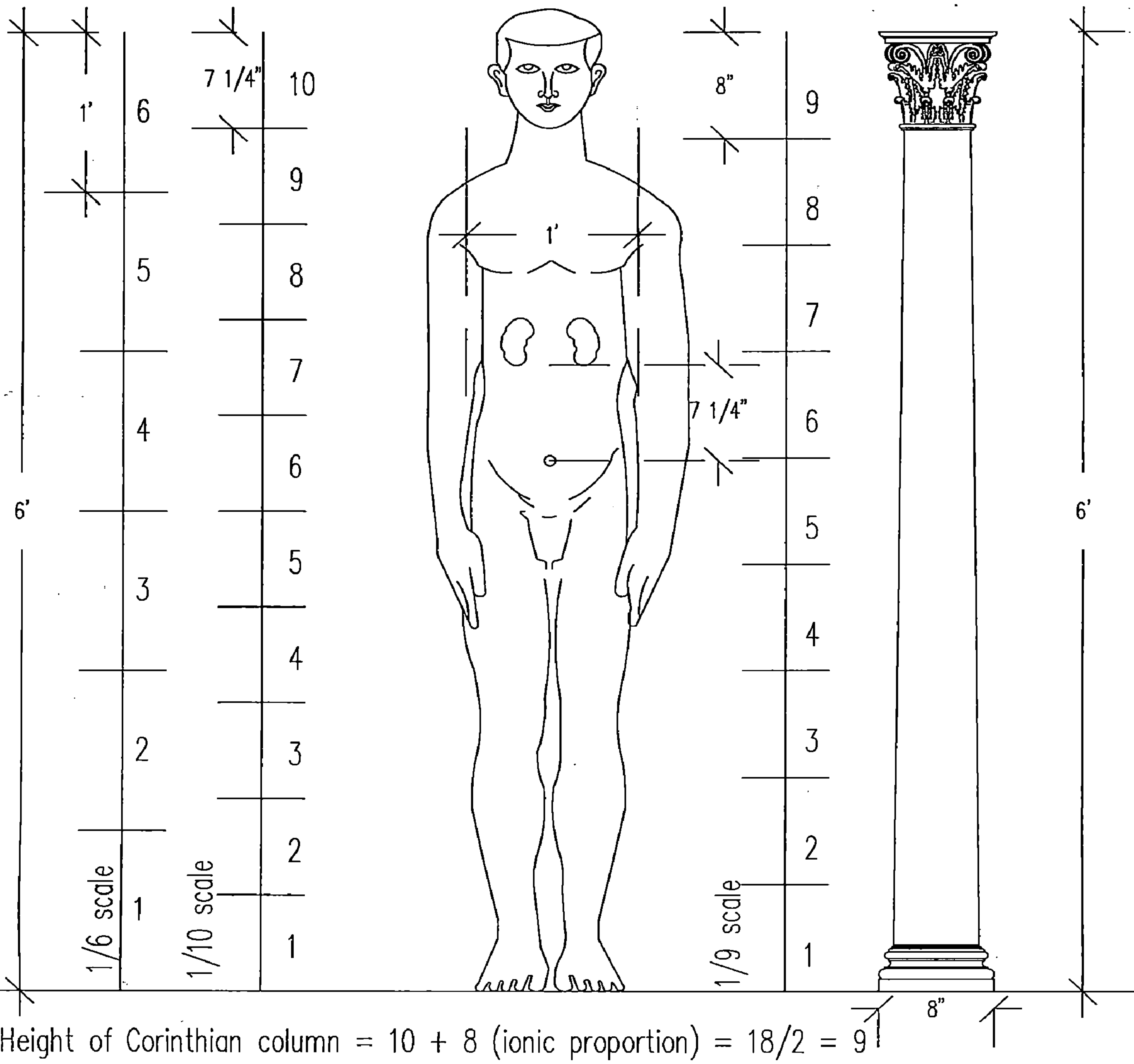


Height of Doric column = 6 + 8 (ionic proportion) = 14/2 = 7

Therefore height of Doric column was prescribed as 7 times its diameter at base

Figure 2.7.9 Illustration Of Human Proportions According To Alberti And Structure Of Corinthian Column

- The maximum width of the shoulders is one sixth of a man's height
- The distance from naval to kidney is one-tenth of a man's height

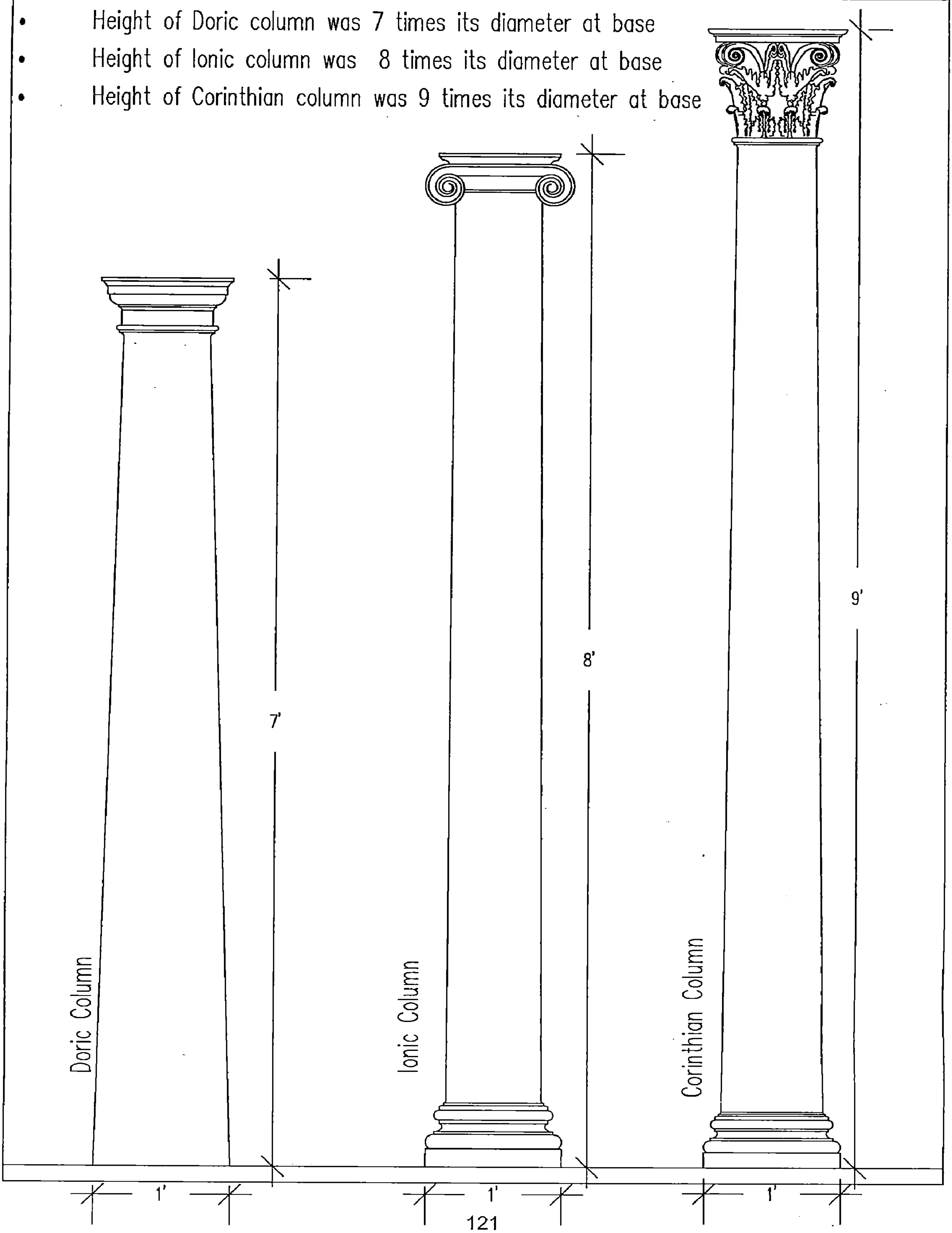


Height of Corinthian column = 10 + 8 (ionic proportion) = 18/2 = 9

Therefore height of Corinthian column was prescribed as 9 times its diameter at base

Figure 2.7.10 Illustration Of Comparative Column Proportions According To Alberti

- Height of Doric column was 7 times its diameter at base
- Height of Ionic column was 8 times its diameter at base
- Height of Corinthian column was 9 times its diameter at base



2.8.14.8 ON WALL THICKNESS

Alberti writes about wall thickness for temples as under.

"The thickness of the wall is determined in the same way as that of the column, so that the ratio of height to thickness must be the same for both wall and column. I notice that the ancients used to make the walls of their temples a twelfth—or, where they wanted the work to be particularly strong, a ninth—of the width of the front." (*'De Re Aedificatoria'*, Book VII, Chapter X).

Interpretation:

Having mentioned about determining wall thickness from same method as adopted for columns (as explained earlier); Alberti talks about wall thickness for temple as one twelfth of width of front elevation. For stronger look; he writes it should be one ninth of width of front elevation. It remains a subject of separate scrutiny if Palladio did apply this law in his villa plans.

2.8.15 PROPORTION IN BASILICA AND FORUM

Of many public building types mentioned by Alberti, the study would dwell on proportions in Basilica and forum as Alberti considers them next to temple in importance and also because its proportions could be compared with proportions mentioned by Vitruvius for similar buildings. For proportions of Basilica; Alberti narrates,

"The basilica, then, may be described as a form of wide, quite open walk-way, roofed and surrounded by inward-facing porticoes. For any without porticoes might be considered not so much a basilica as a curia or senate house, a building type that will be dealt with in the appropriate place.

The basilica ought to have a plan with a length twice its width. It should also have a central nave, and a free and unimpeded causidiciary. If it is to have no causidiciary, but only the simple porticoes on either side, it should be laid out as follows: The width of the plan is divided into ninths, five of which are allocated to the central nave and two to each of the

porticoes. The length also is divided into ninths, one of which is taken up by the depth of the alcove of the tribunal, and two by the width of the alcove at its mouth.

If, in addition to a portico, there is also to be a causidiciary, then the width of the plan is divided into quarters, two of which are taken up by the central nave and one by each of the porticoes. Then the length is divided up as follows: the depth of the alcove of the tribunal takes up a twelfth of the overall length, and the width of its opening two and a half twelfths; the width of the causidiciary should take up one sixth of the length of the plan.

If, however, there are to be both a causidiciary and a double portico, the width should be divided into tenths, four of which are taken up by the central nave, three by the porticoes on the right, and three by those on the left, each individual portico taking up half the space. The length is divided into twentieths, one and a half of which are taken up by the alcove of the tribunal, and three and a third by the width of the opening. The causidiciary takes up no more than three complete parts." (*'De Re Aedificatoria'*, Book VII, Chapter XIV).

Interpretation:

Alberti proposes 2:1 ratio of width to length of basilica which is similar to proportions prescribed by Vitruvius. For central nave of portico within the basilica Alberti proposes 9:5 ratio. Refer figure 2.7.11 to 2.7.13

Figure 2.7.11 Basilica With Simple Portico Inside

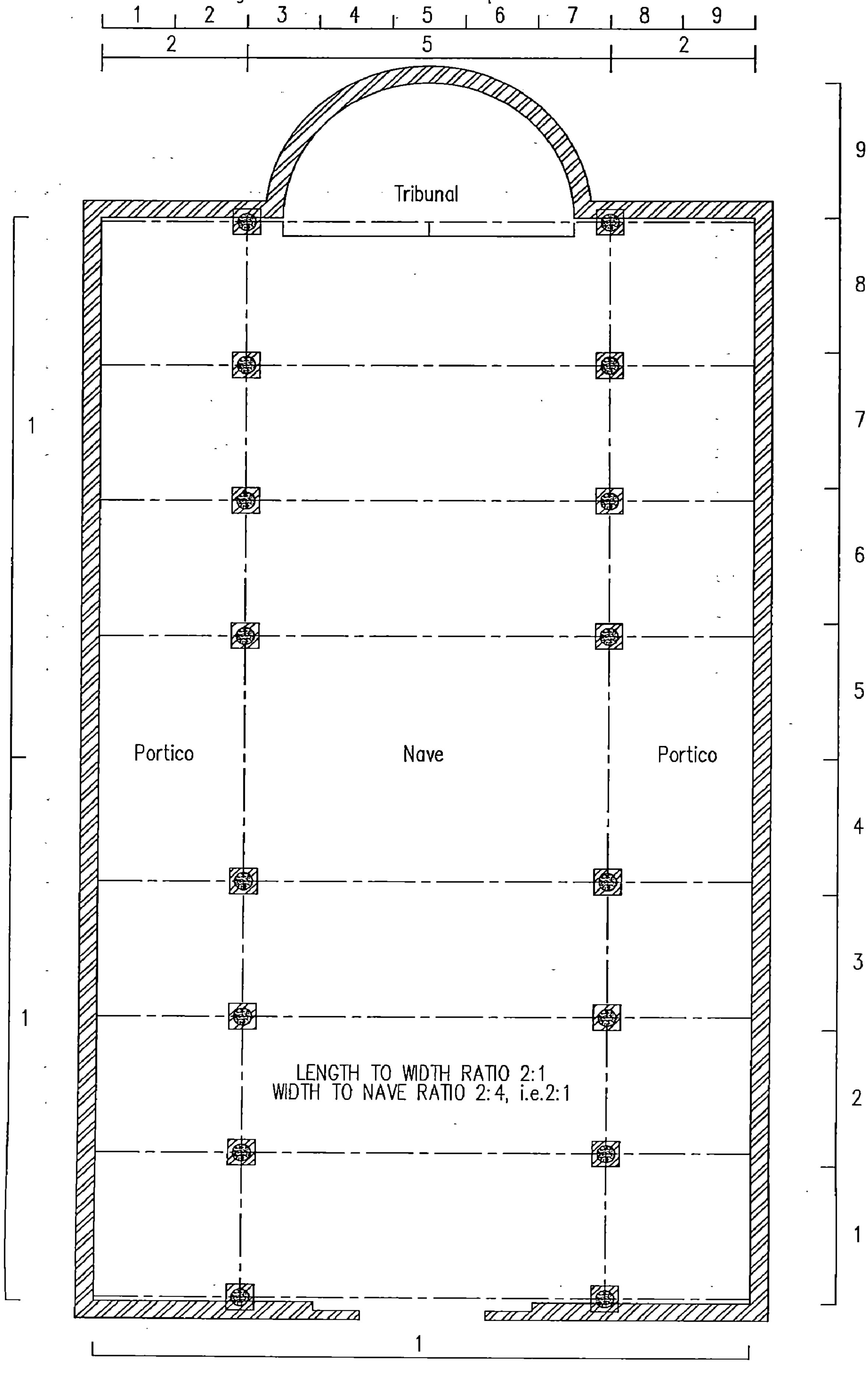


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Figure 2.7.12 Basilica With Portico And Causidiciary

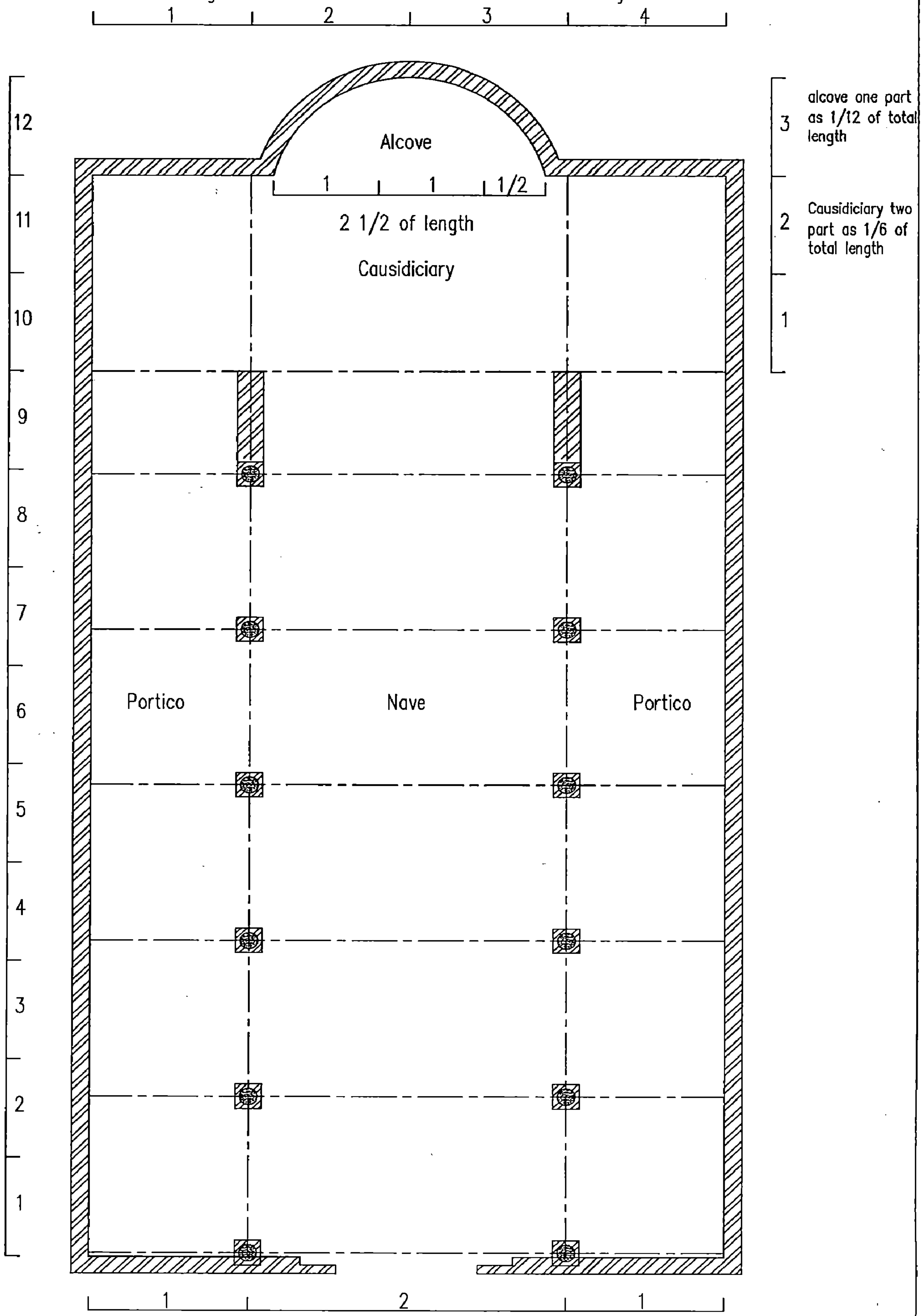

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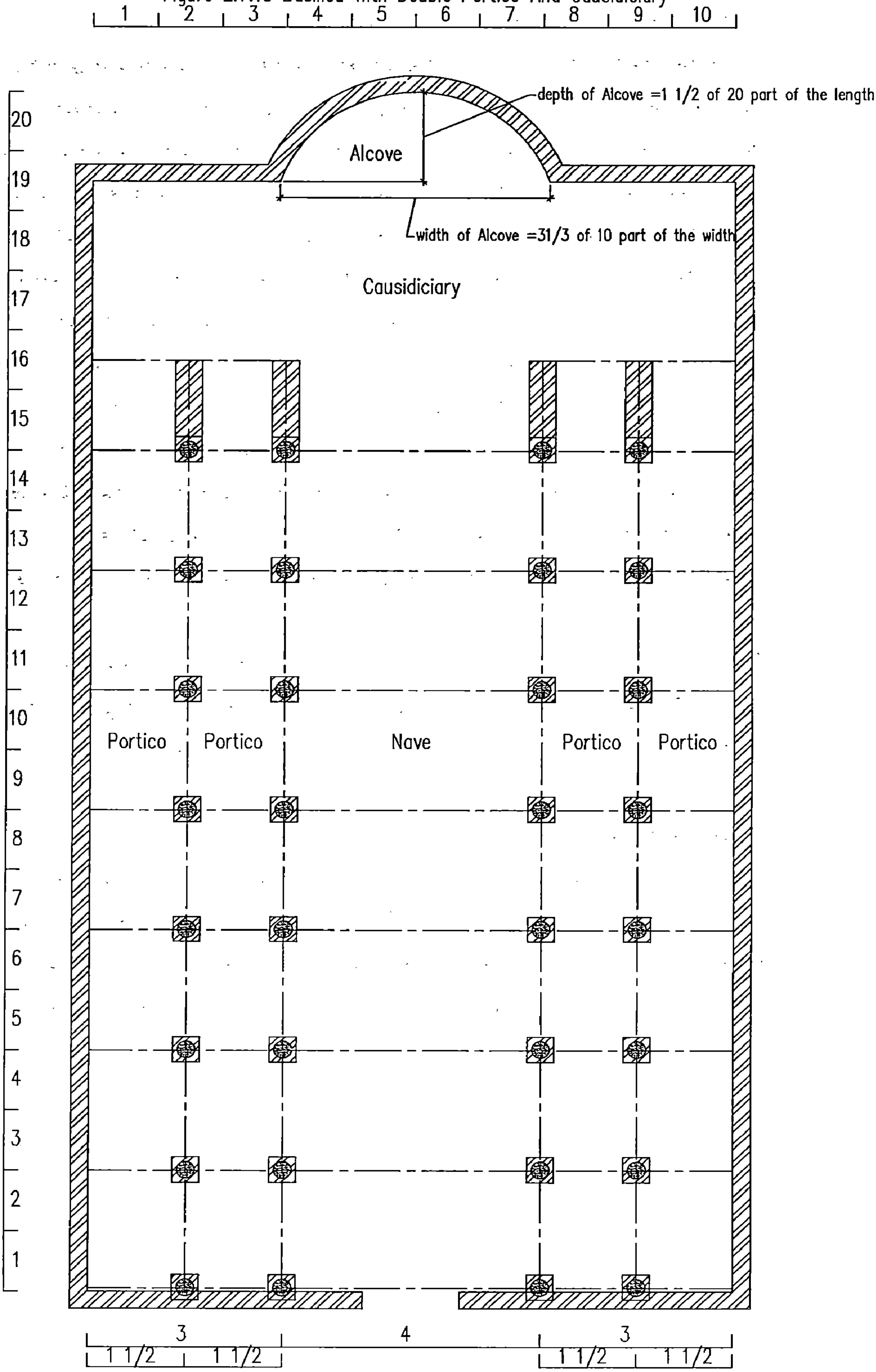
Figure 2.7.13 Basilica With Double Portico And Causidiciary



Redrawn From Source, Alberti; Leon Battista., De Re Aedifictoria, Page: 235

For forum; Alberti narrates

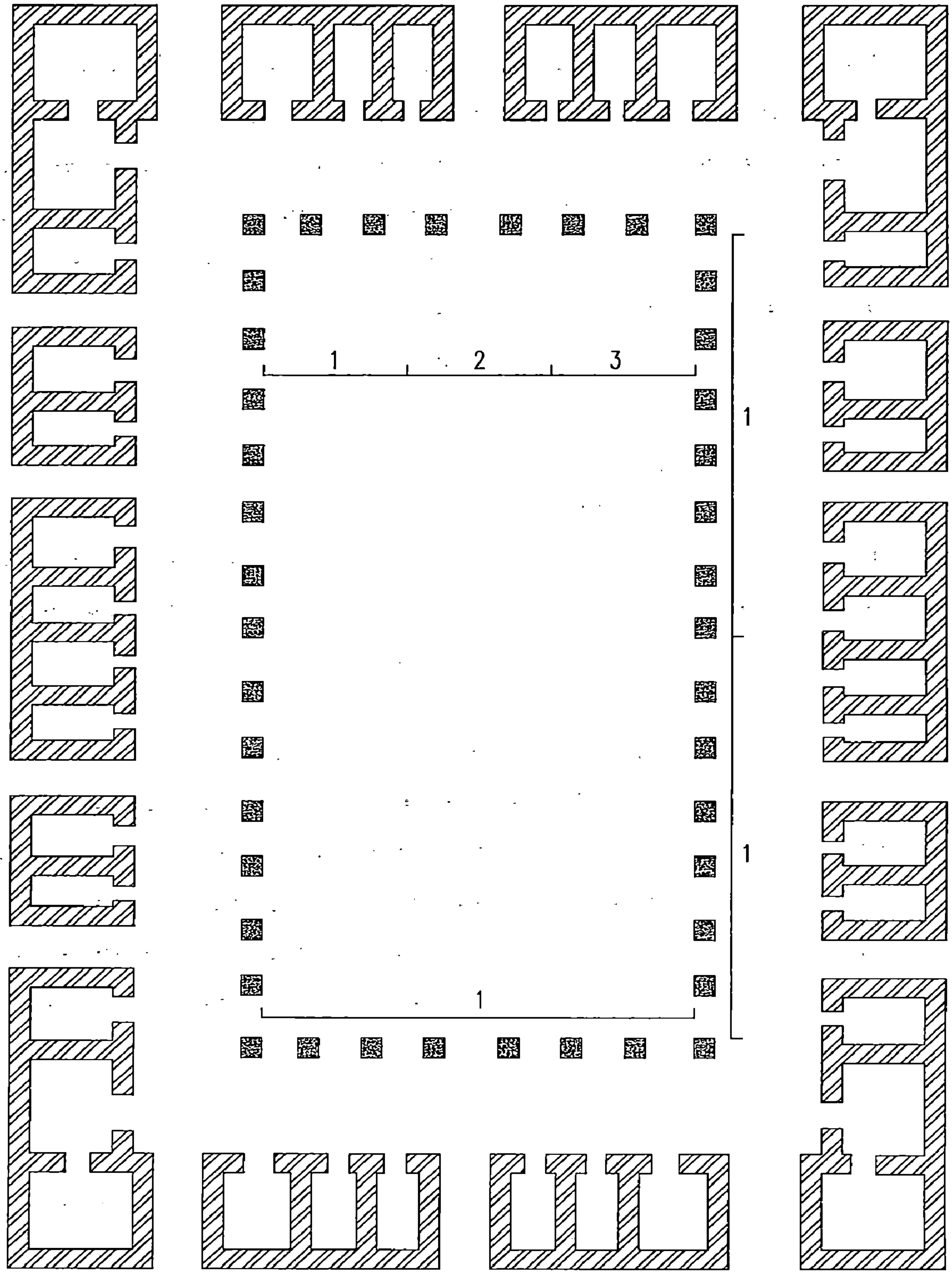
"Nowadays we prefer to make the area of the forum a double square; the portico and other surrounding buildings must have dimensions that relate strictly to those of the open space, so that it appears neither too extensive and the surrounding buildings too low, nor too confined if hemmed in by the buildings stacked up all around. The ideal roof height would be between one third and a minimum of two sevenths the width of the forum. I would give the portico a base one fifth its width high; the depth should equal the height of the columns. The lineaments of the colonnading should follow those of the basilica, although here the combination of cornices, fasciae, and beam should take up one fifth the height of the column. But if you want a second row of columns above the first, their diameter and height should be reduced by a quarter, and below them should run a socle, like a base, its height half that of the base below.

But the greatest ornament to the forum or crossroad would be to have an arch at the mouth of each road. For the arch is a gate that is continually open" (*'De Re Aedificatoria',* Book VIII, Chapter VI).

Interpretation:

For length to width ratio for forum, Alberti prescribes 2:1. If roof were to sit on wall height equal to width, Alberti prescribes one third the width as height of roof of forum; which could be interpreted as 4:3. For minimum of such roof height he prescribes two seventh the width which could be inferred as 9:7. Refer figure 2.7.14

Figure 2.7.14 Forum Proportion As Per Alberti



portico ratio 2:1

Redrawn From Source, Alberti; Leon Battista., De Re Aedifictoria, Page: 264

2.8.16 ON TAKING LIBERTIES FROM RULES FOR BETTERMENT OF ARCHITECTURE

"Since the parts of a building differ greatly one from another, in their nature as well as in their appearance, I feel that we must next examine all these matters which we have mentioned earlier but left until now. With certain parts, it hardly matters whether you make them round or quadrangular, provided they serve their purpose properly; yet their size and position are of great importance."
(*'De Re Aedificatoria'*, Book IX, Chapter III).

Interpretation:
Alberti aptly suggests the premise of requirements and life style of client to determine and preside on geometry of house plan to be generated. This seems relevant in today's context and could be taken as underlying guiding force of planning and analysis of contemporary test applications in chapter six

Alberti seems not so strict at following the rules by writing ***"Indeed, sometimes it may be more delightful to stray a little from the dignity and calculated rule of lineaments, which would not be permitted in public works." "In doing this, the artist must, as far as he is able, guard each part in its noble form by skillfully maintaining the lines and angles, as if he would not wish to cheat the work of the appropriate concinnitas"*** (*'De Re Aedificatoria'*, Book IX, Chapter I).

Interpretation:
Alberti mentions about taking liberties for betterment of architecture which Palladio seems to have explored (as explained in chapter four) with mathematical rational at deriving nonstandard ratios that fall beyond the palate of his seven room ratios and yet observed being implemented in his plates of villa plans in book 2.

2.8.17 SUMMARY OF ALBERTI'S THEORY

Alberti mentions Pythagoras, Plato and Vitruvius often in *''De Re Aedificatoria'* thus setting the lineage of theory proportions. He also writes about liberty of deviation from rules which Palladio seems to have explored in his practice.

Alberti is responsible for bringing musical theory and architectural proportion together. He discusses musical ratios under the heading of finitio, one of the three elements of concinnitas, and mentions that they are derived from the first four numbers. Alberti thus uses the first four numbers of 1, 2, 3 and 4 which he calls the musical numbers. He comments that the relations can be applied to the dimensions of length, width, and height of rooms. Further, he uses combinations of 4 : 3 (the perfect fourth) and 3 : 2 (the perfect fifth) to generate the three classes of areas (or room shapes). Alberti implies following nine main ratios 1:1, 2:1, 3:1, 3:2, 9:4, 8:3, 4:3, 16:9 and 4:1.

He distinguishes the use of even and odd numbers in architecture, for instance he says the columns should be even in number and the openings should be odd in number. He discusses the four odd numbers of 3, 5, 7, 9 and the four even numbers of 4, 6, 8, 10 excluding the 1 (monad) in the odd number set and the 2 (dyad) in the even number set. He limits the use of numbers 9 in the odd number set and number 10 in even number set. Alberti also derives the irrationals root2 and root3 from the square, cube, and equilateral triangle. He develops a geometrical approach involving magnitudes derived from the cube. Some examples in Palladio's work based on such irrational numbers are indicated in analysis that shows interrelation of theory and practice.

CHAPTER THREE: PALLADIO'S THEORY OF PROPORTIONS

This chapter deals with Palladio's theory of proportions with its interpretation and derivation.

3.1 SOURCE OF STUDY

Palladio, a Renaissance architect wrote a comprehensive treatise on architecture, *'I Quattro Libri Dell' Architecttura' in* 1570 A.D., which is translated into English as 'The Four Books of Architecture'. The first book outlines the preparations, foundation and materials necessary before building can commence and then describes five orders of architecture and its columns. He concludes this book with an account of different room types and the main parts of a building. Book two characterizes complete dwellings with Greek, Roman and his own designs for villas. It has his drawings with plans, elevation and some details. Book three deals with public works, squares, roads, bridges and basilicas which is illustrated by Palladio through 'examples of ancient' and his own projects. Book four deals with ancient sacred architecture (temples of Rome) along with description of Bramante's Tempietto.

This study subscribes to translation by Robert Tavernor and Richard Schofield for its clarity on commentary from books one, three and four and Adolf K. Placzek's translation for its plates from book two.

3.2 HISTORICAL CONTEXT WITHIN WHICH PALLADIO'S THEORY DEVELOPED

Andrea di Pietro Della Gondola, known to history as 'Palladio' was an Italian architect 91508-1580 A.D.). He belonged to Renaissance era which was considered as the age of revival and revolution in history of architecture. Alberti was the first Renaissance architect to write an architectural treatise, Palladio was born almost a century after Alberti. If one summarizes the prevalent philosophy in architecture at that time, one can say that 'Renaissance architects imbibed the learnings from their ancestors and strived to evolve their own interpretation, thereby enriching the concepts of proportions and subsequently their architecture.' They were convinced that underlying every creation of God, be it Universe, nature or music there was a structure which was harmonic in nature and which could be explained through mathematics. To achieve 'concinnitas' was to follow nature and its harmonic relationships. And architecture strived to achieve 'concinnitas' through use of proportions which were absolutely essential in creating 'perfect' building. Renaissance architects adhered to the Pythagorean concept, "All is number" and Platonic concept of 'harmonic structure of Universe'. Palladio stressed the importance of Alberti's treatise and he considered Vitruvius as his master and guide as written in foreword of his first book; Palladio states ***"Since always held the opinion that the ancient Romans, as in many other things, had also greatly surpassed all those who came after them in building well; I elected as my master and guide Vitruvius, who is the only ancient writer on this art"*** (*'I Quattro Libri Dell' Architecttura'*, Book I, Forward)

3.3 OVERVIEW OF THEORIES DEVELOPED BY PALLADIO

Vitruvius looked back to architectural achievements of the Greeks and early Roman; while Alberti having studied the past put forward a theory which could be used in future buildings. Palladio picked up from there, studied it, refined it and used it in practice. Many of Palladio's views stem directly from Vitruvius and Alberti's theory (more particularly about temple planning) but Palladio goes on to explain it more explicitly with help of scaled and dimensioned drawings of both, buildings of ancients and of his own practice; thereby avoiding lengthy description.

As Padovan states (pg 233) ***"Palladio's theory of proportion must be gleamed from dimensioned plans in his 'Four books on Architecture' rather than from the very brief text. The text furnishes only two relevant pieces of information".*** As rightly pointed out by Padovan, Palladio's two main theories can be summarized as under:

1) Proportions prescribed for seven types of rooms (i.e. seven room ratios).
2) Principles of room height using three different 'means'.

To this one can add

3) Proportions in doors and windows

Palladio used his ratios (i.e. seven room ratios) along with a matrix of complex ratios in planning of his buildings. However what separates Palladio from his predecessors is the use of harmonic ratios ('musical ratios', i.e. ratios with musical analogy) in not only one single room (like main rooms of atrium or dining as observed in Alberti's theory) but also in the relation of all the rooms to each other such that the part corresponds to the whole. Palladio adhered to this view (part to whole) not only in planning of churches and public buildings but also in domestic buildings (i.e. villa plans). Palladio writes ***"But the large rooms ought to be so related (compartite) to the middle ones and these to the small, that as I have said elsewhere, one part of the building may correspond with other, so that the whole body of the edifice may have in itself a certain harmony (convenieza) of numbers which may make it entirely beautiful and graceful."*** (*'I Quattro Libri Dell' Architecttura'*, Book II, Chapter II).

Besides these aspects of proportioning system mentioned above, Palladio gives an account of proportions in sacred buildings (i.e. temples), public buildings (Basilica and Forum) and describes column proportions in five orders of architecture namely Doric, Ionic, Corinthian, Tuscan and Composite.

Palladio's theory for these buildings (i.e. temples, Basilica and orders in column) is more of a reflection of past, similar to that of his predecessors while his proportioning system for room ratio and derivation of height were extensively applied (and demonstrated with drawings) to dwelling units (villa plans) which would be studied in next chapter (i.e. analysis of villa plans). To correlate with the theories of predecessors and for easy reference of his own theory; while analyzing plates, the study will first record the proportions in temple and other buildings and then deal with Palladio's main theory to generate continuous flow of information between his theories explained and plans studied and analyzed theoretically.

The study of Palladio's theory of proportions would be as follows:

1) Palladio's concept of beauty
2) Proportions in temple
3) Proportions in Basilica and Forum
4) Palladio's seven room ratios
5) Derivation of room height - study of 'means'
6) Proportions in openings

3.4 PALLADIO'S CONCEPT OF BEAUTY

Palladio; like Vitruvius considered 'beauty' one of three things besides usefulness (convenience) and durability, as an important aspect of building ***"without which none deserve credit".*** (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter I)

"for one could not describe as perfect a building which was useful, but only briefly, or one which was inconvenient for a long time, or being both durable and useful, was not beautiful." (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter I).

"Beauty will derive from a graceful shape and the relationship of the parts among themselves and to the whole because building must appear to be like complete and well-defined bodies, of which one member matches another and all the members are necessary for what is required" (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter I).

The way to seek God was through making of 'perfect building', was axiom of Renaissance architecture and as Palladio states to achieve it, the relation of parts to whole and whole to part was a prerequisite. Palladio adhered to this demand in design of not just churches but also in domestic buildings for which it could be said that Palladio first took the decisive step. While proportions were used to derive two dimensions of façade (as in ancient architecture and use of 'orders') and three dimension of a single room by other architects, Palladio employed them to integrate a whole structure. As Wittkower states (pg 130) ***"The systematic linking of one room to the other by harmonic proportions was the fundamental novelty of Palladio's architecture".***

Palladio, like Vitruvius, also considered human body being 'perfect'; each member co-ordinates with the other. He, through example of human body, believes that each part should be absolutely essential and relevant in making of whole, thereby agreeing with Alberti on using elements which are essentially such that nothing could be added or removed without disturbing the balance of the whole.

3.5 PROPORTIONS IN TEMPLE

Palladio like his predecessors believed that temple was the most important building which required maximum care in planning and execution as they were abodes of God. He writes ***"If possible they must be built so perfectly that one cannot imagine anything more beautiful and so arranged in every part that those who enter them will be astonished and stand there with their spirits raised when contemplating their grace and beauty"*** (*'I Quattro Libri Dell' Architecttura'*, Book IV, Chapter II).

The study of temple proportion would be dealt as under

1) Temple shapes and round (Ritondo) as most preferred form
2) Proportions of column (five orders) and their intercolumniation
3) Temple forms and number of columns
4) Planning of temples and their proportions

3.5.1 TEMPLE SHAPES AND ROUND (RITONDO) AS MOST PREFERRED FORM

Palladio cites that the ancients built temples with specific form and style (i.e. round, quadrangular etc.) for specific deities. For example for Vesta (Goddess of Earth, the Sun and Moon) ancients built round temples and for Jupiter (patron of air and heaven) they built temples that were unroofed in the middle with portico around them. Palladio narrates the different shapes adopted in temple planning as under ***"Temples are made round [ritondo], quadrangular [quadrangulare], and with six, eight, or more angles—all of which have the characteristics of the circle—cross-shaped, and of many other shapes and plans depending on the endless inventiveness of man; whenever they are built with elegant and ornate architecture which is distinguished by beautiful and appropriate proportions, they deserve great praise. But round [ritondo] and quadrangular [quadrangulare] ones are the most beautiful and regular forms, and are those from which the others derive their dimensions".*** (*'I Quattro Libri Dell' Architecttura'*, Book IV, Chapter II).

Interpretation:

Palladio strongly advocates round form stating it as 'singularly appropriate for temples'. Plato attributes sphere to cosmic relevance with Universe in that shape. Vitruvius used square and circle to circumscribe 'Vitruvian man'. Alberti also mentioned circle as most prevalent form in nature. However Palladio empathetically specifies round form for temples and used it in his practice. Circle also finds place in Palladio's most graceful room ratios.

3.5.2 PROPORTIONS OF COLUMN (FIVE ORDERS) AND THEIR INTERCOLUMNIATION

Palladio cites column proportion of five orders namely Tuscan, Doric, ionic, Corinthian and Composite. He also proposes their intercolumniation. Palladio cites Vitruvius's method of using thickness of column as 'module' and proposes to use the same himself. He states; "***I did not want to use any fixed and predetermined unit of measurement, that is, one belonging to a particular city, such as the braccio, foot [piede], or palm [palmo], since I am aware that units of measurement differ just as cities and regions do: but, imitating Vitruvius, who divides up the Doric order with a unit of measurement derived from the thickness [grossezza] of the column, which is universally applicable and called by him a module, I too will make use of such a unit for all the***

orders; the module will be the diameter of the column at the bottom divided into sixty minutes, except for the Doric, for which the module will be half the diameter of the column divided into thirty minutes, because that is more appropriate for the elements [compartimento] of this order. Consequently, by making the module larger or smaller depending on the type of building, anyone will be able to use the proportions and profiles [sacoma] appropriate to each order drawn in these books." (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XIII).

For column height and intercolumniation; Palladio states "***The intercolumniations [intercolunno], that is, the spaces [spazio] between the columns, may be made a diameter [diametro] and a half of the column, taking the diameter from the lowest part of the column; or two, two and a quarter, three diameters, and also greater; but the ancients did not use intercolumniations greater than three column diameters—except for the Tuscan order, which, having a wooden architrave, was made with much larger intercolumniations—nor less than a diameter and a half; they used this interval particularly when they built very large columns. But the intercolumniations they approved of more than any other were those which were two and a quarter column diameters, and this they described as a beautiful and elegant form of intercolumniation. And one must take note that there should be a proportional relationship between the intercolumniation, that is, the spaces, and the columns, because if one puts slender columns in wider spaces they will appear to be much smaller since there will be a lot of space in the voids that will lessen their thickness considerably; if, on the contrary, thick columns are put in narrow spaces, the narrowness and tightness of the interval will make the columns look swollen and graceless. So, if the spaces exceed three diameters, the columns should be made a seventh of their height in thickness, as I have pointed out below in connection with the Tuscan order. But if the spaces are three diameters, the columns will be seven***

and a half heads [testa] or eight, as in the Doric; and if two and a quarter, the columns will be nine heads long, as in Ionic; and if two, make the columns nine and a half heads long, as in Corinthian; and finally, if they are one and a half diameters [diametro], the columns will be ten heads [testa] long, as in the Composite. I have taken great pains over these orders so that they might provide models for all the types of intercolumniation which Vitruvius taught us about in the chapter cited above. Columns must always be even in number on the facades [fronte] of buildings, so as to have an intercolumniation in the middle which will be larger than the others". (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XIII)

Interpretation:

With diameter of column as 'module' Palladio proposes intercolumniation which corresponds to Vitruvius's classification of temple elevations based on intercolumniation and can be interpreted as:

1) One and a half (1 ½): Pycnostyle
2) Two (2): Sistyle
3) Two and quarter (2.25): Eustyle
4) Three (3): Diastyle
5) Greater (4): Araeostyle

Though Palladio does not mention the styles of intercolumniation here, he does mention it while stating individual 'order' in his book. However he does not mention Areostyle while discussing Tuscan order.

An intercolumniation with two and quarter finds special mention, which is 'Eustyle' as classified by Vitruvius who also praised it for its beauty and elegance.

Vitruvius classified temple elevation based on intercolumniation to derive at the above mentioned styles. Taking it further, Palladio prescribed order and column height to correspond to its intercolumniation so that there was proportional relationship between column and its corresponding intercolumniations. This could be interpreted as follows:

Table 3.1 Coordination of intercolumniation, style and order of architecture with column height

	Intercolumniation	Name of Style	Name of order	Height of column in Modules/ head
1	Space greater than three diameter (4)	Araeostyle	Tuscan	7
2	Three diameter (3)	Diastyle	Doric	7 ½ to 8
3	Two and quarter (2.25)	Eustyle	Ionic	9
4	Two (2)	Sistyle	Corinthian	9 ½
5	One and a half (1 ½)	Pycnostyle	Composite	10

Refer figure number 3.1 to 3.6

Figure 3.1 Proportions Of Tuscan Column And Its Intercolumniation As Cited By Palladio

- height Of Tuscan Column Was 7 Times Its Diameter Of Column At Its Base
- intercolumniaion Of Tuscan Order Was More Than Three Times Diameter Of column At Its Base

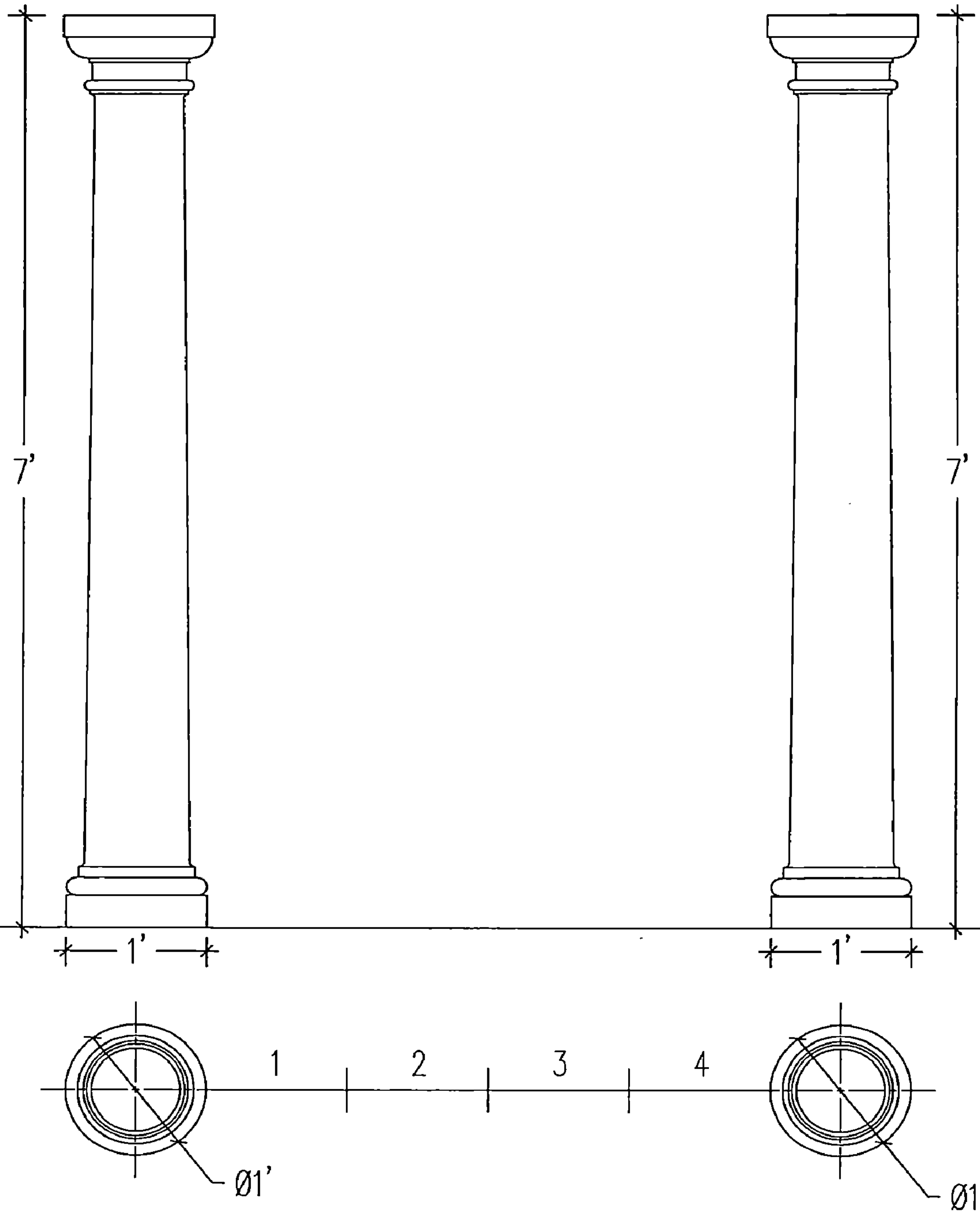


Figure 3.2 Proportions Of Doric Column And Its Intercolumniation As Cited By Palladio

- height Of Doric Column Was $7\frac{1}{2}$ Times Its Diameter Of Column At Its Base
- intercolumniaion Of Tuscan Order Was More Than Three Times Diameter Of column At Its Base

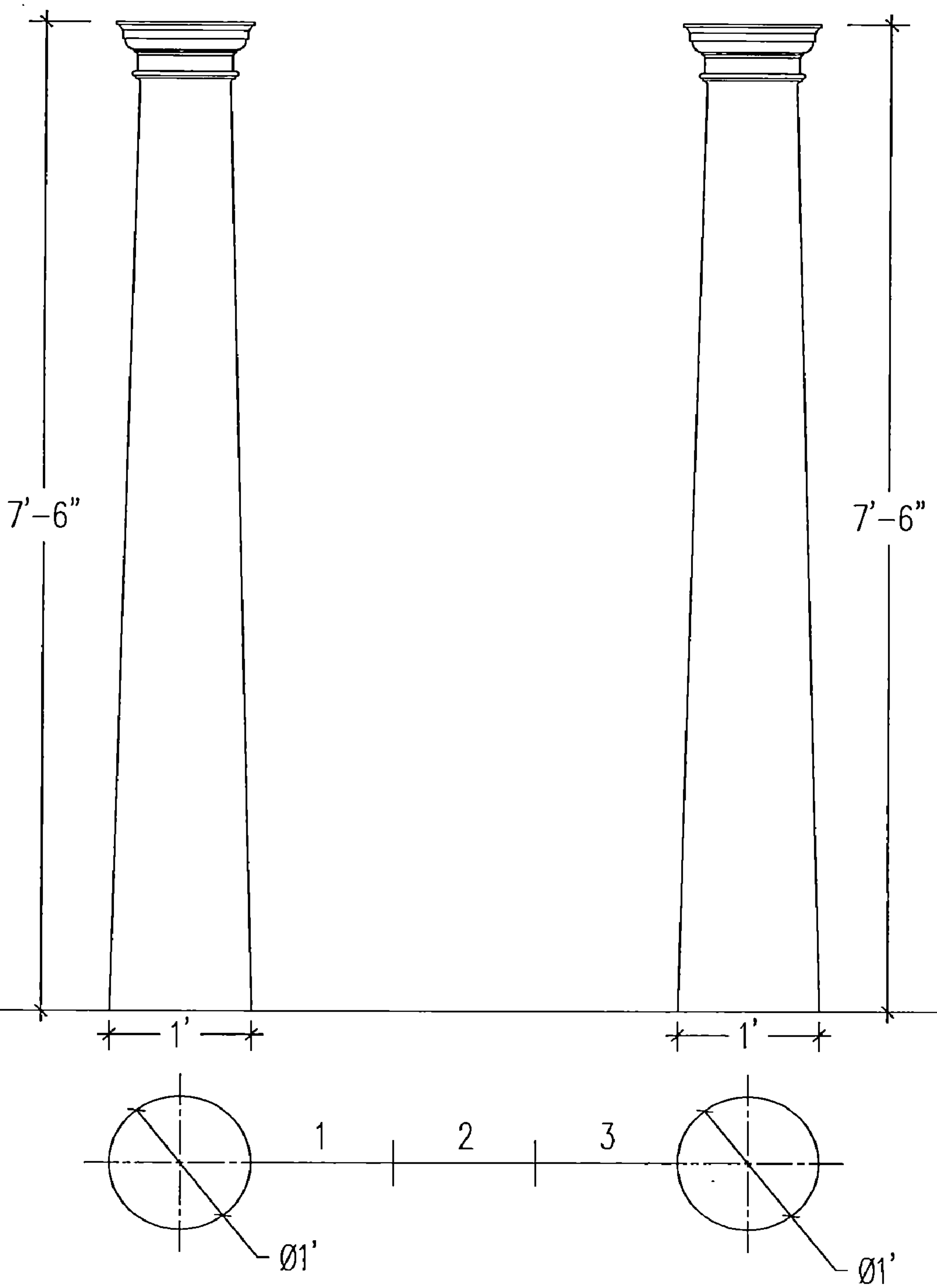


Figure 3.3 Proportions Of Ionic Column And Its Intercolumniation As Cited By Palladio

- height Of Ionic Column Was 9 Times Its Diameter Of Column At Its Base
- intercolumniaion Of Tuscan Order Was More Than Three Times Diameter Of column At Its Base

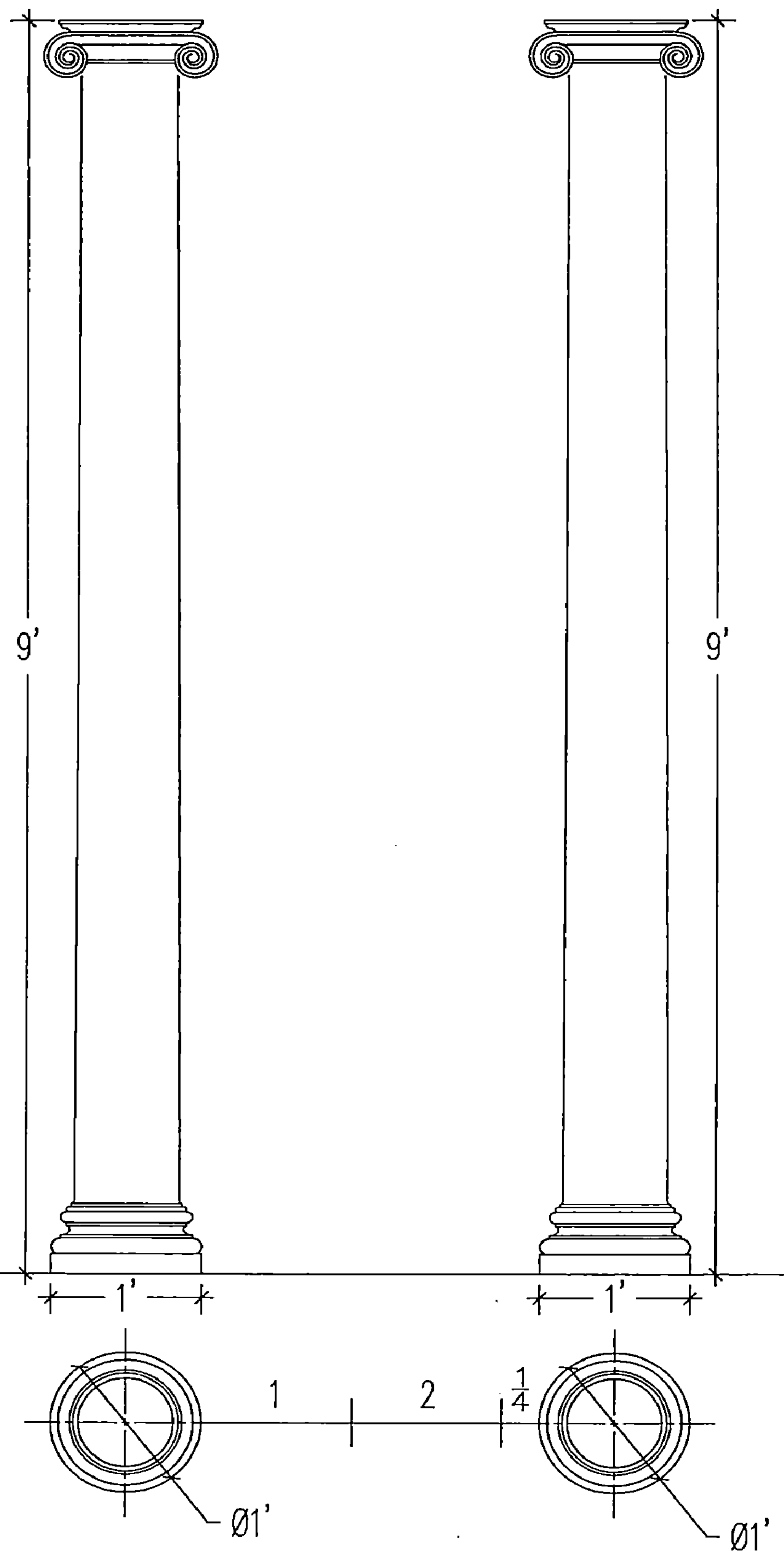


Figure 3.4 Proportions Of Corinthian Column And Its Intercolumniation As Cited By Palladio

- height Of Corinthian Column Was $9\frac{1}{2}$ Times Its Diameter Of Column At Its Base
- intercolumniaion Of Tuscan Order Was More Than Three Times Diameter Of column At Its Base

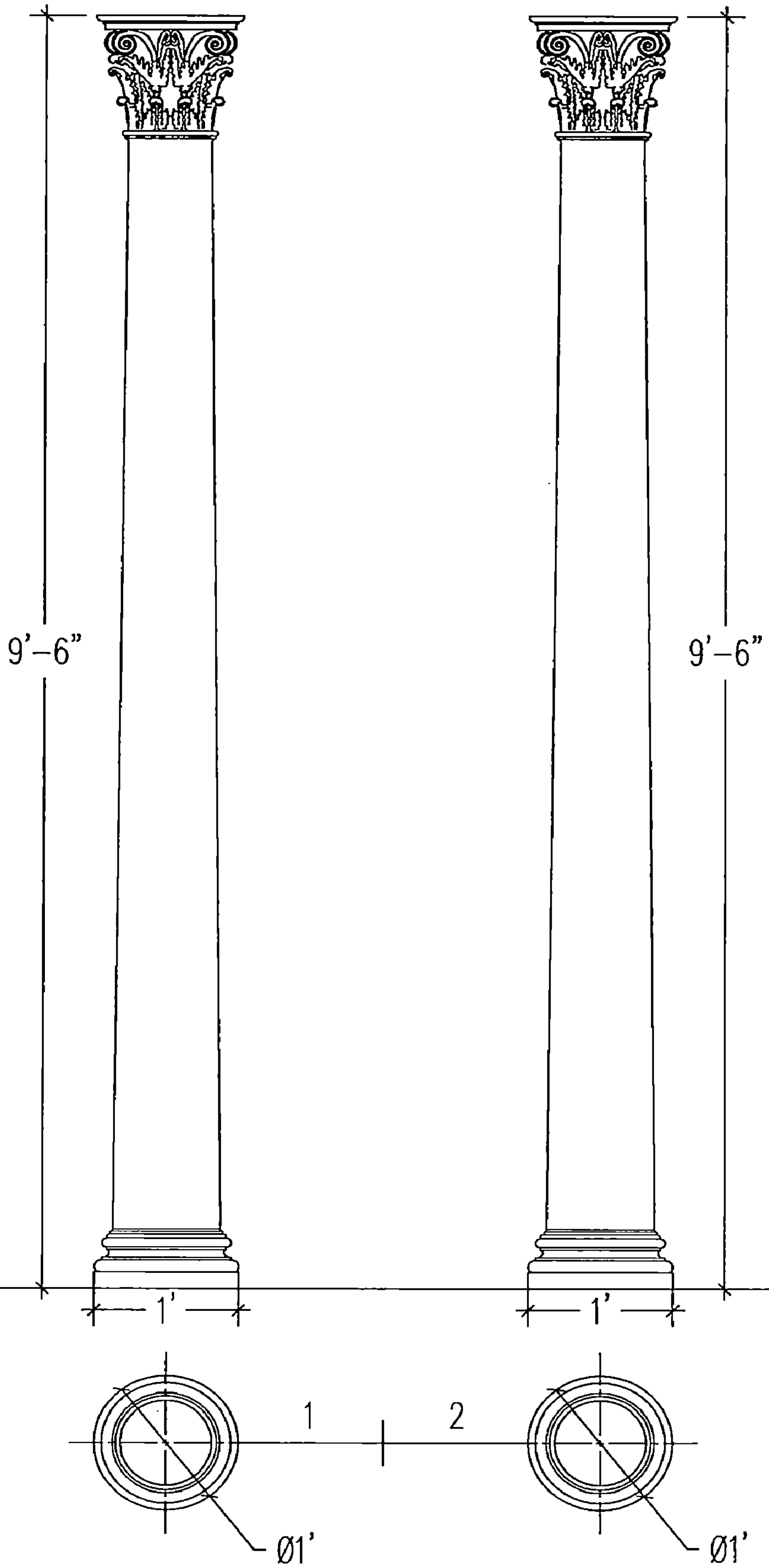


Figure 3.5 Proportions Of Composite Column And Its Intercolumniation As Cited By Palladio

- height Of Composite Column Was $9\frac{1}{2}$ Times Its Diameter Of Column At Its Base
- intercolumniaion Of Tuscan Order Was More Than Three Times Diameter Of column At Its Base

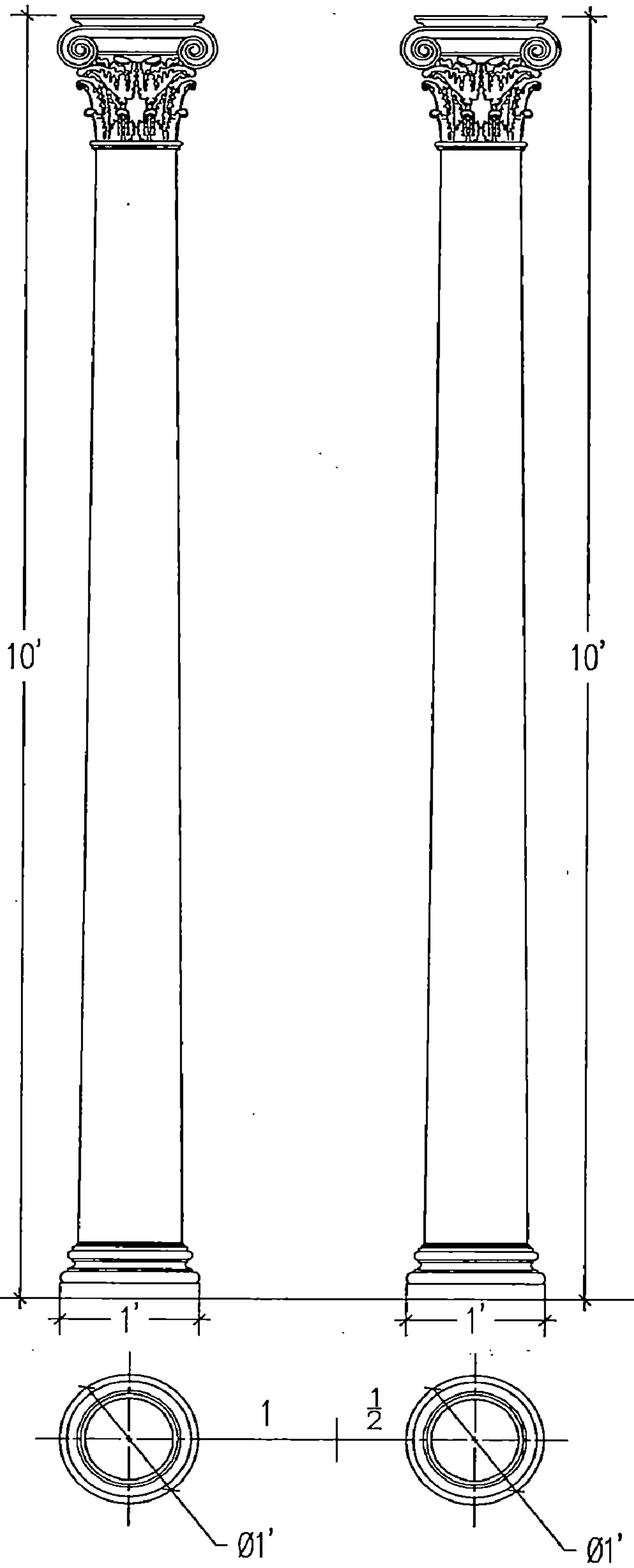
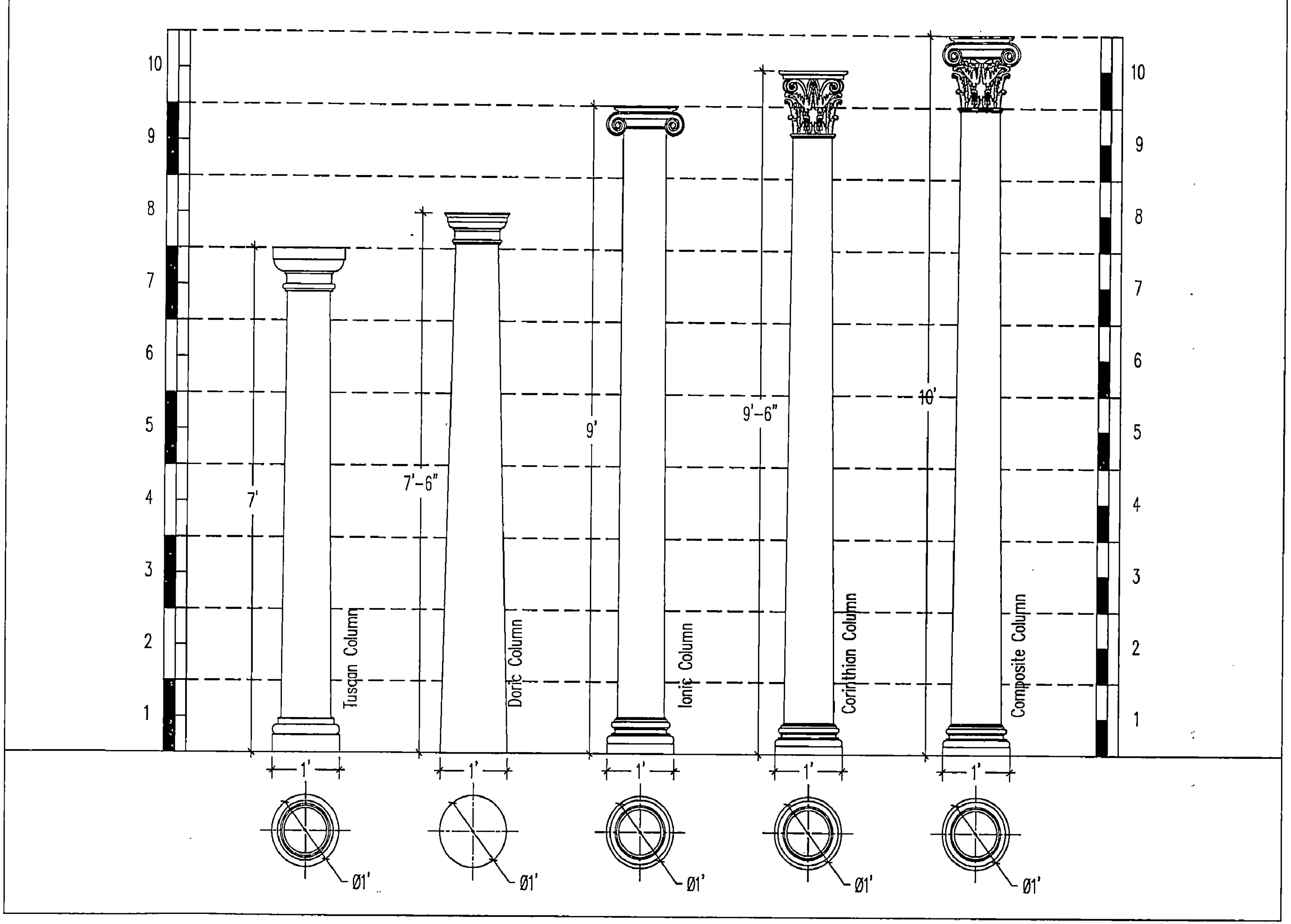


Figure 3.6 Comparitive Overview Of Column Proportions As Cited By Palladio



3.5.3 TEMPLE FORMS AND NUMBER OF COLUMNS

What Vitruvius classified as 'temple forms' was termed as 'appearance of temples' by Palladio. Palladio uses the same terms in classification of ancients temples as Vitruvius; ***"so that those who apply themselves to reading Vitruvius, which I expect everyone to do, will recognize the same terms and will not feel that they are reading something else"*** (*'I Quattro Libri Dell' Architecttura'*, Book IV, Chapter III).

Palladio describes the seven appearances of temples 'that are most regular and easily recognized' as follows: ***"Temples are built with or without porticoes [portico]. Those without porticoes can be built with three appearances; one is called*** in antis, ***that is, having a facade [faccia] with pilasters, because the pilasters that are built at the angles or corners [angolo, cantone] of the buildings are termed*** ante; ***of the other two, one is called prostyle, that is, having a facade with columns, and the other, amphiprostyle. That called*** in antis ***will have two pilasters at the corners, which also run down [voltare] the sides of the temple, and between these pilasters, in the middle of the front, two columns that project outward and support the tympanum [frontespicio] which will be above the entrance. The other, called prostyle, will have more columns than the first type matching the pilasters at the corners, and will have two other columns at right and left where the corner turns, that is, one per side. But if the same arrangement of columns and tympanum is made at the back, the appearance will be what is called amphiprostyle. There is no trace left today of the first two appearances of temples, and indeed in this book there will be no examples. Nor did I think it necessary to make designs of them since the plan and elevation of each of these appearances is illustrated in the edition of Vitruvius commented upon by Monsignor the Most Reverend Barbaro.***

But if porticoes are built for temples, then they should be built either all round the temple or only at the front [fronte]. One can also describe those that have porticoes only on the facade [facciata] as prostyle in appearance. But those that are built with porticoes all round can be constructed with four appearances. They can be built with six columns on the main facade [facciata] and at the back, and with eleven columns down the sides counting those at the corners; and this appearance is called peripteral, that is, with corridors all round [alato a torno]; the porticoes go around the cella and are an intercolumniation wide. One sees ancient temples that have six columns on the facade [facciata] but do not have porticoes around them, but on the exterior walls on the cella there are half-columns that correspond to those of the colonnade at the front and have the same ornaments, as at Nimes in Provence; one could say that the Ionic temple which is now the church of S. Maria Egiziaca is of this sort; architects built this way to make the cella larger and to save money, since the peripteral appearance of the temple stayed the same for one who viewed its side. Or one can place eight columns on the fronts [fronte] and fifteen down the sides, including the corner ones; these will have double porticoes around them and so their appearance is that called dipteral, in that it has two corridors [alato doppio]; or it is a good idea to build temples that, like the previous one, have eight columns on the fronts and fifteen down the sides; but the porticoes around them are not made double because one row of columns is removed so that the porticoes end up two intercolumniations and one column diameter wide; their appearance is called pseudodipteral, that is, with a false double corridor [falso alato doppio]. This appearance was invented by Hermogenes, an architect from very long ago, who built large and convenient porticoes of this sort around temples, reducing the labor and expense but without detracting from the appearance. Or, finally, they made both facades with ten columns and double porticoes around them, as in those that are dipteral in appearance. Inside, these temples had other porticoes with two

rows [ordine] of columns, one above the other, and these columns were smaller than those outside; the roof extended from the columns outside to those inside, and the space entirely surrounded by columns inside was unroofed; so that the appearance of these temples was known as hypaethral, that is, unroofed." (*'I Quattro Libri Dell' Architecttura'*, Book IV, Chapter III).

Interpretation:

The appearances of temples that Palladio described had similar description and same number of columns in front, back and sides as proposed by Vitruvius which are as under. However Palladio classified these temples into two types i.e. with or without porticos.

Temples with porticos:

1) Peripteral (number of columns 6*11)
2) Dipteral (number of columns 8*15*2 rows)
3) Pseudodipteral (number of columns 8*15)
4) Hypaethral (number of columns 10*15)

Temples without porticos:

5) Antis (number of columns 2)
6) Prostyle (number of columns 4)
7) Amphiprostyle (number of columns 4 in front and back)

3.5.4 PLANNING OF TEMPLES AND THEIR PROPORTIONS

3.5.4.1 Round temples:

Palladio describes proportions in planning of round and quadrangular forms and narrates as under:

For circular temple:

"In antiquity circular temples were sometimes built open, that is, without a cella, with columns supporting the cupola like those they dedicated to

Juno Lacinia, in the middle of which was placed the altar and on that the eternal flame. These temples are arranged as follows: the diameter of the whole space that the temple is to occupy is divided into three equal parts; one is allocated to the steps, that is the ascent to the floor [piano] of the temple, and two are left for the temple and the columns, which are placed on pedestals and, including the bases and capitals, are equal in height to the inner diameter of the circle of steps and are one-tenth their own height in width. But those that are built closed, that is, with a cella, are built either with corridors [ala] around them or with a portico at the front only. The characteristics [ragione] of those that have corridors around them are as follows; first, two steps are built around them and the pedestals are placed on the steps, above which come the columns; the corridors are one-fifth the diameter of the temple in breadth, taking their diameter from the central axis of the pedestals; the columns are as long as the diameter of the cella and are one-tenth their length in width; the dome or cupola [tribuna, cupola] is built above the architrave, frieze, and cornice of the corridors and is half the height of the whole building." (*'I Quattro Libri Dell' Architecttura'*, Book IV, Chapter V).

Interpretation:

Palladio mentions two types of circular temples i.e. one without Cella and one with Cella.

For round temple without Cella; Palladio proposes ratio of 3:1 for whole area to steps and 3:2 for whole area to column area. Palladio prescribes column height for such temples as $1/8^{th}$ of inner diameter of temple and column width to be $1/8^{th}$ of such derived height from inner diameter of temple plan. For example if inner diameter of temple plan was 64 units, the height of column would be $1/8^{th}$ of this diameter i.e. 1/8 * 64 = 8 units. To derive at column diameter this derived height of column height would be again divided into eight parts i.e. 1/8 * 8 = 1 units.

For round temples with Cella; Palladio uses proportions of corridor as 1/5th of diameter of temple. Palladio prescribes ½, 1/3rd, 1/5th, 1/8th and 1/10th part divisions for proportions in circular temples.

3.5.4.2 Quadrangular temples:

For rectangular temples Palladio narrates:

"With rectangular temples [quadrangulare], the porticoes at the fronts should be as long as the width of such temples, and if they are eustyle in type, which is beautiful and elegant, they should be organized like this. If the appearance is to be made of four columns, the whole facade [facciata] of the temple should be divided (not counting the projections of the bases of the columns which will be at the corners) into eleven and a half parts, and one of these parts will be called a module, that is, the measurement with which all the other parts will be measured; by making the four columns one module thick, they will comprise four modules, the intercolumniation in the middle three, and the other two intercolumniations four and a half modules, that is, two and a quarter apiece.' If the facade has six columns, it will be divided into eighteen modules; if eight, into twenty-four and a half; and if ten, into thirty-one, always allocating from these parts one module for the thickness of the columns, three for the space [vano] in the middle, and two and a quarter for each of the other spaces. The height of the columns will be set depending on whether they are to be Ionic or Corinthian. Beyond the portico is to be found the porch [antitempio] and then the cella; the breadth is divided into four parts and the length of the temple is established using eight of these, of which five are allocated to the length of the cella including the walls in which the doors are, and the other three remain for the porch, which has two spur walls [ala] continuing on to the walls of the cella at its sides, at the ends of which two antae [an to J are built, that is, two pilasters which are as broad as the columns of the portico". (*'I Quattro Libri Dell' Architecttura'*, Book IV, Chapter V).

Interpretation:

For rectangular temples; Palladio begins by prescribing 1:1 ratio for length and width of portico. Again praising Eustyle; he writes about intercolumniation for temples with four to ten columns in front. He prescribes to divide the front width of temple into 11 ½ parts for 4 column front elevation, divide it in 18 parts for front with 6 columns, 24 ½ parts for 8 columns and 31 parts for 10 column front. Each such derived division is considered a module for proportion for that temple. Each column is one module thick. Central intercolumniation gets 3 such modules; while rest all intercolumniation gets 2 ¼ module each.

Thus having written about the intercolumniations, Palladio then writes about proportions of temple. He divides temple length in 8 equal parts and width in 4 equal parts; making overall temple plan 2:1. Of these 8 parts; he gives 5 parts to cella; making cella plan 5:4. Palladio allots rest of 3 parts of length (out of 8 parts) to porch; making porch plan 4:3.

3.6 PROPORTIONS IN BASILICA AND FORUM

In the study of Vitruvius and Alberti's theory, the proportions of Basilica and Forum were studied to increase the palette of ratios prescribed by them. Palladio discusses the change in function of Basilica as place to administer justice and important business by the ancient verses that of being multifunctional with shops for various trades and businesses, prison and other places essential for public life during his time. However Palladio does not discuss or prescribe any general proportions applicable to planning of these areas and hence are not studied.

3.7 PALLADIO'S SEVEN ROOM RATIOS

Palladio in concluding lines of Chapter XXI; titled 'On Loggias, Entrances, Halls and Rooms And Their Shapes' of book one writes ***"There are seven types of room that are the most beautiful and well proportioned and turn out better: they can be made circular [ritondo], though these are rare; or square [quadrato]; or their length will equal the diagonal of the square [quadrato]***

of the breadth; or a square [quadrato] and a third; or a square and a half; or a square and two-thirds; or two squares"

Interpretation:

Palladio proposes his own proportioning system with these ratios independent of his predecessors. It is this theory for room dimensions (length to breadth ratio) along with derivation of room heights (using 'means') which is at focus of this research.

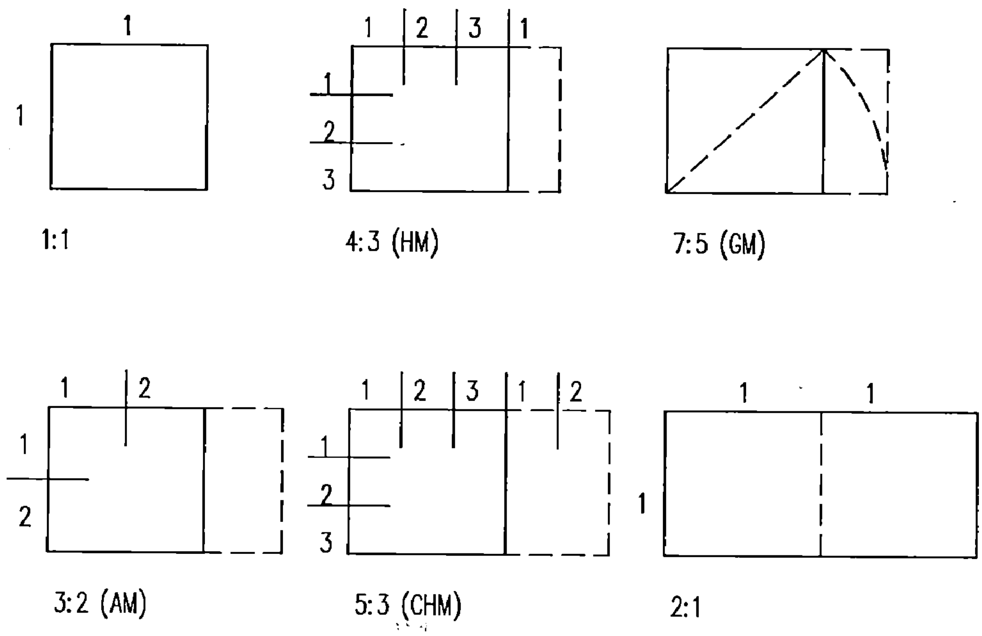
Palladio simply states the seven room ratios without giving its method of derivation. This study would analyze these ratios and look for possible interpretations to derive them.

Thus implied 'proportion', a harmonious relationship between the parts, with and within the whole which Palladio described as seven room shapes could be mathematically interpreted as:

1) Square (1:1)
2) Square and a third (4:3)
3) Square and two thirds (5:3)
4) Diagonea (7:5 or root 2)
5) Square and a half (3:2)
6) Two squares (2:1)
7) Circle

Graphically they could be understood as shown in figure 3.7, Mathematical derivation of Palladio's proportional theory.

Figure 3.7 Mathematical Derivation Of Palladio's Proportional Theory



Source: Author 1997

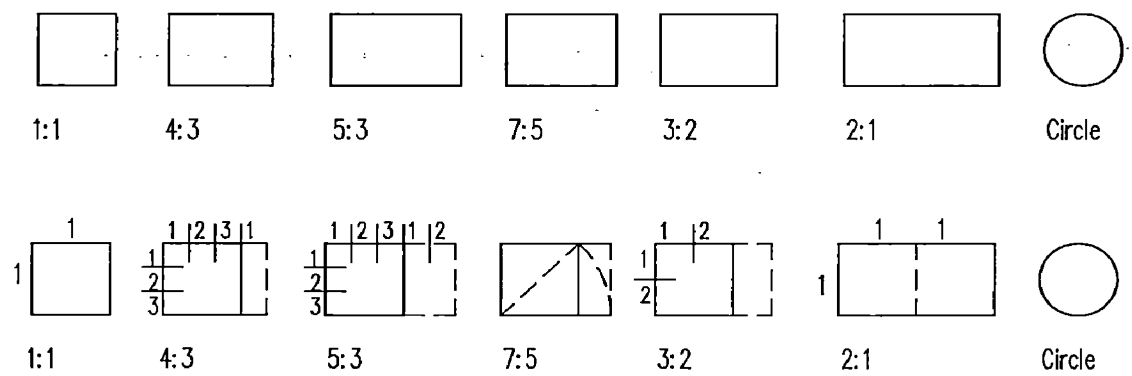
Palladio's generation of room shapes appears to have been based on Vitruvius's theory of proportion where one finds mention of root 2 (7:5), 3:2, 5:3 as three kinds of atrium shapes and a square (1:1) and a double square (2:1) as two kinds of dining room shapes. ('*De Architectura*', Book VI, Chapter III, Section VIII and Section III). And for square (1:1) and a circle as a basic and the most perfect shapes; Vitruvius in section III of chapter I of his book III, writes ***"In the members of a temple there ought to be the greatest harmony in the symmetrical relations of the different parts to the general magnitude of the whole."*** Palladio himself quotes Vitruvius on circle and square in the first paragraph of second chapter of his second book, ***"but the most beautiful, and most regular forms, and from which the others receive their measures, are the round, and the quadrangular; and therefore Vitruvius only mentions these two."*** Thus it could be inferred that out of seven ratios prescribed by Palladio; all except one (i.e. 4:3) are mentioned by Vitruvius to derive different room dimensions. When Palladio's ratios are compared to that of his predecessors; one can infer the following: Pythagoras through derivation of musical notes mentions ratios 1:1, 2:1, 3:2, 4:3 and 5:3, this leaves out two shapes (ratios); namely 7:5 and circle of Palladio's list of ratios. Plato and Palladio have three ratios namely 2:1, 3:2 and 4:3 in common while Alberti and Palladio have four ratios in common; namely 1:1, 2:1, 3:2 and 4:3.

3.8 THEORETICAL DERIVATION AND UNDERSTANDING OF PROPORTIONAL THEORY

3.8.1 ANALYTICAL UNDERSTANDING:

Other way of understanding derivation of these rectangular room shapes from a square is with use of divisions of square as the half (1/2) and the third (1/3). The square (1) is divided into two equal parts and one part (1/2) is added to the square to create a new shape that is a square and a half (1 + 1/2) which is 3/2 or 3:2. Or the square (1) is divided into three equal parts, one part (1/3) is added to the square to create a new shape that is a square and a third (1 + 1/3) which is 4/3 or 4:3. Or the square (1) is divided into three equal parts, two parts (2/3) are added to the square to create a new shape that is a square and two thirds $(1 + 2/3)$ which is $5/3$ or $5:3$. This could be graphically represented as shown in figure 3.8.

Figure 3.8 Analytical Understanding Of Palladio's Proportional Theory



3.8.2 MUSICAL ANALOGY:

Rudolph Wittkower in *'Architectural Principles in the Age of Humanism'* with his proposition states that the ratios of width to length in Palladio's rooms are based on the harmonic proportions of music. It leads to postulation that Palladian theory had underlying attribute to Pythagorean theory of sound formation with string instrument. Pythagoras (6th Century B.C.) stated that ***"the numbers by means of which the agreement of sounds affects our ears with delight are the very same which pleases our eyes and our minds"***. Rudolph Wittkower emphasizes the importance of number theory or numerology as a foundation for Palladio's proportions. Harmonic proportion provides an insight to some of Palladio's villas. Wittkower's thesis interprets these ratios with following musical analogy. [Wittkower; Rudolf, 'Architectural Principles In The Age Of Humanism', pg 117-126 and 132-140].

On the basis of professor Wittkower's thesis one can interpret these seven ratios of Palladian theory as musical consonants.

1) Square as Unison; that is (1:1)
2) Square and a third as Perfect Fourth; that is (4:3)
3) Square and two thirds as Major Sixth; that is (5:3)
4) *Diagonea* as Tritone; that is (7:5)
5) Square and a half as Perfect Fifth; that is (3:2)
6) Two squares as Octave; that is (2:1)

This musical analogy in other words is the ratio of distance between the two lengths of a string, from the point where it is held down to the fret to the either ends of the string. For example while playing note of *daitessaron* or the perfect fourth; the ratio measured this way would be 4:3 which is mathematically a square and a third.

(Refer Figure 4.2: Understanding of Palladio's Proportional Theory with Musical Analogy and Figure 4.3: Musical scale)

Figure 3.9 Understanding Of Palladio's Proportional Theory With Musical Analogy

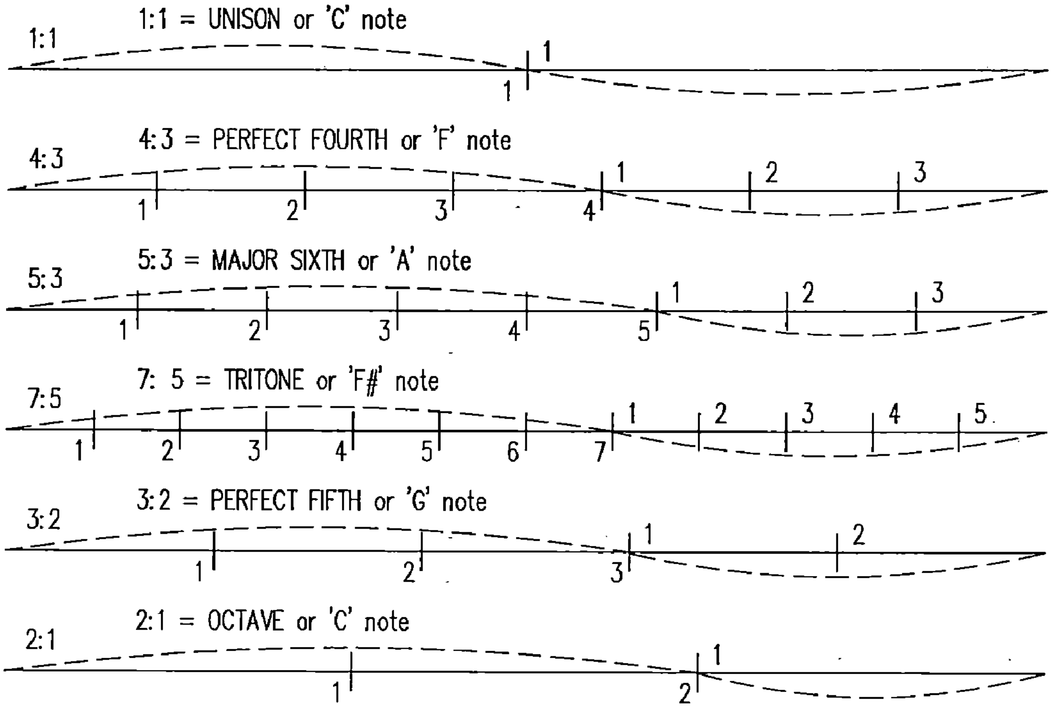
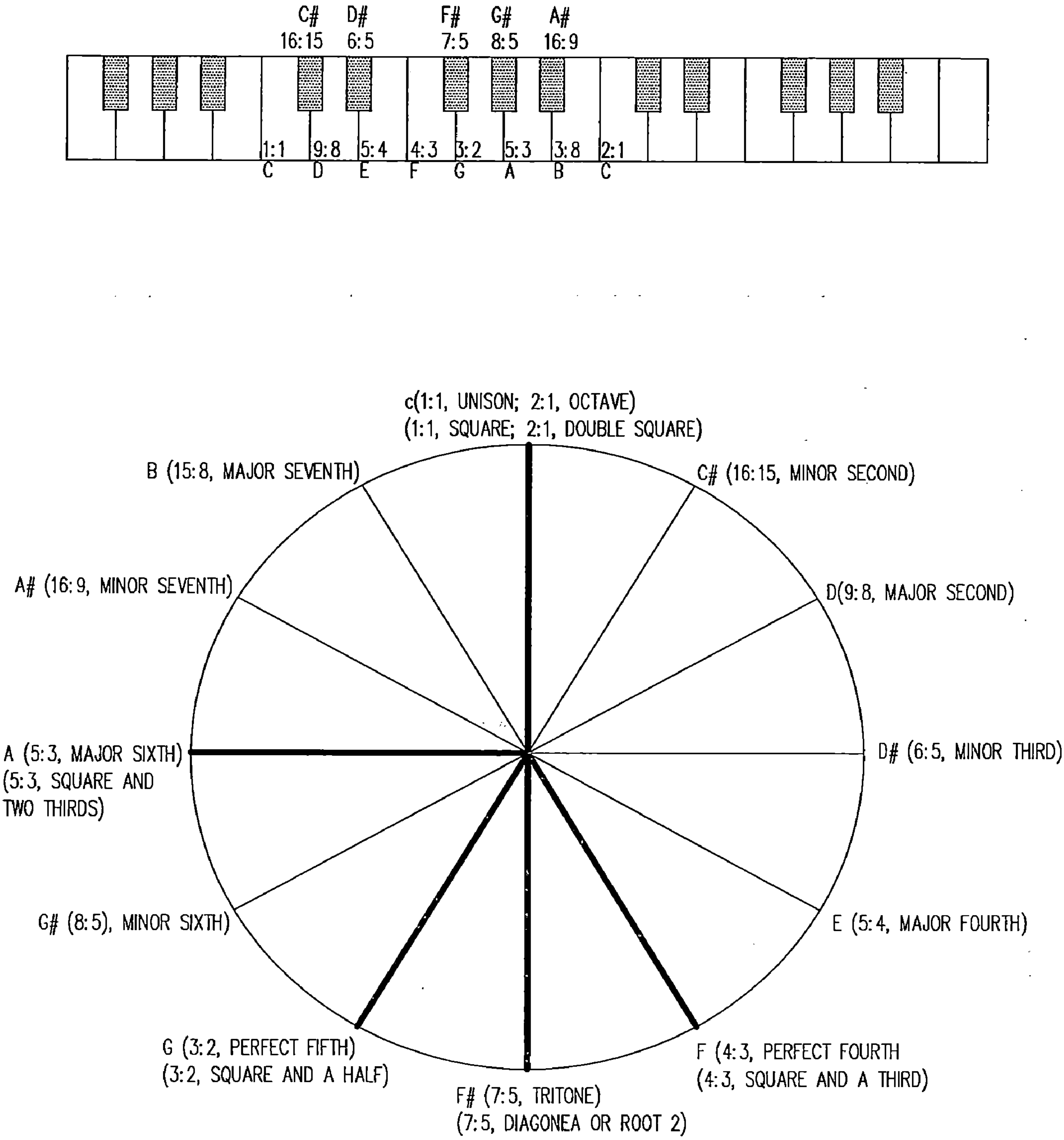


Figure 3.10 Musical Scale



Source: Author 1997

3.9 MATHEMATICAL DERIVATION:

3.9.1 DERIVATION OF RATIOS FROM BASIC RATIOS.

Of seven defined ratios in Palladio's proportional theory, namely circle, square (1:1), square and a third (4:3), square and two thirds (5:3), diagonea (7:5), square and a half (3:2) and two squares (2:1); the following rectangular room ratios namely (4:3), (7:5) and (3:2) could be understood as been derived from application of mean proportions between two extremes of square as one and two squares as two. Substituting w = 1 and b = 2 in the formulas for different means we get:

1) Arithmetic mean (AM) = (w + b)/2 we get 3/2 which is 3:2
2) Geometric mean (GM) = root (w*b) we get root 2 which is 7/5 or 7:5
3) Harmonic mean (HM) = (2*w*b)/(w + b) we get 4/3 which is 4:3
4) Counter Harmonic Mean (CHM) = (w*w + b*b)/(w+b) we get 5/3 which is 5:3

3.9.2 COMPUTATION OF BASIC RATIOS

The second category of ratios that escape the boundary of Palladian palette of seven ratio could be understood as

1) The ratios derived from multiplication of basic ratios.
2) The ratios derived from division of basic ratios.
3) The ratios derived from scaling of basic ratios.
4) The ratios derived as mathematical rational convergent for square root of different numbers.

One can derive the ratios which are not coded in Palladio's theory on the basis of following principles:

3.9.2.1 MULTIPLICATION OF RATIOS

That is, given two ratios a:b and c:d, applying this function we get ac : bd as

a : b
| |
c : d

ac : bd

3.9.2.2 DIVISION OF RATIOS

That is, given two ratios a:b and c:d, applying this function we get be : ad as

a : b
c : d

bc : ad

3.9.2.3 SCALING OF RATIOS

That is, given a ratio a:b, applying this function we get Ka : Kb as

a : b
K: K

Ka : Kb

Applying the rules of multiplication and division (rule of scaling is not applied in general, for as mentioned above; scaling of ratios depends on variable ‘K’ which is case specific.) to Palladio's six applicable room ratios (excluding circle) we get:

Table 3.2 Multiplication of ratios

a:b x c:d = ac : bd

-	1:1	4:3	7:5	3:2	5:3	2:1
1:1	1:1	4:3	7:5	3:2	5:3	2:1
4:3	-	16:9	28:15	2:1	20:9	**8:3**
7:5	-	-	49:25	21:10	**7:3**	14:5
3:2	-	-	-	**9:4**	**5:2**	**3:1**
5:3	-	-	-	-	25:9	**10:3**
2:1	-	-	-	-	-	**4:1**

Source: Author 1997

Table 3.3 Division of ratios

a:b / c:d = bc : ad

-	1:1	4:3	7:5	3:2	5:3	2:1
1:1	1:1	4:3	7:5	3:2	5:3	2:1
4:3	-	1:1	21:20	9:8	**5:4**	3:2
7:5	-	-	1:1	15:14	25:21	**10:7**
3:2	-	-	-	1:1	**10:9**	4:3
5:3	-	-	-	-	1:1	**6:5**
2:1	-	-	-	-	-	1:1

Source: Author 1997

3.9.3 THE RATIOS DERIVED AS MATHEMATICAL RATIONAL CONVERGENT FOR SQUARE ROOT OF A NUMBER.

To find a rational convergent for square root of a number mathematically one begins by assuming two closest ratios within which the root of the number sought will fall. That is if we need to find rational convergent of root of number 'X', we assume that the answer will fall in-between ratios a/b and c/d. Now using the following formula we get series of figures as convergent, each successive being closer to the actual answer. Step one: a/b + c/d = a+c / b+d = e/f. All the following steps: e/f + (f * X)/e = e'/f ' where 'X' is the number whose square root is sought. Hereon the value of e'/f ' is substituted for e/f in the equation e/f + (f * X)/e to get second value for e"/f " which would be again substituted in the same equation to get next convergent value and so on.

We take example of square root of number two which makes value for 'X'.

Now we assume square root of two falls between ratios 1/1 and 2/1.

Substituting these values in Step one (initiator):

a/b + c/d = a+c / b+d = e/f we get

1/1 + 2/1 = 1+2 / 1 +1 (i.e. addition of numerators / addition of denominators)

=3/2 which is first value of e/f.

Step two (generator):

$e/f + (f * X)/e = e'/f'$

$3/2 + (2 * 2)/3 = 3/2 + 4/3 = (3+4) / (2+3)$ (i.e. addition of numerators / addition of denominators) $= 7/5$

Step three:

$e/f + (f * X)/e = e'/f'$

$7/5 + (5*2)/7 = 7/5 + 10/7 = (7+10) / (5+7) = 17/12$

Following the procedure one gets the following values for the square roots of numbers 2, 3, 5, 6, 7, 8, 10 and 12. Thus covering all numbers from 1 to 10 (except 4 and 9 whose square roots are whole numbers; 2 and 3 respectively) that are considered as basics of numerology that crafted order of the physical world according to Plato and 12 as Pythagoras acknowledged twelve (12) as the "most divisible" small number. The examples are calculated for 6 cycles after which ratio grow beyond comprehensive room size. This would help us understand the use of ratios like 26 : 15, 15 : 6, 30 : 12 and 15 : 11.

Table 3.4 Rational convergent of root two

Root 2 = 1.4142

X=2			
STEP 1	A/B	C/D	A+C/B+D= E/F
	1/1	2/1	3/2
STEP 2	E/F +	(F*X)/E	= E'/F'
	3/2	(2*2)/3	**7/5**
	7/5	(5*2)/11	**17/12**
	17/12	(12*2)/17	41/29
	41/29	(29*2)/41	99/70
	99/70	(70*2)/99	239/169

Source: Author 1997

Table 3.5 Rational convergent of root three

Root 3 = 1.7320

X=3			
STEP 1	A/B	C/D	A+C/B+D= E/F
	1/1	3/1	4/2
STEP 2	E/F +	(F*X)/E	= E'/F'
	4/2	(2*3)/4	**5/3**
	5/3	(3*3)/5	**7/4**
	7/4	(4 *3)/ 7	19/11
	19/11	(11*3)/19	**26/15**
	26/15	(15*3)/26	71/41

Source: Author 1997

Table 3.6 Rational convergent of root five

Root 5 = 2.2360

X=5			
STEP 1	A/B	C/D	A+C/B+D= E/F
	2/1	5/2	7/3
STEP 2	E/F +	(F*X)/E	= E'/F'
	7/3	(3*5)/7	**11/5**
	11/5	(5*5)/11	**9/4**
	9/4	(4 *5)/9	29/13
	29/13	(13*5)/29	47/21
	47/21	(21 *5)/47	38/17

Source: Author 1997

Table 3.7 Rational convergent of root six

Root 6 = 2.4494

X=6			
STEP 1	A/B	C/D	A+C/B+D= E/F
	2/1	3/1	5/2
STEP 2	E/F +	(F*X)/E	= E'/F'
	5/2	(2*6)/5	**17/7**
	17/7	(7*6)/17	59/24
	59/24	(24*6)/59	203/83
	203/83	(83*6)/203	701/286
	701/286	(286*6)/701	2417/987

Source: Author 1997

Table 3.8 Rational convergent of root seven

Root 7 = 2.6457

X=7			
STEP 1	A/B	C/D	A+C/B+D= E/F
	2/1	3/1	5/2
STEP 2	E/F +	(F*X)/E	= E'/F'
	5/2	(2*7)/5	19/7
	19/7	(7 *7)/19	34/13
	34/13	(13*7)/34	125/47
	125/47	(47*7)/125	227/86
	227/86	(86*7)/227	829/313

Source: Author 1997

Table 3.9 Rational convergent of root eight

Root 8 = 2.8284

X=8			
STEP 1	A/B	C/D	A+C/B+D= E/F
	2/1	3/1	5/2
STEP 2	E/F +	(F*X)/E	= E'/F'
	5/2	(2*8)/5	3/1
	3/1	(1*8)/3	11/4
	11/4	(4*8)/11	43/15
	43/15	(15*8)/43	163/58
	163/58	(58*8)/163	627/221

Table 3.10 Rational convergent of root ten

Root 10 = 3.1622

X=10			
STEP 1	A/B	C/D	A+C/B+D= E/F
	3/1	10/3	13/4
STEP 2	E/F +	(F*X)/E	= E'/F'
	13/4	(4*10)/13	53/17
	53/17	(17*10)/53	223/70
	223/70	(70*10)/223	923/293
	923/293	(293*10)/923	3853/1216
	3853/1216	(1216*10)/3853	16013/5069

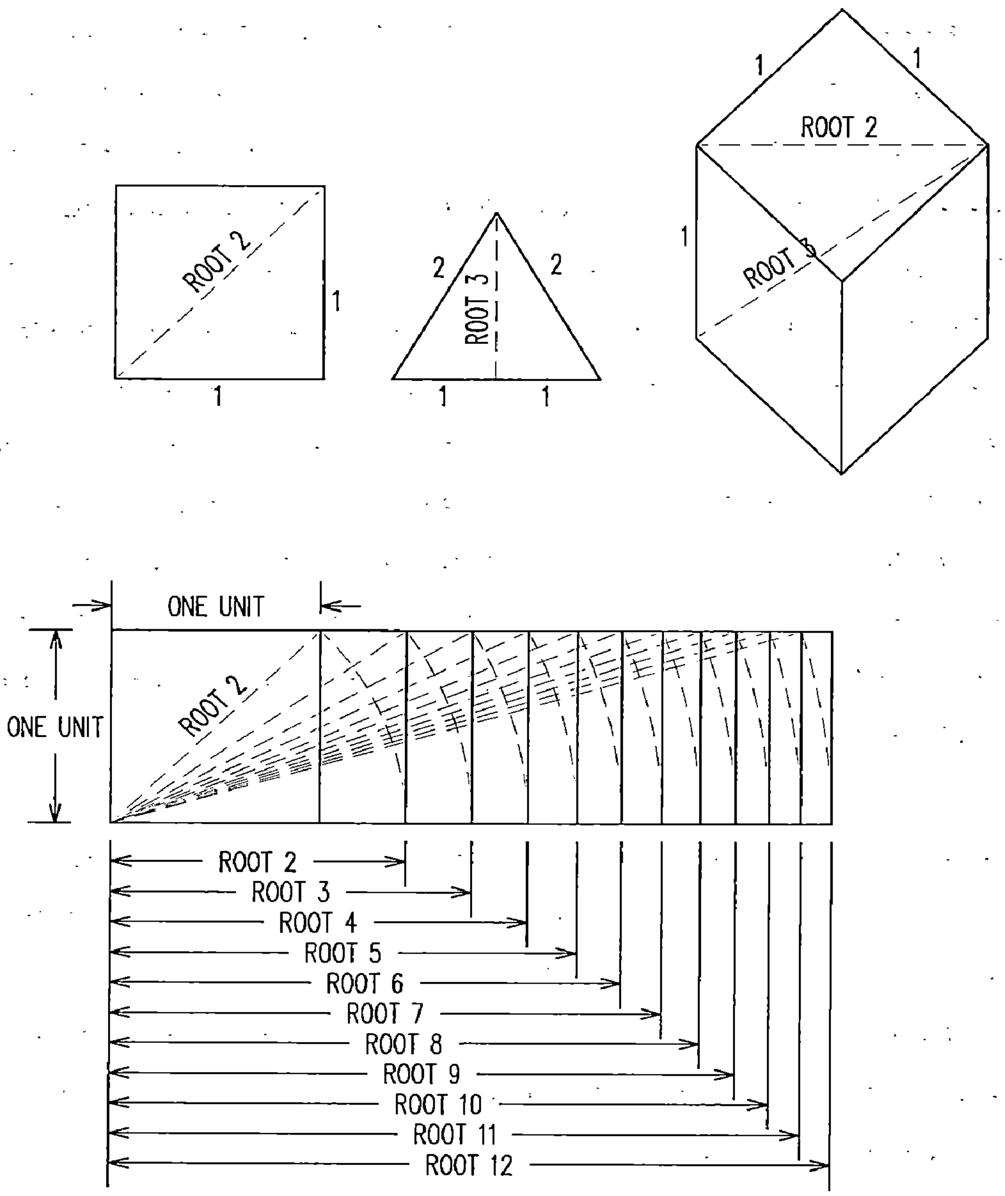
Table 3.11 Rational convergent of root twelve

Root 12 = 3.4641

X=12			
STEP 1	A/B	C/D	A+C/B+D= E/F
	3/1	12/3	15/4
STEP 2	E/F +	(F*X)/E	= E'/F'
	15/4	(4*12)/15	63/19
	63/19	(19*12)/63	291/82
	291/82	(82*12)/291	1275/373
	1275/373	(373*12)/1275	5751/1648
	5751/1648	(1648*12)/5751	25527/7399

The values of these irrational numbers such as root of 2 and 3 could be graphically derived from diagonal of a square and altitude of equilateral triangle (with base of two units) respectively as specified by Alberti and is shown in figure 3.11, Geometric derivation of irrational numbers

Figure 3.11 Geometric Derivation Of Irrational Numbers



Source: Author 1997

3.10 PRINCIPLES OF ROOM HEIGHT

The first theory of Palladio's seven room ratios deals with length and breadth to generate two dimensional plan. Palladio's second important theory is about derivation of room height using 'means'. To derive room height Palladio narrates:

"Rooms are built with either a vault or a ceiling [in solaro]; if with a ceiling, the height from the pavement to the joists will be the same as the breadth and the rooms above will be a sixth less in height than those below. If they are vaulted (as is customary for rooms on the ground floor, because that way they turn out to be more beautiful and less susceptible to fire), the heights of the vaults in square rooms will be a third greater than their breadth. But with those that are longer than they are broad it is essential to derive the height from the breadth and length, so that they are in proportion to each other. One will establish this height by adding the breadth to the length and dividing the product into two equal parts so that one of these halves will be the height of the vault. So, for example, let BC be the place to be vaulted; add the breadth AC to the length AB, and draw out the line EB, which one divides into two equal parts at the point F; let us say that FB is the height that we are looking for. Or, it could be that the room to be vaulted is twelve feet long and six broad; if the six and twelve are added together, making eighteen, half of which is nine, then the vault must be nine feet high.

Again another height can be found which is in proportion to the length and breadth of the room like this: say the place to be vaulted is CB, let us add the breadth to the length and produce the line BF; then let us divide it into two equal parts at point E, which we make the central point, and make a half circle BGF and extend AC till it touches the circumference at point G; AG will be the height of the vault CB. Using numbers the height will be calculated like this; if you know the breadth and length of the room in feet, let us find a number that has the same proportion to the breadth as the length has to it, and let us identify it by multiplying the lesser extreme

with the greater, because the square root of the result of the multiplication will be the height that we are looking for. So, for example, if the place that we want to vault is nine feet long and four broad, the height of the vault will be six feet, and in terms of proportions, nine is to six as six is to four, that is, the sesquialtera. But one should take note-that it will not always be possible to calculate this height with whole numbers.

One can also establish another height which will be smaller but nevertheless suitably proportioned to the room, like this: having drawn out the lines AB, AC, CD, and BD that stand for the breadth and length of the room, one will find the height as in the first method, which will be to take CE, which should be added to AC; then draw the line EDF and extrapolate AB so that it intersects with EDF at point F; the height of the vault will be BF. But using whole numbers one can establish the height like this: having fixed the height of the room from the breadth and length using the first method, which, following the example given above, is 9, position the length, breadth, and height as in the diagram; then multiply 9 by 12 and by 6, and put the result of the multiplication by 12 under the 12, and the result of the multiplication by 6 under the 6; then multiply the 6 by 12 and put the result under the 9, which will be 72; having found a number which, multiplied by 9, comes to 72, which in our case would be 8, lee us declare that the height of the vault is 8 feet.

12 9 6

108 72 54

8

These heights are related to each other in the following way: the first is greater than the second and this is greater than the third; so we should make use of each of these heights depending on which one will turn out well to ensure that most of the rooms of different sizes have vaults of an equal height and those vaults will still be in proportion to them, so that they turn out to be beautiful to the eye and practical for the floor or

pavement which will go above them because they will all end up on the same level. There are other heights for vaults which do not come under any rule, and the architect will make use of these according to his judgment and practical circumstances." (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XXIII).

Interpretation:

For height of the rooms and ceiling forms, Palladio mentions (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XXIII) that the rooms can either have a vaulted or a flat ceiling. If a room has a flat ceiling, the height of the same; from floor to ceiling is to be same as the width of the room, that is a square room in plan (1:1) could be a cube in three dimension (1:1:1). Palladio adds that room above the ground floor would have height one sixth part less than the height of the room below, thus heights of the floors from below to above are in a geometrical proportion as 1 : 5/6 : 25/36 (5/6 x 5/6). This is to say that the columns on the above are according to simple ratios, for instance 5:4 (20 and 16 feet, with variation), 6:5 (18:15 feet), 9:8 (18:16 feet) and 10:9 (20:18 feet). For vaulted ceilings, Palladio states (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XXIV) that height of the room from floor to the highest point of the vaulted ceiling inside the room is one third more than the width of the room, that is to say, if the room was square (1:1) with vaulted ceiling, its height at the center would be 1/3 more than the width; giving rise to overall proportion of the room as 3:3:4. Palladio comments that rooms with vaulted ceilings appear to be more beautiful and are less exposed to fire than the one with flat ceiling.

Palladio prescribes the three methods of determining the height of a room when the length and the width of the room are not the same. Deriving from arithmetic, geometric and harmonic proportions he simply names them first, second and third method respectively. Before discussing Palladio's three methods of determining room heights for room ratios other than 1:1, the study looks at the different types of means.

3.10.1 ARITHMETIC MEAN (AM):

If we were to simplify Palladio's words for these means, to understand it through simple words, it would be

'let the room to be vaulted be twelve feet long and six broad; add six to twelve and it will make eighteen, the half of which is nine; the vault ought therefore to be nine feet.' In an arithmetic mean, the second amount exceeds the first by the same amount as the third exceeds the second, as in 2:3:4. Three exceeds two by the same amount that four exceeds three. Or, in Palladio's example: 9 exceeds 6 by 3, which is the same amount by which 12 exceeds 9. Practically, this means taking the length and adding it to the width, then dividing the result in half, as Palladio described. If 'h' implies height, 'w': width and 'b': breath then this mean can be expressed by the following formula: h = (w + b) divided by 2. (Refer Figure 3.12, Arithmetic mean)

3.10.2 GEOMETRIC MEAN (GM):

'the length and breadth of the room being known, we will find a number that has the same proportion to the breadth as the length has to the number sought, that if the place we intend to vault is nine feet long and four feet wide, the height will be six feet.'

In a Geometrical Mean the first amount is in proportion to the second amount as the second is to the third, a is to b as b is to c. Or a:b = b:c.

In Palladio's example; 6 exceeds 4 by a third of 6 which is 2,

just as 9 exceeds 6 by a third of 9 which is 3.

or 4:6:9. or 4:6 = 6:9.

Practically this means, in the words of Palladio;

'We find this by multiplying the lesser extreme with the greater; because the square root of the number which will result from such a multiplication will be the number we seek.'

In his example we multiply the lesser extreme, or width, which is 4, by the greater extreme, which is 9, to get 36. The square root of 36, (i.e. the only number which when multiplied by itself will give 36) is 6. Thus the height of the room is 6.

This can be expressed by the following formula: h = square root of (w * b).

(Refer Figure 3.13, Geometric mean).

3.10.3 HARMONIC MEAN (HM):

Harmonic Mean is the mean exceeding one extreme, and being exceeded by the other, by the same fraction of the extremes. Palladio uses the example of a room six feet wide by twelve feet long that has a ceiling height of eight feet. The mean 8 exceeds the smaller extreme 6 by a third of the smaller extreme which is 2; just as it (the mean) is itself exceeded by the same fraction (a third) of the larger extreme 12 which is 4.

This is expressed as: (8-6) divided by 6 = (12-8) divided by 12,

or, where b is the mean between the two extremes a and c:

(b-a) divided by a = (c-b) divided by c.

Practically, this is found by multiplying the greater and lesser extremes and dividing the result by the Arithmetical Mean found in the first example.

Thus 12 times 6 gives 72, which is then divided by the Arithmetical Mean 9 to give the answer 8 which is the Harmonic Mean; the height of the room. Second method of doing this is to multiply the greater by the lesser, 12 x 6 = 72, then multiply that result by two, 2 x 72 = 144, and then divide that result by the sum of the two extremes (6 and 12): Thus; 144 divided by (6 + 12), that is, 144 divided by 18 = 8.

This can be expressed by the following formula: h = 2(w*b) divided by (w+b).

(Refer Figure 3.14, Harmonic mean)

Palladio provides geometrical construction for the three methods with numerical examples as illustrated in Figure 3.15, Palladio's geometric construction of Arithmetic, Geometric and Harmonic mean.

(ab) is the length and (bd) is the width of the room. In the first diagram, (be) is same as (bd). (gf) is the Arithmetic Mean between (ab) and (bd), for it is the half of (ae) which is the same as (ab + bd). In the second diagram, (be) is the same as (bd). (fb) is the Geometric Mean between (ab) and (bd), for the two triangles (abf) and (fbe) are similar and (ab : fb :: fb : eb). Therefore (fb) or GM = root(ab * bd). In the third diagram, (be) is the Arithmetic Mean between (ab) and (bd), that is AM = (ab + bd)/2. (cf) is the

Harmonic Mean between (ab) and (bd), for the two triangles (bed) and (cdf) are similar and (be : cd : : bd : cf). Therefore (cf) or HM = (2*ab*bd) / (ab + bd).

Given a ratio; X:Y, (for example 10:40) there is a second method which is geometrical that could be adopted to find these means in terms of lengths. This method is shown graphically in figure 3.16, geometric method to find Arithmetic, Geometric and Harmonic mean of any given ratio. Draw a segment of length that is equal to unit addition of ratio. In this example it will be 50 units as X+Y = 10 + 40 = 50. Taking this segment AB of 50 units as diameter draw a circle passing through its extreme ends A and B with centre as C. The radius CA gives us arithmetic mean with 25. Now draw a perpendicular from common point of ratio XY (point D which divides diameter AB in segments AD of 10 units and segment DB of 40 units) that would intersect the circle at point E. segment DE would give us geometric mean with 20 units of length. Now draw segment EF passing through centre (of circle) C. Draw segment DG perpendicular to segment EF from point D, this would insect the segment EF at point G. Now segment EG with 16 units gives us harmonic mean while segment GF with unit length of 34 gives us counter harmonic mean.

Figure 3.12, 3.13, 3.14 Geometric Representation Of Arithmetic, Geometric And Harmonic Mean

Figure 3.12
ARITHMETIC MEAN

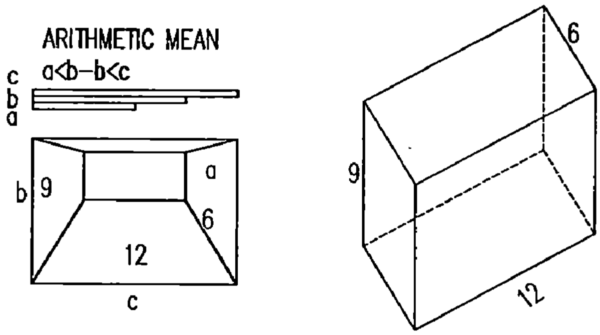


Figure 3.13
GEOMETRIC MEAN

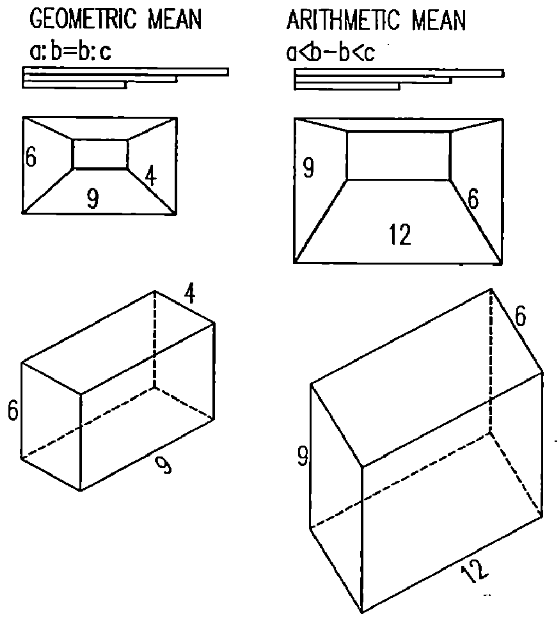
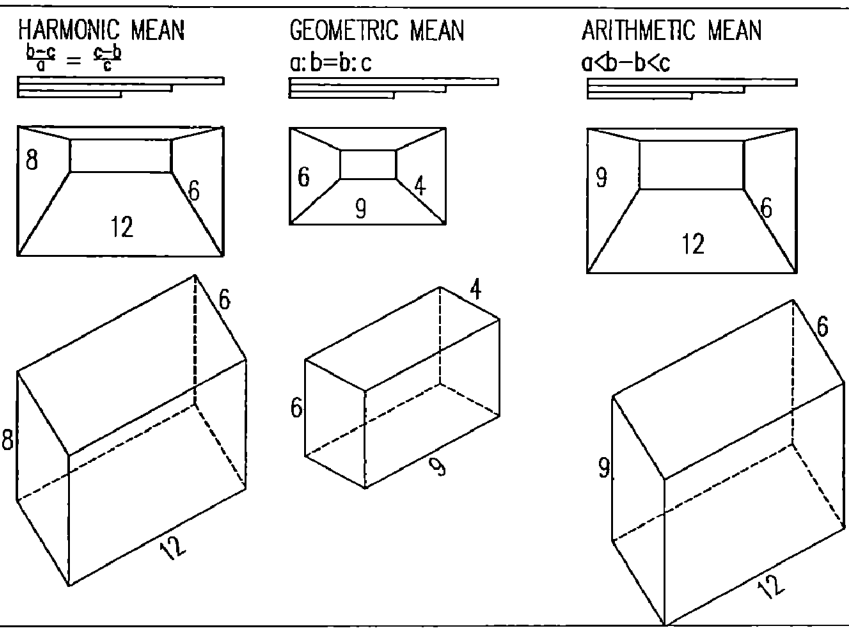
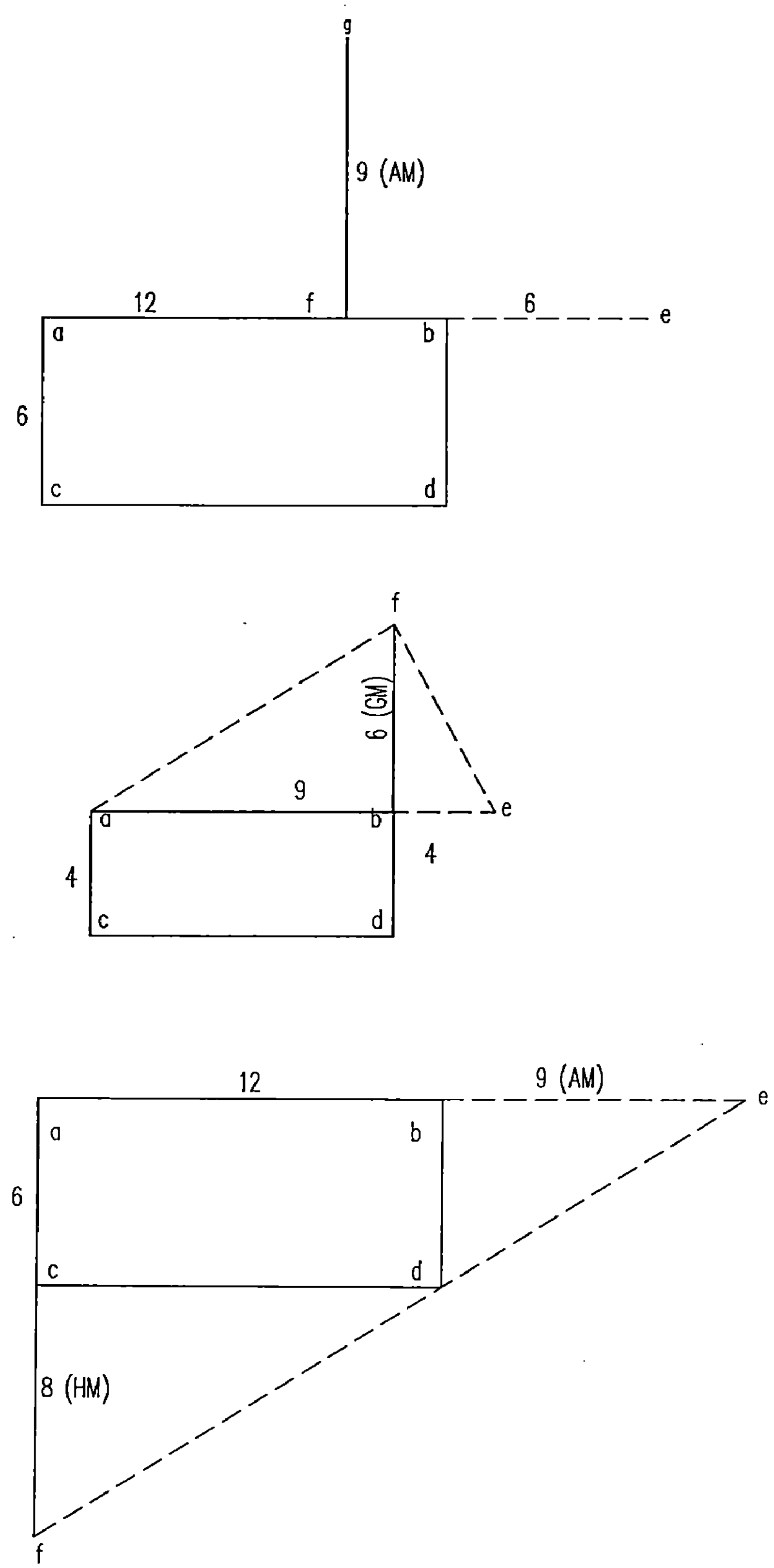


Figure 3.14
HARMONIC MEAN



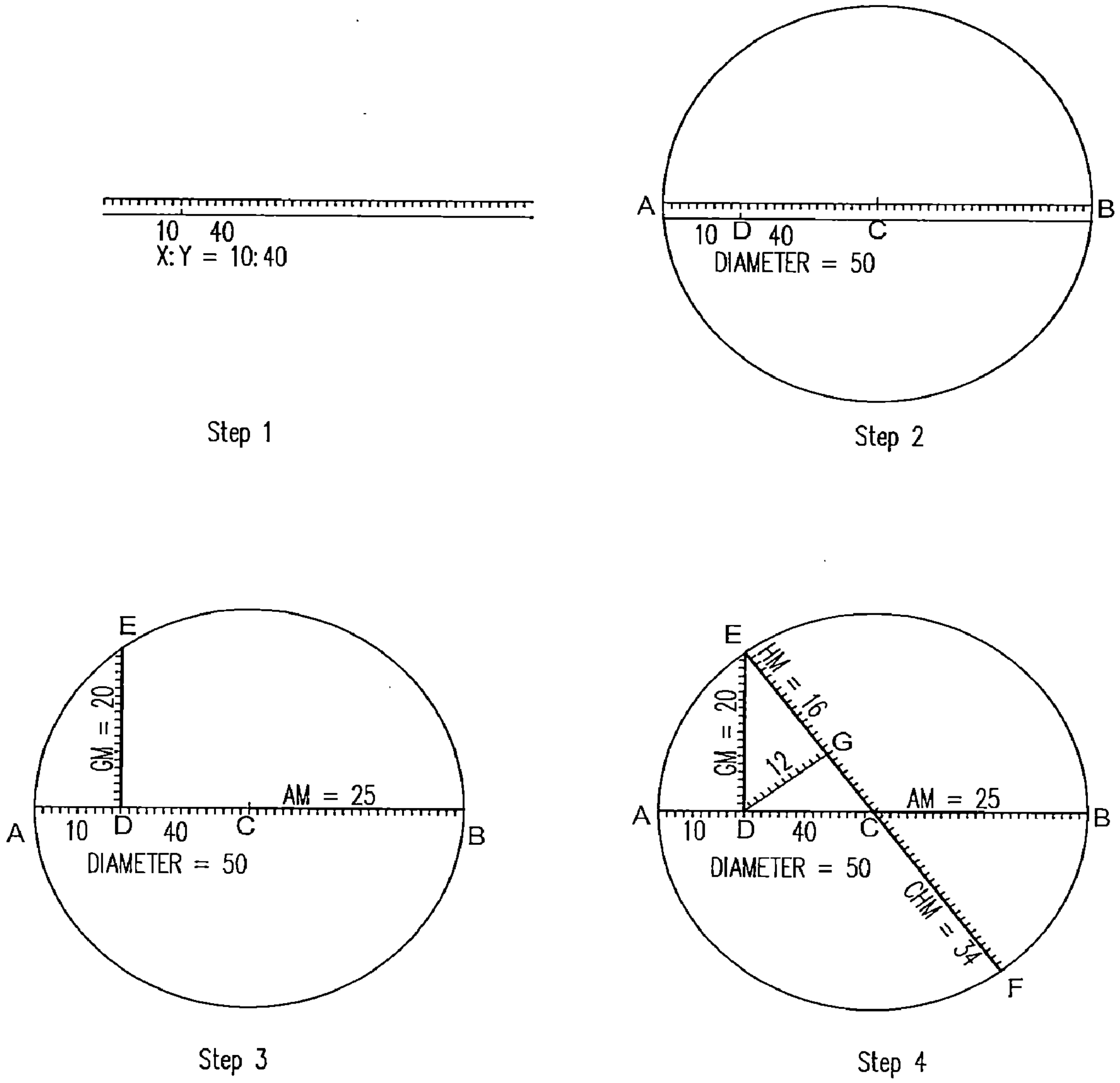
Source: Author 1997

Figure 3.15 Palladio's Geometric Construction Of Arithmetic Mean, Geometric Mean And Harmonic Mean



Source: Author 1997

Figure 3.16 Geometric Method To Find Arithmetic Mean, Geometric Mean, Harmonic Mean And Counter Harmonic Mean Of Any Given Ratio



Source: Author 1997

instance, the following three rooms with different lengths and widths can have the same vault height according to the three methods:

1) For a room with length of 6 and width of 2 can have vault height of 4 with the use of first (Arithmetic Mean) method.

2) For a room with length of 8 and width of 2 can have vault height of 4 with the use of second (Geometric Mean) method.

3) For a room with length of 6 and width of 3 can have vault height of 4 with the use of third (Harmonic Mean) method.

This use of mean proportions in architecture could be concluded as Palladio's invention and awareness to achieve beauty in architecture using mathematics. Applying these rules of different means to set of five applicable room ratios [excluding square (1:1) and circle] of Palladio's proportion theory one gets following palette of proportions for room width (w), height (h) and breath (b):

Table 3.12 Palette of proportions

	Arithmetic Mean h=(w+b)/2	Geometric Mean h=root(w*b)	Harmonic Mean h=(2*w*b)/w+b
w:b	w : h : b	w : h : b	w : h : b
4:3	4 : 7/2 : 3 8 : 7 : 6	4 : root 12 : 3 4: 10/3 :3 12: 10 : 9	4 : 24/7 :3 28 : 24 : 21
7:5	7 : 6 : 5	7 : root 35 : 5 7 : 35/6 : 5 42 : 35 : 30	7 : 35/6 : 5 42 : 35 : 30
3:2	3 : 5/2 : 2 6 : 5 : 4	3 : root 6 : 2 3 : 5/2 : 2 6 : 5 : 4	3 : 12/5 : 2 15 : 12: 10
5:3	5 : 4 : 3	5 : root 15 : 3 5 : 35/9 : 3 45 : 35 : 27	5 : 15/4 : 3 20: 15 : 12
2:1	2 : 3/2 : 1 4 : 3 : 2	2 : root 2 : 1 2 : 7/5 : 1 10 : 7 : 5	2:4/3:1 6:4:3

Source: Author 1997

Note: root 12 = 2 root 3 = 2* 5/3 = 10/3

root 35 = root 7 * root 5 = 5/2* 7/3 = 35/6

root 15 = root 5 * root 3 = 7/3* 5/3 = 35/9 The values for the rational convergent of roots are taken from the tables as explained earlier in the chapter

3.11 PRINCIPLES OF DOOR WINDOW DIMENSIONS

There seems discrepancy in Robert Tavernor and Richard Schofield (The MIT Press Edition) and Adolf K. Placzek's (Dover Publication) translation on this topic. The study follows Adolf K. Placzek's interpretation which seems rational and consistent in following the terminology of 'breadth' and 'length' of a room. The study hereunder quotes MIT press edition to note the difference in two texts. The study writes interpretation for the text from Dover publication.

The MIT Press Edition quotes:

3.11.1 ON DOOR SIZE:

"One cannot give a certain and predetermined rule covering the heights and breadths of the main doors of buildings or the doors and windows of rooms; so the architect must build the principal doors to match the size of the building, the type of patron, and the things that must be brought in and out. It seems to me a good idea to divide the space between the level or floor [piano, suolo] and the surface of the wooden ceiling into three and a half parts (as Vitruvius says in Book IV, chapter 6) and make two of these the clear height and one of them the breadth, minus a twelfth of the height.

The doors of rooms must not be made more than three feet wide or six and a half feet high, nor less than two feet wide and five high.

3.11.2 ON WINDOW SIZE:

....For this reason window must not be made broader than a quarter of the <u>length</u> (this word 'length' is the difference between two publications) ***of the rooms***

nor narrower than a fifth and their height should be made two squares and a sixth of their breadth. I like very much those rooms which are two-thirds longer than their breadth; that is, if the breadth is eighteen feet then the length should be thirty. I divide the breadth into four and a half parts; and with one part I establish the clear breadth of the windows and with the other two, adding a sixth of the breadth, I make all the windows of the other rooms the same size as these windows. The windows above, that is those of the second story, should be a sixth less than the clear height of those below, and if more windows are built above, they should similarly diminish by a sixth." (*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XXV).

Dover Publication writes:

"No certain and determinate rule can be given for the height and breadth of the principal door of fabrics, or concerning the doors and windows of rooms; because, in making the principal doors, the architect ought to accommodate them to bigness of the fabric, to the quality of the master, and to those things that are to be carried in and out of the frame.

The best way, in my opinion, is to divide the space from the floor to the superficies of the joysts, into three parts and a half, (as VIRTUVIUS teaches in the sixth chapter of his fourth book) and allow two to the height, and one to the breadth of the opening, wanting the twelfth part of the height.

The doors of the rooms are not to be made wider than three foot, and six and half feet high; nor less than two foot in breadth, and five in height.

.....Therefore the windows ought not to be wider than the fourth part of the <u>breadth</u> (this word 'breadth' is the difference between two publications) ***of the rooms, or narrower than the fifth, and are to be made two squares and a sixth part of their breadth more in height. And although the rooms in a***

house are made large, middling, and small, the windows, nevertheless, ought to be all equal in the fame order or story.

I like those rooms very much whose length is two thirds more than the breadth, that is, if the breadth be eighteen foot, the length should be thirty, and I divide the breadth into four parts and a half, one I give to the breadth of the void of the window, and two to the height, adding one sixth part of the breadth more; and according to the largeness of these I make those of the other rooms.

The windows above these, that is, in the second story, ought to be a sixth part less in the height of the void, than those underneath, if other windows are placed higher, they ought to diminish still a sixth part."
(*'I Quattro Libri Dell' Architecttura'*, Book I, Chapter XXV).

Interpretation:
Referring to Vitruvius on door size, Palladio writes to divide the room height in three and half parts and to give two of such divisions to height of the door and one to its width. Irrespective of room height this could be inferred as 2:1 ratio for doors. He continues by defining maximum door size as 3' wide x 6.5' high and minimum as 2' wide x 5' high.

For window size Palladio writes- Make breadth of window as ¼ or 1/5 of rooms width, i.e. windows are related to wall in which they are with ratio 4:1 or 5:1. Palladio gives 1/6 more than two squares to its height making it13:6, height to width ratio for window. He states to have same window size for floor irrespective of long, intermediate or short room. Here it seems Palladio is indirectly hinting at Alberti's theory of room shapes of three categories – short, intermediate and long rooms. Windows on first floor would be $1/6^{th}$ less in height than the window on ground floor making it 2:1.

3.12 SUMMARY OF PALLADIO'S THEORY

Palladio was a true renaissance architect who studied the theories of ancients and developed his own insight. Palladio does not write in detail about his theory of proportions like his immediate predecessors in linage of theory of proportions; namely Alberti and Vitruvius (he states Vitruvius to be his master). He did not merely follow his predecessors but formed his own theory. Even while citing ancient 'orders' he introduced his own theory linking orders to intercolumniation i.e. for slender columns he prescribes smaller intercolumniation or less space in-between two columns and for stouter columns more space in-between. He emphatically showed preference for using circle in temple planning. There was a general acceptance of the above mentioned theories; but Palladio, unlike his predecessors firmly stated his preference. In his own theory of seven room ratio (circle, 1:1, 4:3, 7:5, 3:2, 5:3 and 2:1) Palladio deviated from his predecessors by not restricting his palette of ratios to just harmonic intervals of music (based on Pythagorean Lambda) and used incommensurable ratio of root two (7:5). It is noticed that Palladio predecessors based their theories majorly on Pythagorean Lambda that is formed with double series of even numbers 2, 4, 8, 16, 32 etc. and triple series formed by odd numbers 3, 9, 27, 81 and 243. Use of circle is another deviation. Another unique feature of Palladian architecture was use of proportions in several interconnected spaces; emphasizing the concept – 'part to the whole' and 'whole to the part' unlike his predecessors who used proportions to define area of single room or two dimensional facade.

Palladio's theory thus is a deviation from past. But did he practice what he preached? How far is his theory from his actual works? Are the room ratios used in his villa plans derived from his theory or are they arbitrary? Can the ratios used in villa plans be interpreted?

Padovan states (pg 236) ***"The dimensions of many of Palladio's plans prove to be far less arbitrary than they previously appeared. Each villa may be based on a particular mathematical theme, very possibly with a symbolic significance. The Renaissance was an age that delighted in number***

symbolism and in mathematical games, analogies and conceits, where in musical composition, the making of verse, or architecture".

The next part of the study is an attempt to analyze these villa plans and look for possible interpretations of the ratios adopted by Palladio in designing of his villa plans as shown in book two of *'I Quattro Libri Dell' Architecttura'*.

CHAPTER FOUR: STUDY AND ANALYSIS OF PALLADIO'S PROPORTIONAL DESIGNS IN VILLA PLANS

This chapter is to bring numeric understanding of application of Palladian theory of proportion in villa plans documented in Book two of *I Quattro Libri dell' Architecttura* and rekindle Palladian grammar for contemporaries. Analysis tries to show that Palladian theory of proportion could be reinvented and reinstalled in contemporary architectural planning grammar by understanding morphology of Palladian villa plans.

4.1 METHOD OF ANALYSIS

Palladio concludes Book two with following words; ***"With this project we may bring to a close, praise the Lord, these two books in which I have used my ingenuity to gather and convey with the greatest possible brevity and simplicity though words and illustrations all the things that seem to me to be crucially important for building well, and especially for erecting private houses that are inherently beautiful and are both useful and a credit to the patrons"*** thus laying emphasis on his belief in application of theory of proportions for villas as apt. Subscribing to his ideology, out of fifty eight plates in books two; as listed below and documented in original form from book two at the end of this study (in appendix 4); thirty eight plates have been identified as house plans (Villa and Palazzo) for the analysis (which are marked with a star). Palladio cites these plates by the names of patrons of the project. This study follows the same chronology followed by the name of the place where the edifice was built or proposed and a brief description of the plate. For some plates (plates 17, 18, 19, 23, 24, 25, 26, 27, 28 and 29) which Palladio seems to have used as illustration to understand theory and probably were never built, Palladio does not mention its place of construction. House plans as illustrated in book two are classified in four distinct groups by Palladio which is as follows

1) **City house or palazzo.** Eight city houses and one country house (Villa) are illustrated with plates 1 to 16.

2) **Atrium.** Four such atriums are illustrated in plates 17 to 24. As Palladio writes these plates are to describe architectural order orders like Tuscan, Corinthian, he does not mention its measure hence; they are omitted from this analytical study.

3) **Halls.** With plates 25 to 29 Palladio describes three styles of halls. Palladio with his commentary primarily seems to describe beauty of architectural order and intercolumniation without specifying its measure hence they too are omitted from this analytical study.

4) **Country house or villa.** Palladio in plates 30 to 51 describes country houses. Main feature of these country houses were that they had two parts of planning arrangement, one for the owner or the master and second for produce of farm and animals. Plates 52 to 58 describe six palazzo and one villa projects that were never built.

Braviko Mitrovic in 'Learning from Palladio', pg. 43 and 47 differentiates palazzo and villa as follows

"A Palazzo is located in a city. A palazzo is a bigger building, typically organized around a central courtyard. The urban residence of a wealthy, aristocratic family, a palazzo responded to many pragmatic program functions. A villa is a residence on an agricultural estate with quarters for the owner and his family, and may include apartments for servants and workers as well as additional agricultural buildings. A villa is usually too small to enclose a courtyard or a need light wells. It is typically surrounded by open space, except for the agricultural buildings of its estate. In villa it is sala, the large hall, which serves as the living room. A typical villa has a sala flanked by a row of rooms on two sides."

4.2 LIST OF PLATES OF PALLADIO

For ease in referring; each plate from book two is numbered and titled (which is missing in Palladio's presentation of plates) on the basis of references available from Palladio's commentary on the same in book two.

1. * Plate 01, Palazzo (or Palagio) Antonini at Udine, ground plan and elevation
2. * Plate 02, Palazzo Chierirati at Vincenza, Ground plan and elevation
3. Plate 03, Palazzo Chierirati at Vincenza, Part elevation of the facade
4. * Plate 04, Palazzo Iseppo de' Porti at Vicenza, ground plan and long section
5. Plate 05, Palazzo Iseppo de' Porti at Vicenza, Half of the main elevation
6. Plate 06, Palazzo Iseppo de' Porti at Vicenza,
   Half of the main courtyard in sectional elevation
7. Plate 07, Palazzo Giovanni Battista Della Torre at Verona, in plan and cross section
8. * Plate 08, Palazzo Ottavio de' Thiene at Vicenza, ground plan and sectional elevation
9. Plate 09, Palazzo Ottavio de' Thiene at Vicenza, Part elevation of the end bays
10. Plate 10, Palazzo Ottavio de' Thiene at Vicenza, Part sectional elevation of the courtyard
11. * Plate 11, Palazzo Valmarana at Vicenza, in plan and elevation
12. Plate 12, Palazzo Valmarana at Vicenza, Half of the main elevation
13. * Plate 13, Villa Paolo Almerico near Vicenza, in plan and half-elevation, half-section
14. * Plate 14, Palazzo Giulio Capra at Vicenza, in plan and elevation
15. * Plate 15, Palazzo Montano Barbarano at Vicenza, in plan and elevation
16. Plate 16, Palazzo Montano Barbarano at Vicenza Half of the main elevation
17. Plate 17, The Tuscan atrium, House of the ancients, in plan and long section
18. Plate 18, The Tuscan atrium, in plan and elevation
19. Plate 19, The atrium with four columns, in plan and elevation
20. Plate 20, The Corinthian Atrium, The Convent of the Carita at Venice,
    in plan and long section
21. Plate 21, The Corinthian Atrium, The Convent of the Carita at Venice,

Part sectional elevation

22. Plate 22, The Corinthian Atrium, The Convent of the Carita at Venice, Part sectional elevation
23. Plate 23, Testugginato Atrium, A private house of the ancient Romans, in plan and long section
24. Plate 24, Testugginato Atrium, A private house of the ancient Romans, in plan and section
25. Plate 25, A tetrastyle hall, Halls with four columns, in plan and sectional elevation
26. Plate 26, A Corinthian hall with half-columns, in partial plan and sectional elevation
27. Plate 27, A Corinthian hall with half-columns and pedestals, in partial plan and sectional elevation
28. Plate 28, An Egyptian hall, in partial plan and cross section
29. Plate 29, A private house of the ancient Greeks, in plan and cross section, with adjacent buildings
30. * Plate 30, Villa Vittore, Marco and Daniele Pisani at Bagnolo near Lonigo, in plan and elevation
31. * Plate 31, Villa Francesco Badoero at Polesine, in plan and elevation
32. * Plate 32, Villa Marco Zeno at Cesalto, in plan and elevation
33. * Plate 33, Villa Nicolo and Luigi Foscari at Brenta, in plan and elevation
34. * Plate 34, Villa Elettlo De Aquileia and Marc' Antonio De Barbari at Maser, in plan and elevation
35. * Plate 35, Villa Francesco Pisani at Montagnana, in plan and elevation
36. * Plate 36, Villa Giorgio Cornaro at Piombino, in plan and elevation
37. * Plate 37, Villa Leonardo Mocenico at Marocco, in plan and elevation
38. * Plate 38, Villa Leonardo Emo (or Erno) at Fanzolo, in plan and elevation
39. * Plate 39, Villa Biagio Sarraceno at Finale, in plan and elevation
40. * Plate 40, Villa Gioralmo Ragona at Ghizzole, in plan and elevation
41. * Plate 41, Villa Cavalier Pogliana (or Poiana) at Pogliana, in plan and elevation
42. * Plate 42, Villa Francesco Valmarana at Lisiera, in plan and elevation

43. * Plate 43, Villa Francesco and Lodovico De Trissini at Meledo, in plan and elevation

44. * Plate 44, Villa Mario Repeta at Campiglia, in plan and elevation

45. * Plate 45, Villa Odoardo (Oleardo) and Theodoro De Thiene at Cicogna, in plan and elevation

46. * Plate 46, Villa Giacomo Angarano at Angarano, in plan and elevation

47. * Plate 47, Villa Ottavio (Ottavie) Thiene at Quinto, in plan and elevation

48. * Plate 48, Villa Girolama De Godi at Lonedo, in plan and elevation

49. * Plate 49, Villa Marc' Antonio Sarego at Santa Sofia, in plan and sectional elevation

50. * Plate 50, Villa Anibale Sarego at La Miega, in plan and elevation

51. * Plate 51, Villa of the Ancients, in plan and elevation

52. * Plate 52, A project for a palazzo on a triangular site, in plan and elevation

53. * Plate 53, A project for a palazzo on a site in Venice, in plan and elevation

54. * Plate 54, A project for a palazzo for Francesco and Lodovico Trissino in Vicenza,
in plan and elevation

55. * Plate 55, A project of Palazzo for Giacomo Angarano in Vicenza, in plan and elevation

56. * Plate 56, A project of Palazzo for Gio. Battista Della Torre in Verona,
in plan and elevation

57. * Plate 57, A project of Palazzo for Gio. Battista Garzadore in Vicenza,
in plan and elevation

58. * Plate 58, A project of Villa for Leonardo Mocenico in Brenta,
in plan and elevation

4.3 PARAMETERS OF ANALYSIS: APPLICATION OF THEORY IN VILLA PLANS OF *'I QUATTRO LIBRI DELL' ARCHITECTTURA' BOOK2*

The analysis is set in four sub parts for each plate.

1. First part sets all Palladian Villa plan plates to one of the ten selected set of scale as per the spread of the structure for comparative overview.

2. Second part redraws plates to set parameters of wall thickness, door and window size to minimize and overcome inconsistencies of wood cut prints of plates in book two. This gives insight to evaluate and estimate missing dimensions and at the same time helps to identify typographical errors in the plates. (***"An important difficulty is that the dimensions stated in plans often do not correspond to those of executed work. Also, the plans presented in the treatise consistently omit information about wall thickness, which makes it impossible to calculate the total lengths and widths of the buildings."*** Braviko Mitrovic, 'Learning from Palladio', pg. 64. Wall thickness and its unit of measure are dealt in article "Structural Implications in Palladio's use of Harmonic Proportions" by Elwin C. Robinson.)

3. To arrive at such proportional design; part three of analysis sets schematic line diagrams. According to Lionel March in his article "Palladio's Villa Emo: The Golden Proportion Hypothesis Rebutted" Palladio did not account for wall thickness while designing. To understand villa plans with ratios intended theoretically the plans are set in schematic single line diagrams. This helps us understand combination and juxtapositions of sub ratios or individual room ratios to generate a complete whole. Non standard ratios observed through such analysis are marked with oblong capsule shape around it. Such ratios with its relative theory of evolution are tabulated at end of analysis of all plates.

4. The section four of analysis is to regenerate and reconstruct Palladian villa plans on the assumption of modern day construction technologies of this part of the world (Ahmedabad, India) to rekindle planning grammar of Palladio for contemporaries. It is based on common brick size of 9" length x 4.5" width x 3" height, reinforced cement concrete columns to be 9" wide (so as to be concealed in 9" thick brick masonry, leaving no column offset in room; as in Palladian plates) by 12", 15", 24" and so on in length and 1.5" thick cement plaster on both sides of wall making finished wall as one foot thick. Tread are shown one foot wide in regular dog leg staircases. On reconstruction of door and window breadths the study follows Palladio's notes in

'Chapter XXV. On The Dimensions Of Doors And Windows'.

4.4 UNDERSTANDING SCHEMATIC PLANS

This part of analysis is to reconstruct plan to built understanding of underlying principles of Palladian planning grammar.

George Hersey and Richard Freedman in 'Possible Palladian Villas'; page115 states ***"Palladio labels dimensions in the Quattro Libri not simply to tell us the sizes of the rooms but to signal their proportions. Palladio's dimensions, supposedly, serve a higher pedagogical purpose".*** The altered dimension is to build an understanding of planning grammar by reducing un-Palladian disparity.

"it was realized in the 18th century that the dimensions given by Palladio do not in fact correspond strictly with those of the monuments themselves. Furthermore, the measurements quoted in the text do not always agree with those in the plates, and those of details such as capitals and cornices may not correspond either. There is no simple answer to such problems. In some cases, anomalies can be attributed to carelessness, haste, or typographical errors. In others it seems that Palladio was subjecting the buildings of the ancients to his own sophisticated process of idealization - harmonizing the proportions, regularizing the irregular, and balancing the asymmetrical." Writes Deborah Howard in "Four centuries of literature on Palladio," Book Review Essay, Journal of the Society of Architectural Historians (1980), page 226-227.

This raises a need of regularizing and adjusting dimensions to make plan theoretically more suitable, perfect and adoptable. Dimensions are then pragmatically altered and adopted to suite and show the formation of an ideal plan with respect to the basis of Palladian grammar of proportions.

By virtue of such rectifications in room dimensions one gets different room ratios as absolute values. They are classified as Prescribed room ratio (i.e. Palladio's preferred seven room ratios), Derived room ratios (i.e. ratios that could be derived from the theories of Palladio's predecessors and other relevant theories as explained in previous chapters) and Non theoretical room ratios (i.e. the ratios that neither could be related to Palladio's preferred ratios nor could be derived from the theories of Palladio's predecessors). They are then tabulated to form comparative understanding of different ratios and its deviation from basic ratios (that are generated on the basis of room dimensions from Palladio's plates). This is done to generate comparative matrix of ratios through various stages of analysis.

Where needed and possible; the analysis begins with understanding of module of measure from plates in book two which is used to restructure plan. The study then finds the relationship between length and breadth of building whole to show that not only rooms had ratios but also building as a whole had overall ratios.

Next step brings out divisions in front and sides of plan to learn about beauty generated out of symmetry and repetition of ratios and design elements. Analysis then tries to build understanding of Palladian planning grammar by identifying standard room ratios and non standard room ratios in plan along with perceptible constitutional formation of the non standard room ratios at the end in tabular format.

Though this work does not study elevations; they are shown to have flair of manifestation of the planning theory in third dimension. Where reference was available the analysis incorporates an image of the structure for easy correlation and appreciation of theory and practice. This also helps to set sequence and chronology of plates (To set such as sequence of diagrams, the chapter starts from even page) . The page sets in a rhythm by which the written text describing schematic line diagram plans fall against each other for ease of correlating plan and the narrative. Images are missing for plate numbers 52 to 58 for obvious reasons that they were used as projects by Palladio to demonstrate theory and were never built.

4.5 CRITERION FOR ASSUMING ROOM DIMENSIONS AND DATUM FOR CHANGING ROOM DIMENSIONS

As this research lays importance on understanding proportions and implementation of Palladio's theory of proportions in villa plans rather than structural requirements and its implications on implementation of proportional theory in practice, the research relies on dimensions from the plates and dimensions derived from redrawn plans (and not on executed dimension as explained earlier in the work).

If Palladio mentions only one dimension of a room in plate of villa plan, the other room dimension is assumed on the basis of symmetry of plan (mirror reflection and congruent condition) or is derived from the redrawn plan. This dimensions derived from redrawn plan may vary from intended or actual room dimension by Palladio; as these plans are redrawn on assumption of wall thickness as 2 feet thick; (It is observed through redrawn plans that Palladio shows wall thickness in plate of villa plan as 2' thick) which, at times; may not be the actual or structurally practical case. Hence to understand implementation of his proportional theory in plans; it is imperative to derive our room sizes on assumption of his theory being implemented to greatest extend in his illustrative and theory demonstrative villa plans. The study tries to generate such plans to achieve proportionally better plan that may be suggested by Palladio thereby improving his plans with respect to his theory of seven room ratios or ratios deciphered from theories of proportions by his predecessors.

In doing so research modulates dimension for wall thickness to arrive at schematic line diagrams. This plan modulation or dimension modification could be classified in two parts; one for understanding of room ratios and other done to decipher over all ratio of plan while compensating for all walls in plan. To maintain over all geometry and proportion of layout one has to compensate for total number of internal and external walls to derive at single line schematic diagrams which are to understand implied or intended ratios in villa planning by Palladio.

On the basis of observation that Palladio mentions room sizes in fractions of ¼, ½, ¾ of foot and a foot, room sizes are modified to nearest figure up or down to establish prescribed or derived room ratio so as invalid design states are eliminated to set a clear understanding of the use of proportion by Palladio in his plans. This adjustment of room size can be seen as accommodating for wall thickness. It would help compensate for wall thickness that as observed is up to 24 inch thick. Compensating for this wall thickness, plans are so generated that accumulative compensation for wall thickness is either set in one room size or distributed in intentionally among various rooms to arrive at proportional design, that is to make such line diagrams proportionally more definite. In average; such spectrum of deviation is set between 3" to 4' for one such room modulation. The lower limit is set on the basis that Palladio mentions ¼' as smallest module of fraction in his villa plans. The upper limit is set on consideration of wall thickness as 2' and changes for both walls added to one room. This modulation grows beyond 4' at times due to vast expanse of the project with complex and proportionally interlocked planning. In rare cases of 15 numbers as mentioned hereunder, which constitutes 2.80 % of total 534 sided of 267 rooms, such modulation is beyond 4'. It is observed that 5' variation happens two times, 6' variation- six times, 7' variation- three times, 8' variation- 2 times, 12' variation- one time and 16' variation- one time. This is deliberately done to maintain overall profile of the plan structure, i.e. to maintain complex geometry of room planning bound in outer polygonal geometry and at the same time derive at overall proportional layout.

4.6 ANALYSIS AND UNDERSTANDING OF PALLADIO'S VILLA PLANS OF 'I QUATTRO LIBRI DELL' ARCHITECTTURA' BOOK2

In-depth analysis (diagrammatic and narrative) and its understanding, divided in six parts for each plate is presented in following pages. All selected thirty eight plates of Palladian villa plans from book two of *I Quattro Libri dell' Architecttura* are elevated to same platform of predefined parameters (as explained earlier) for analysis to skim out quintessence of his planning and derive at concluding and comprehensive understanding of adaptation and implementation of Palladio's theory of proportion in his planning grammar across his works.

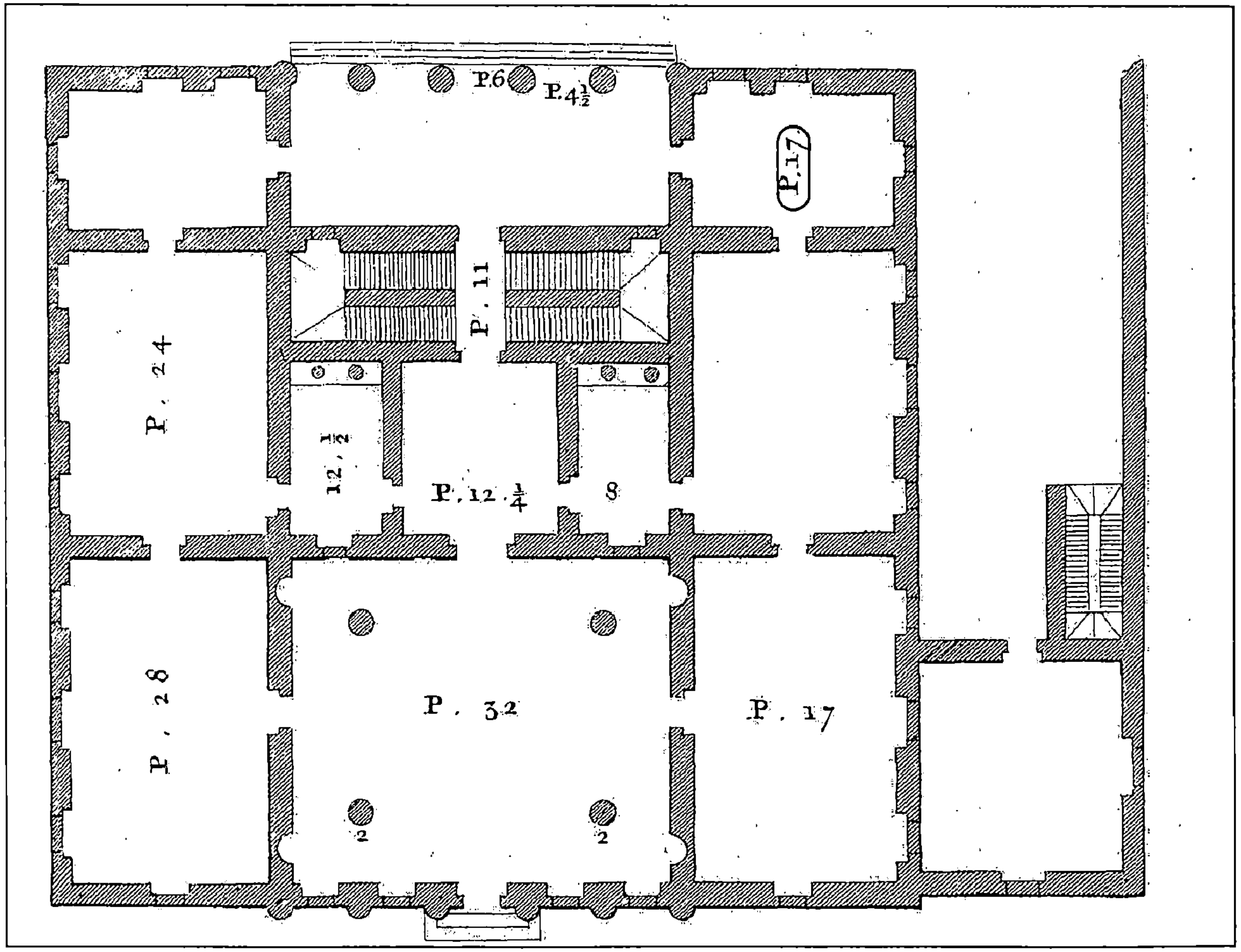


Figure 4.1 Plan Of Florino Antonini In Udine Scanned From Plate 001,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

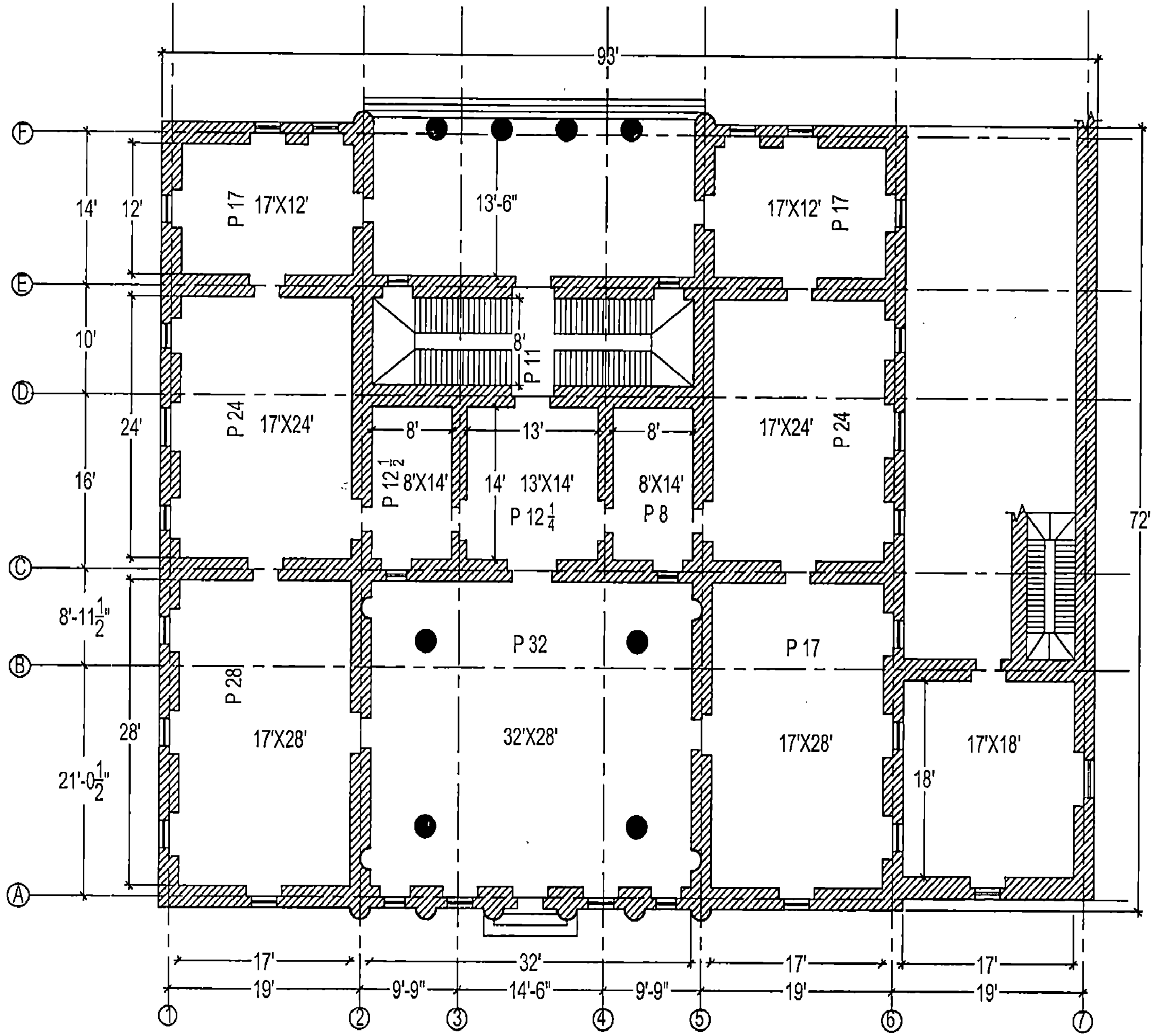


Figure 4.2 Plan Of Florino Antonini In Udine Redrawn From Plate 001, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

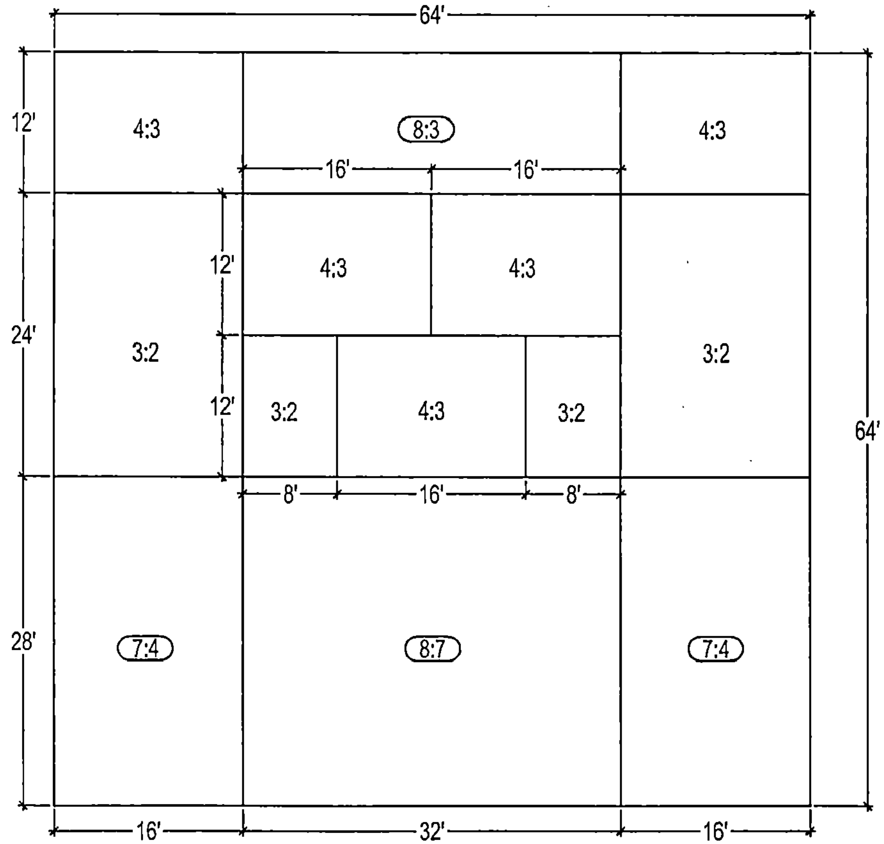


Figure 4.3 Schematic Analysis Of Florino Antonini In Udine, Plate 001, 'i Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 01, PALAZZO ANTONINI AT UDINE.

We can infer the following from schematic line diagram analysis:

- The building whole is 64' x 64' which is a square or 1:1
- The front is divided in to 16':32':16' which is 1:2:1 and symmetrical on central axis. While side is divided in to 12':24': 28' which is 3:6:7 and hence is not symmetrical.
- Central rooms are also seen placed in symmetrical manner 8': 16' : 8' which is 1:2:1
- Main room sizes and ratios observed are 12'x8', 16'x12' and 24'x12' which could be interpreted as 3:2, 4:3 and 2:1.
- Non standard room ratios like 8:7, 8:3 and 7:4 are identified

  8:7 could be understood as square and one seventh.

  8:3 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

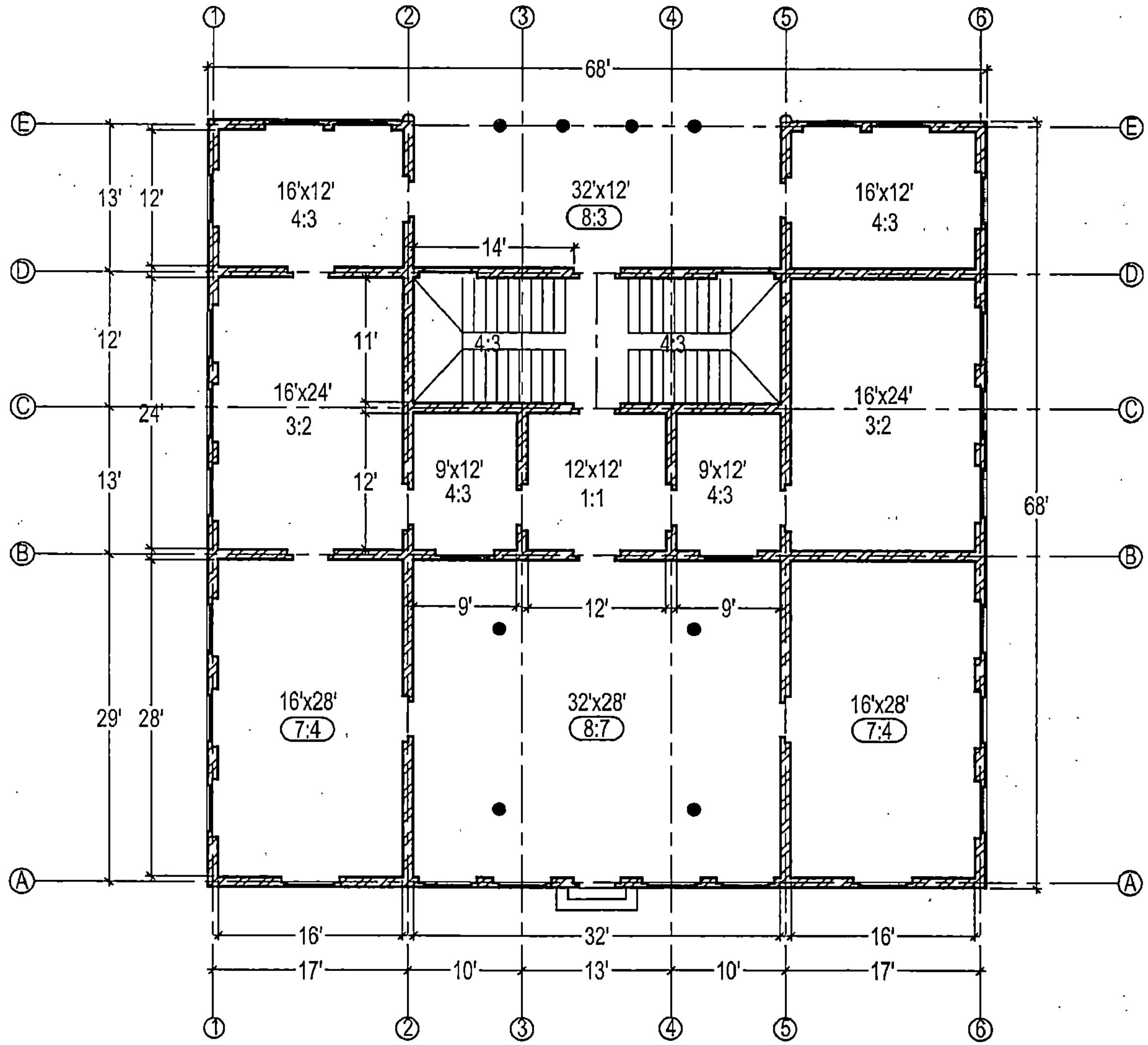
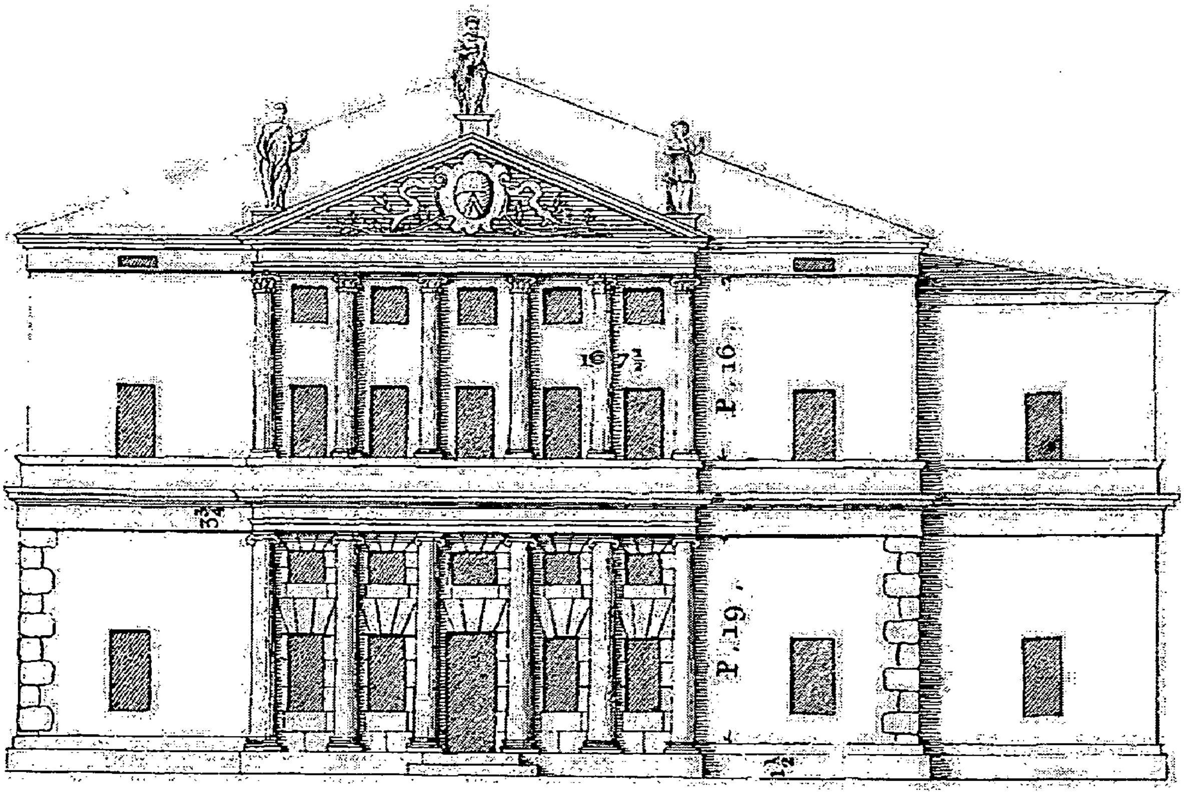
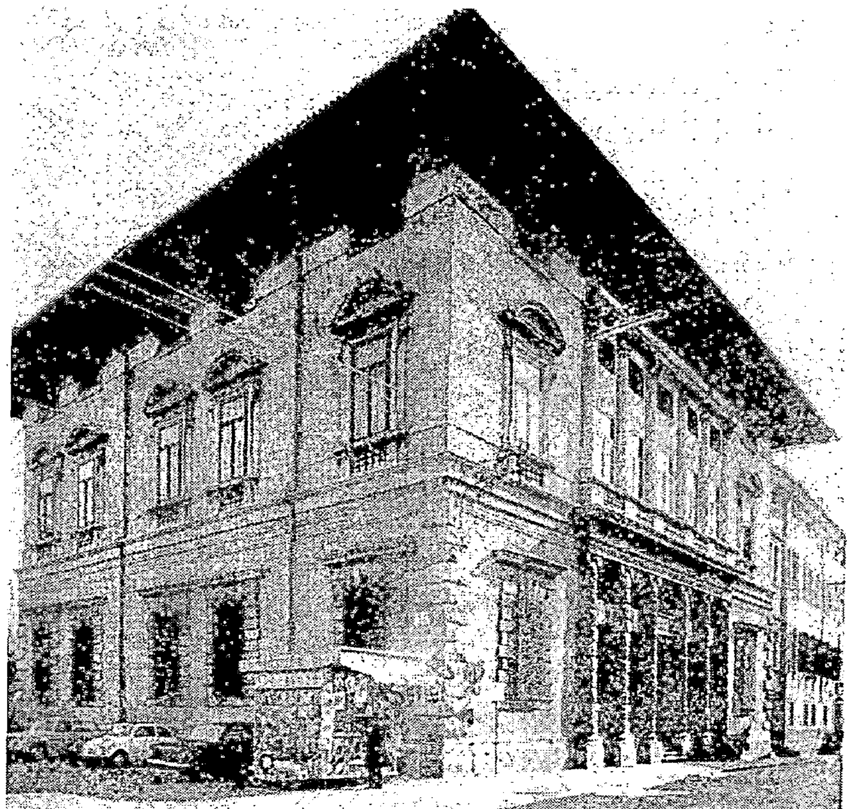


Figure 4.4 Plan of Florino Antonini In Udine, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 01 Palazzo (or Palagio) Antonini at Udine ground elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 68
Figure 4.5 Elevation & View of Palazzo AntoniniPalazzo (or Palagio) Antonini at Udine

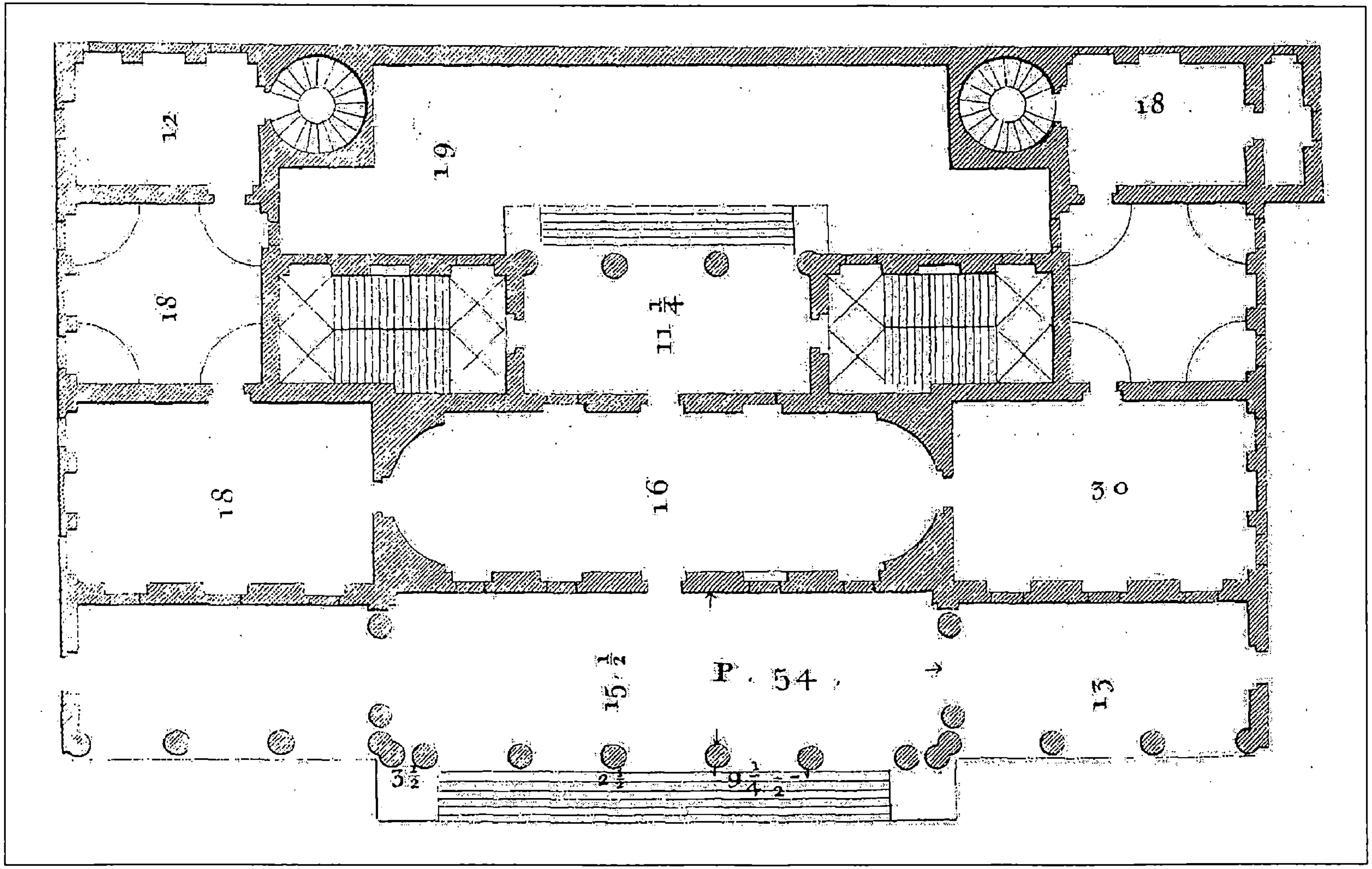


Figure 4.6 Plan Of Valerio Chiericati in Vicenza Scanned From Plate 002,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

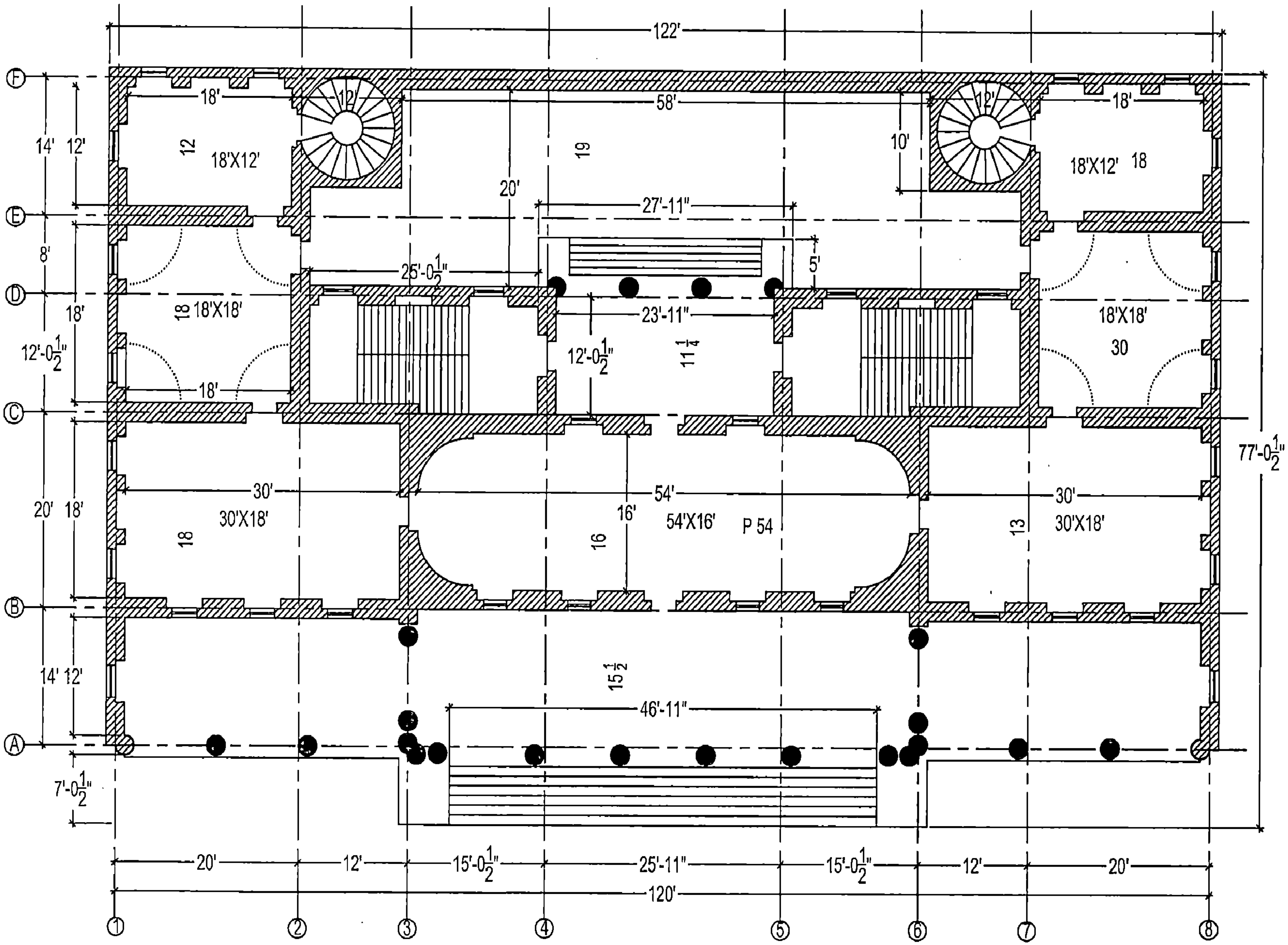


Figure 4.7 Plan Of Valerio Chiericati in Vicenza Redrawn From Plate 002, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

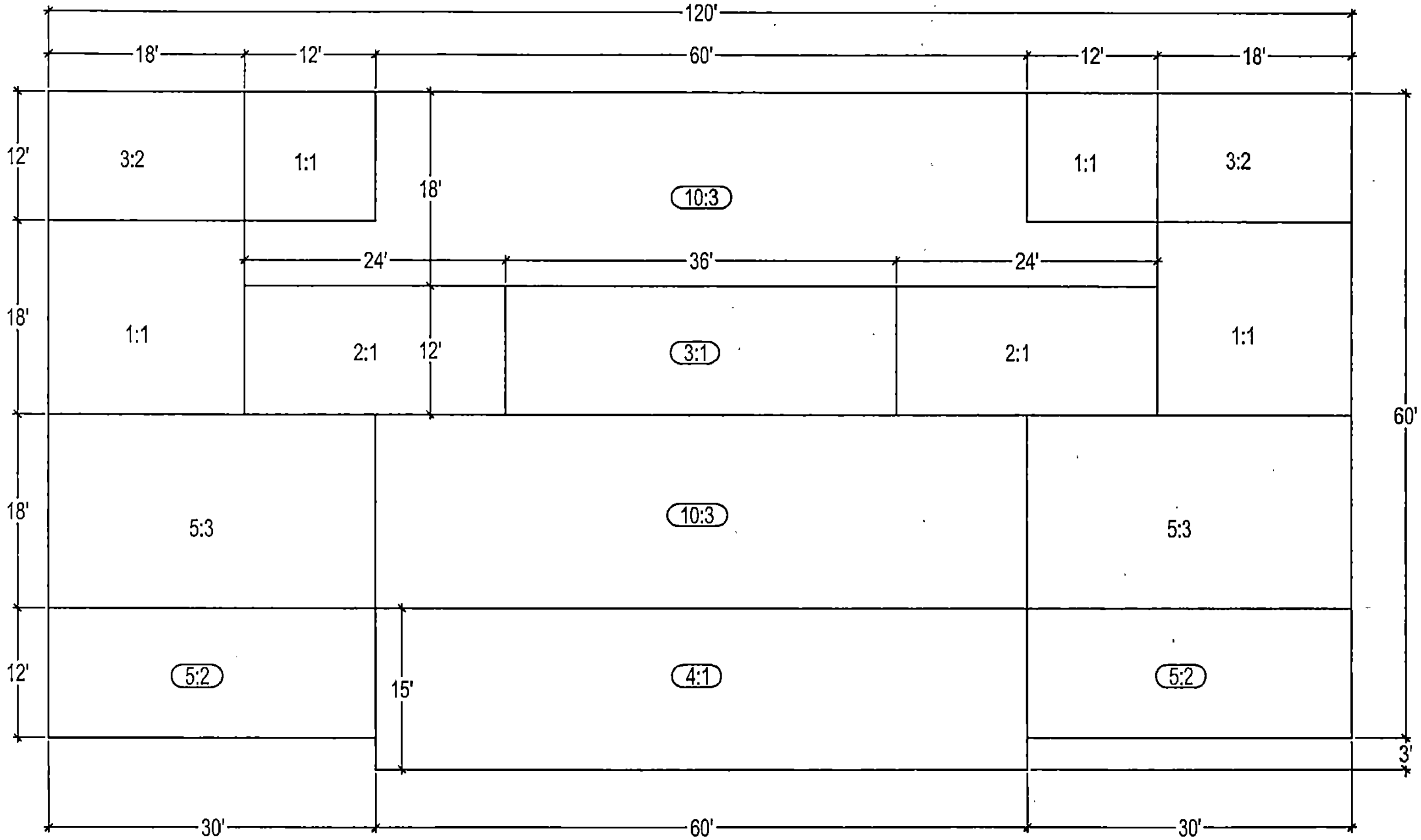


Figure 4.8 Schematic Analysis Valerio Chiericati in Vicenza, Plate 002, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 02, PALAZZO CHIERIRATI AT VINCENZA.

We can infer the following from schematic line diagram analysis:

- The building whole is close to120' x 60' which is two squares or 2:1
- The front is divided in to 30' : 60' : 30' which is 1:2:1 and symmetrical on central axis. While side is divided in to 12':18': 18':12' which is 2:3:3:2 or 30':30' which is 1:1 and symmetrical on central axis.
- Main room sizes and ratios observed are 12'x12', 18'x12', 18'x18' and 30'x18' which could be interpreted as 1:1, 3:2, 1:1 and 5:3.
- Non standard room ratios like 10:3, 5:2, 4:1 and 3:1 are identified

  10:3 could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 2:1 = 10:3 (a:b x c:d = ac:bd)

  5:2 could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).

  4:1 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 2:1 = 4:1 (a:b x c:d = ac:bd)

  3:1 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

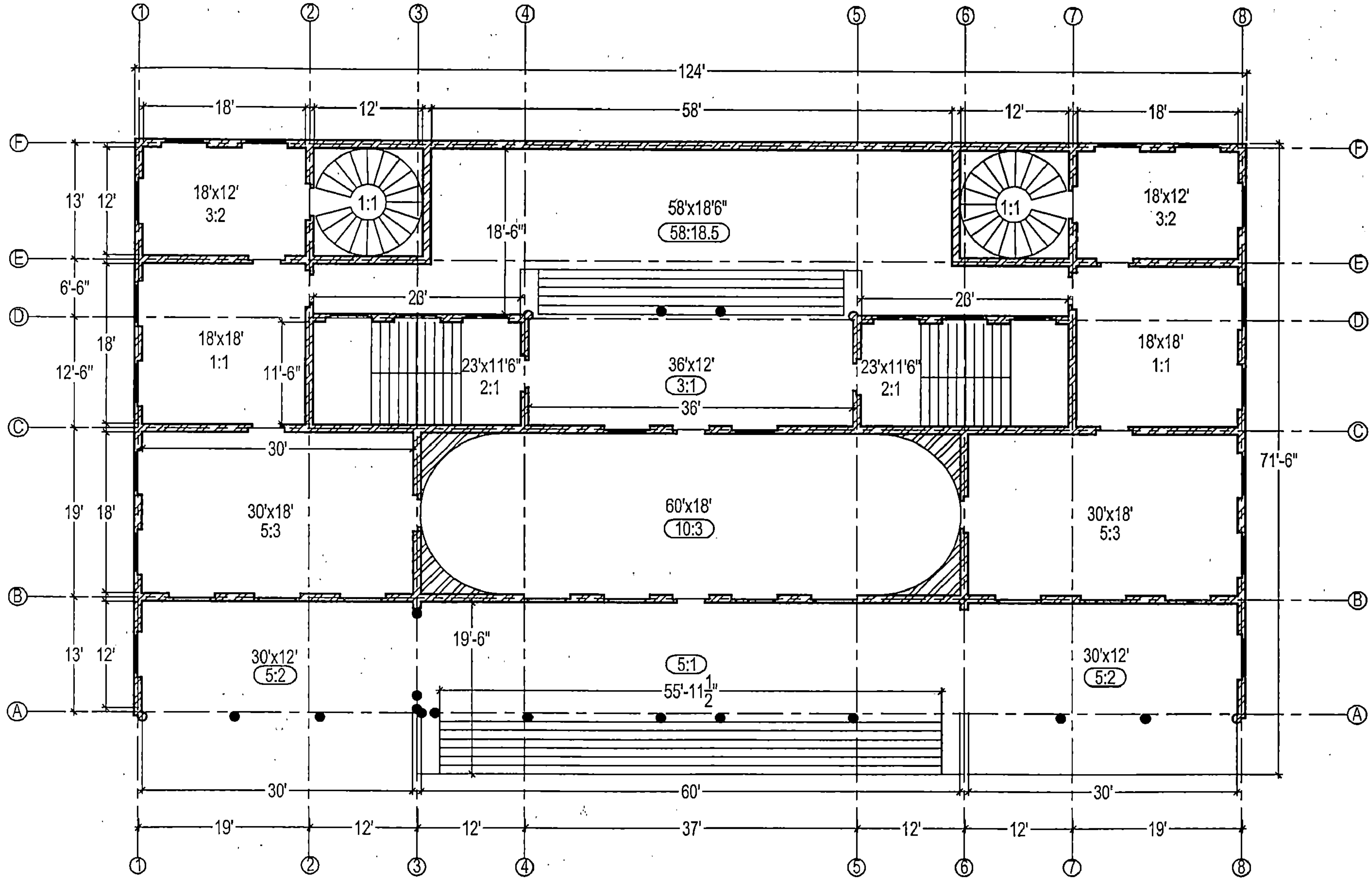
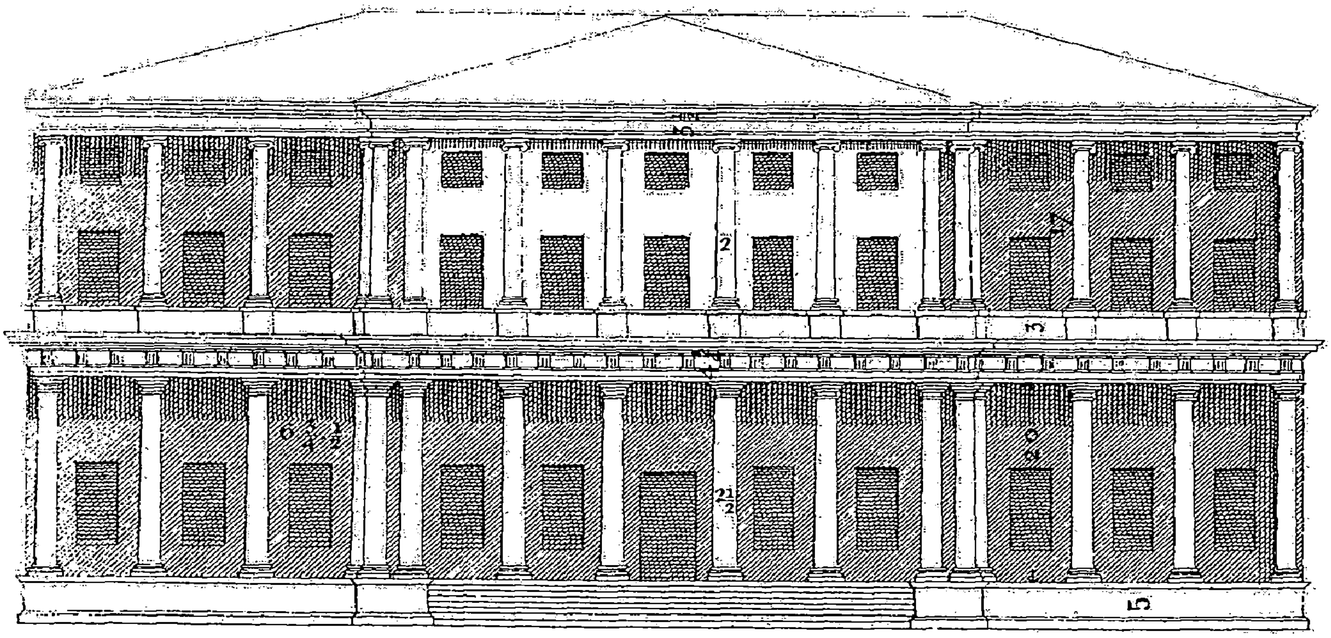
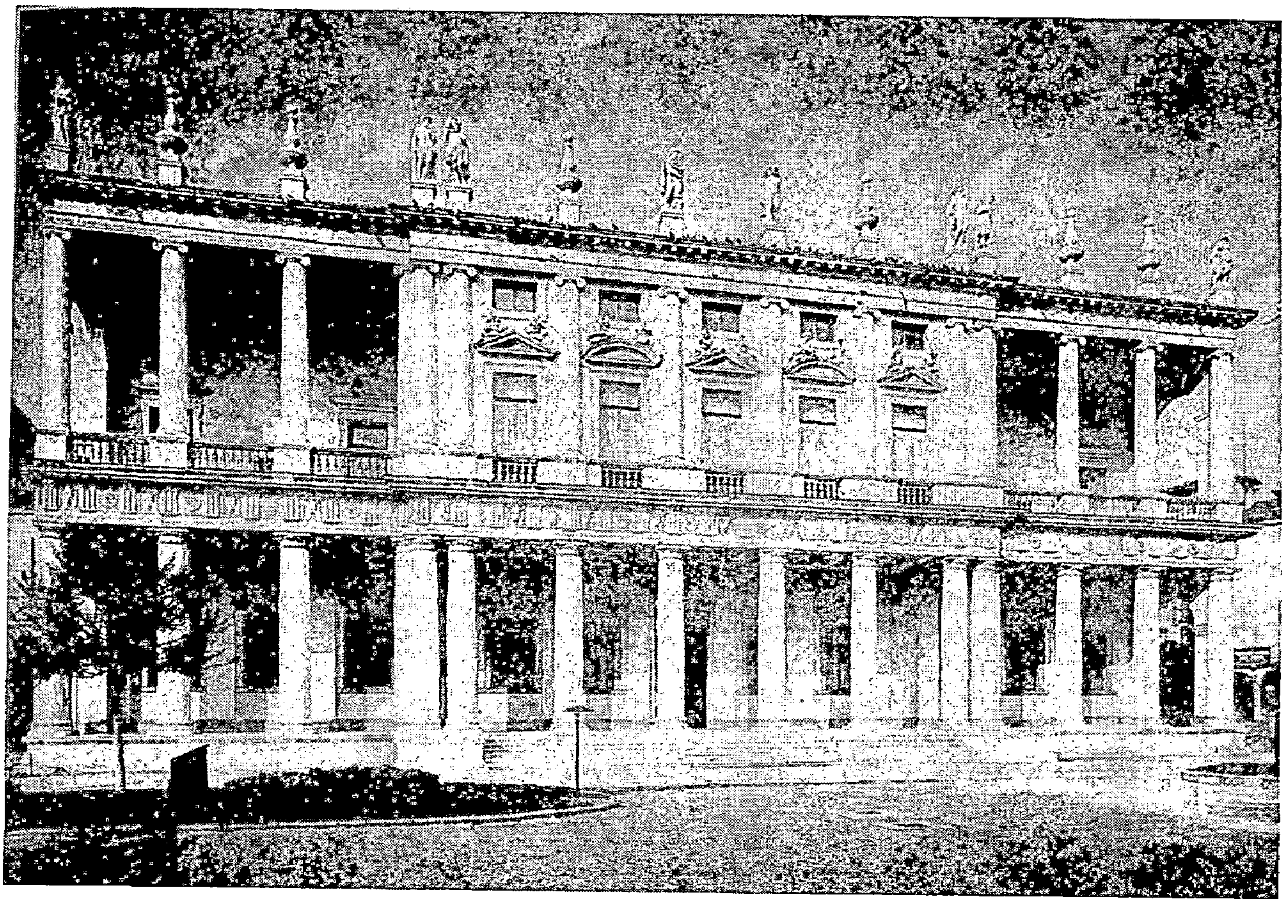


Figure 4.9 Plan of Valerio Chiericati in Vicenza, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 02 Palazzo Chierirati at Vincenza Ground elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 49
Figure 4.10 Elevation & View of Palazzo Chierirati Palazzo ChieriratiGround

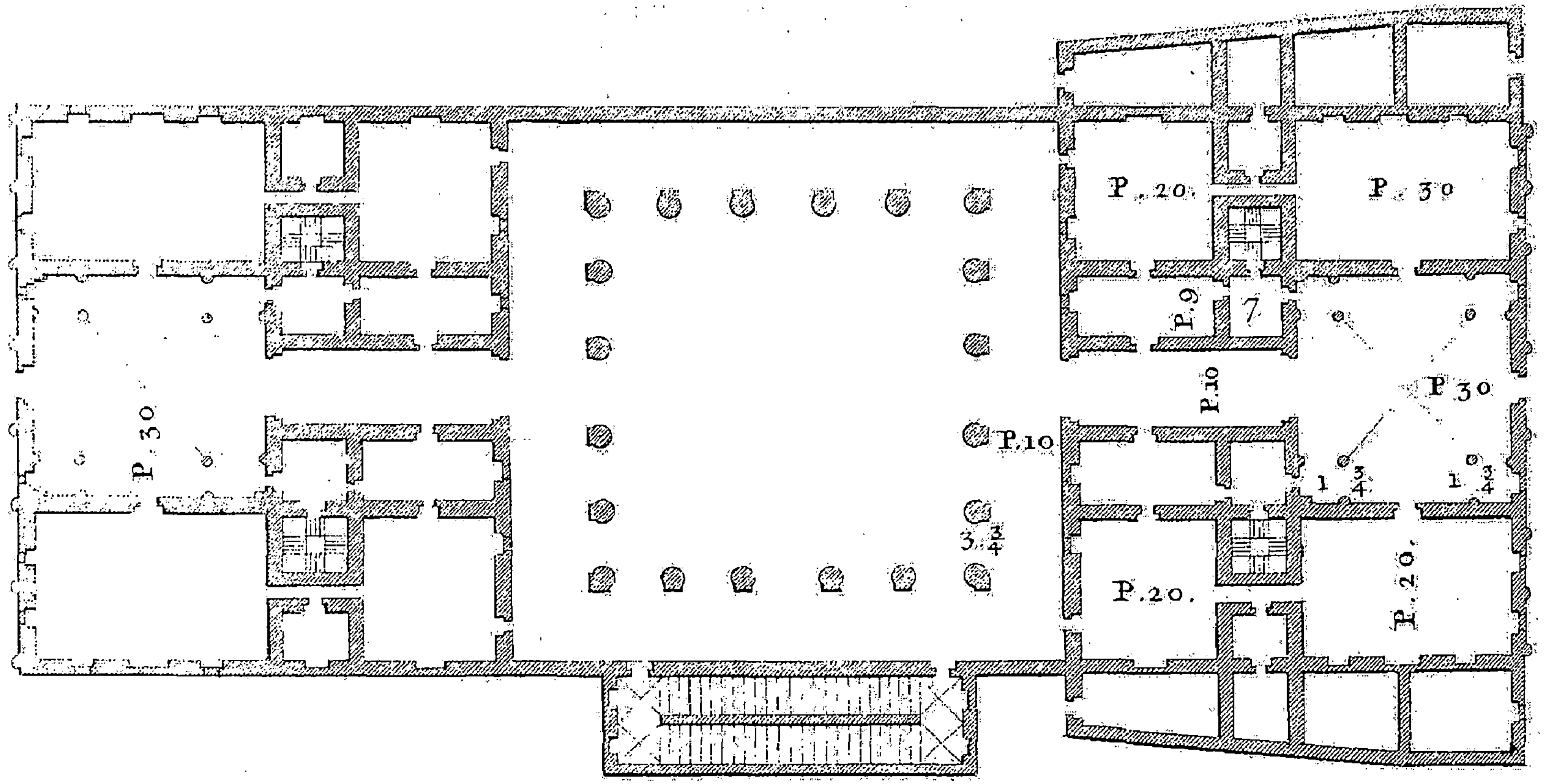


Figure 4.11 Plan Of Palazzo Iseppo de' Porti at Vicenza ground plan Scanned From Plate 004, 'I Quattro Libri Dell' Architecttura', Book-2

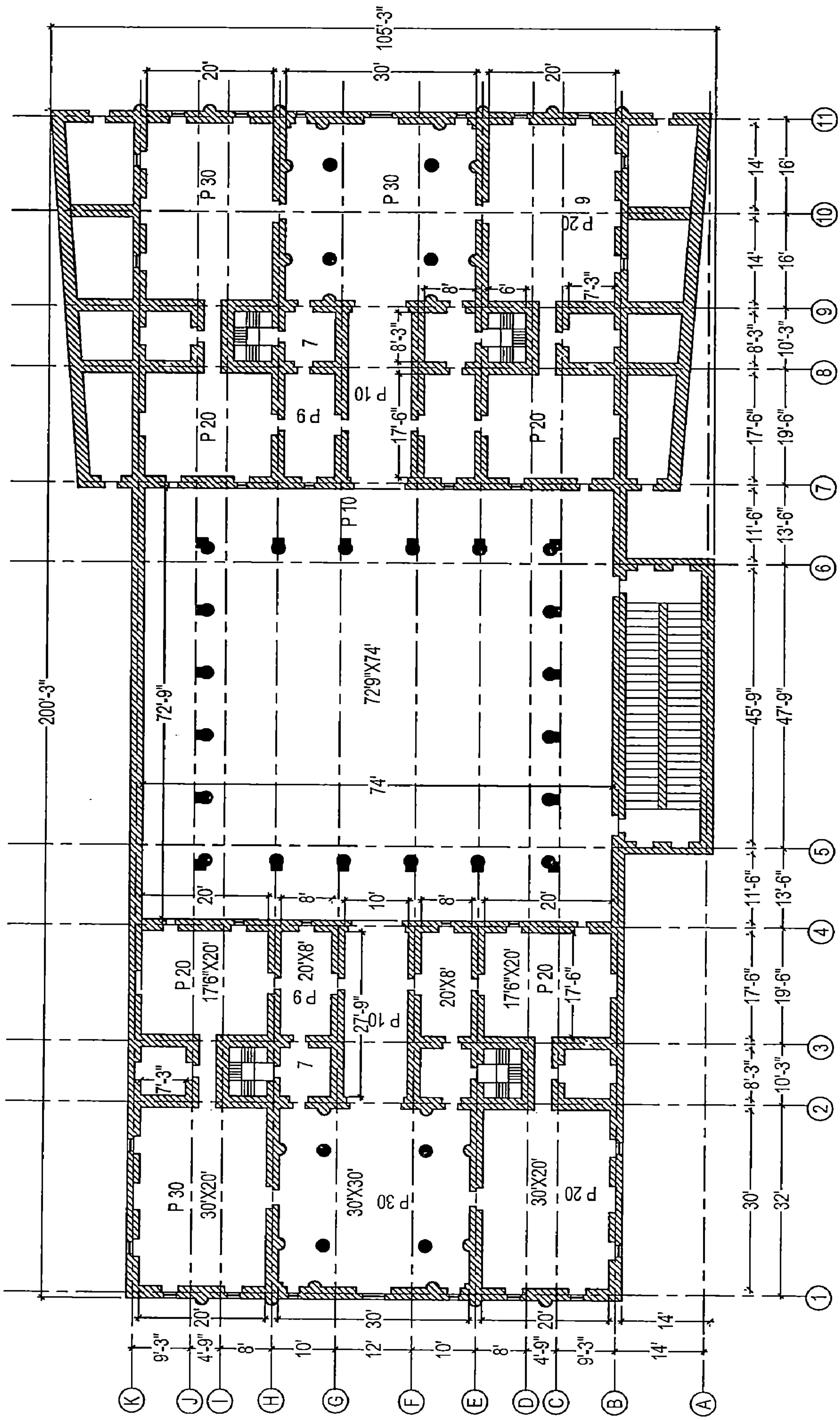


Figure 4.12 Plan Of Iseppo de' Porti in vicenza Redrawn From Plate 004, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

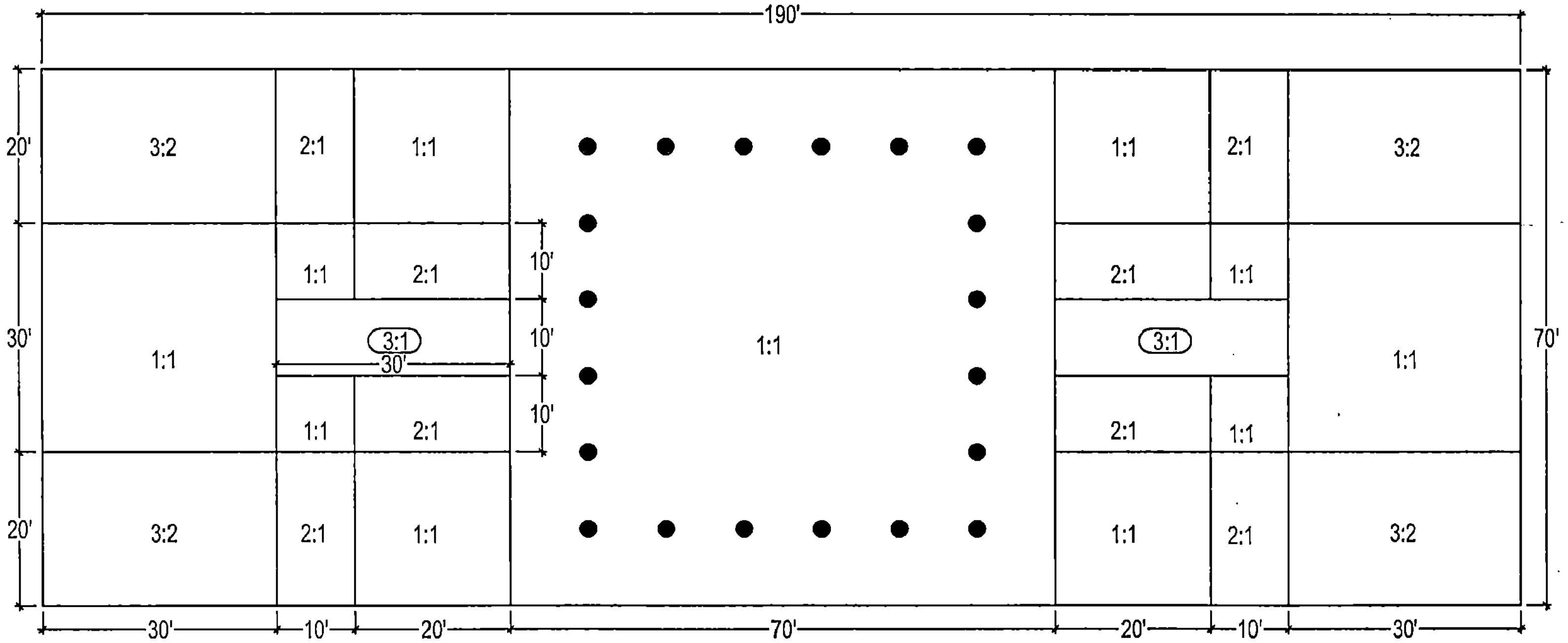


Figure 4.13 Schematic Analysis Iseppo de' Porti in vicenza, Plate 004,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

PLATE 04, PALAZZO ISEPPO DE' PORTI AT VICENZA.

We can infer the following from schematic line diagram analysis:

- The building whole is 190'x70'
- The central court yard is 70'x70' which is 1:1
- The building wings on either sides of central court yard are 60'x70' making the whole layout symmetrical on central axis.
- Main room sizes and ratios observed are 10'x10', 20'x10', 30'x20' and 30'x30' which could be interpreted as 1:1, 2:1, 3:2 and 1:1.
- Non standard room ratios like 3:1 is identified which finds mention in Alberti's theory of long room ratios.

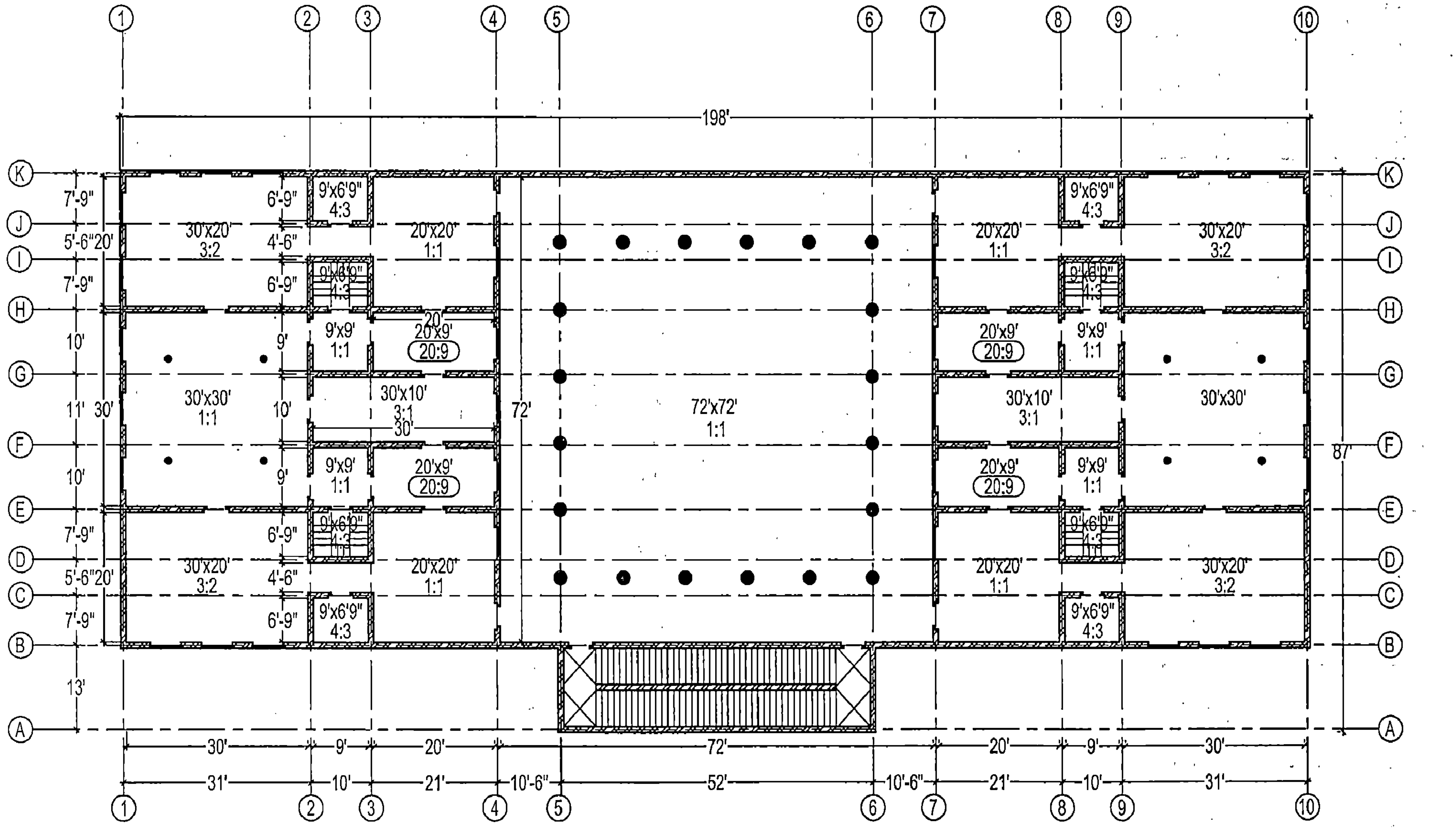
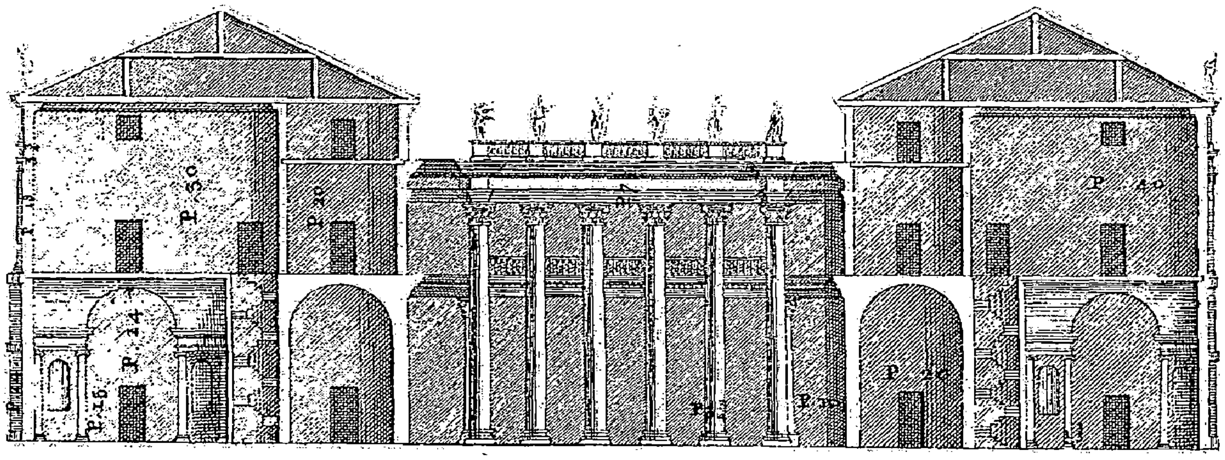
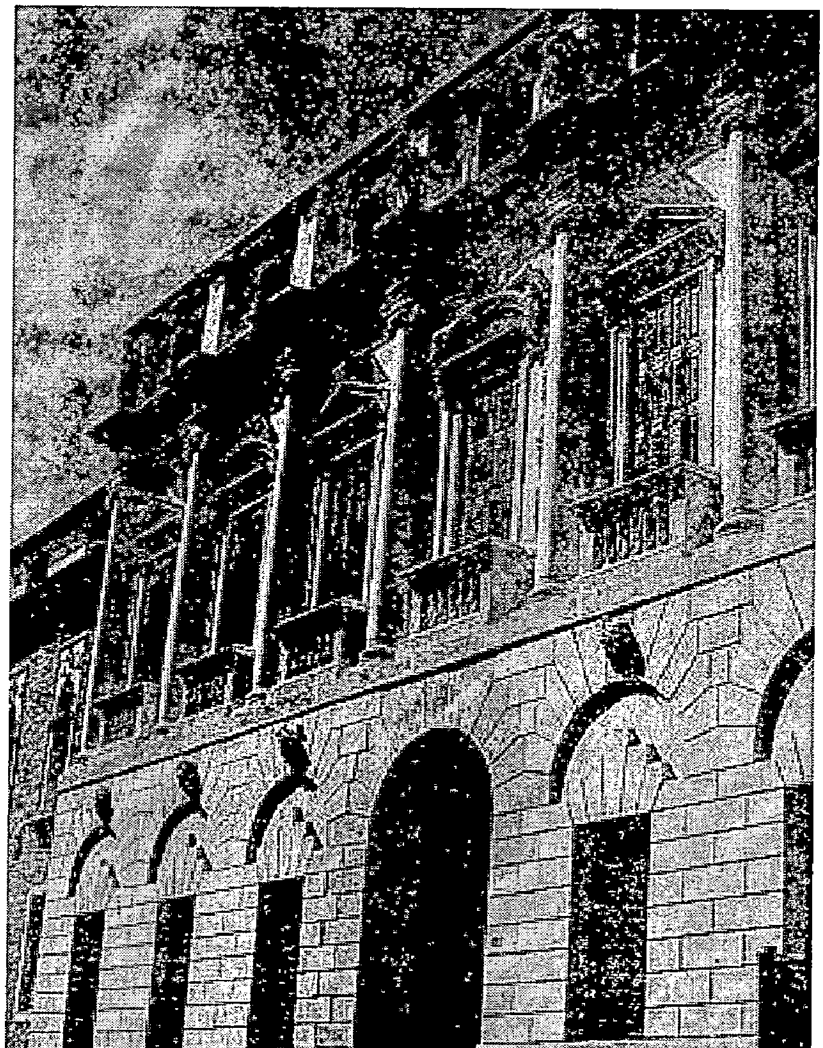


Figure 4.14 Plan of Valerio Chiericati in Vicenza, developed on the basis of schematic analysis



Source: Plate 04 Palazzo Iseppo de' Porti at Vicenza ground long section



Source: www.skyscrapercity.comsection
Figure 4.15 Elevation & View of Palazzo Iseppo De' Porti

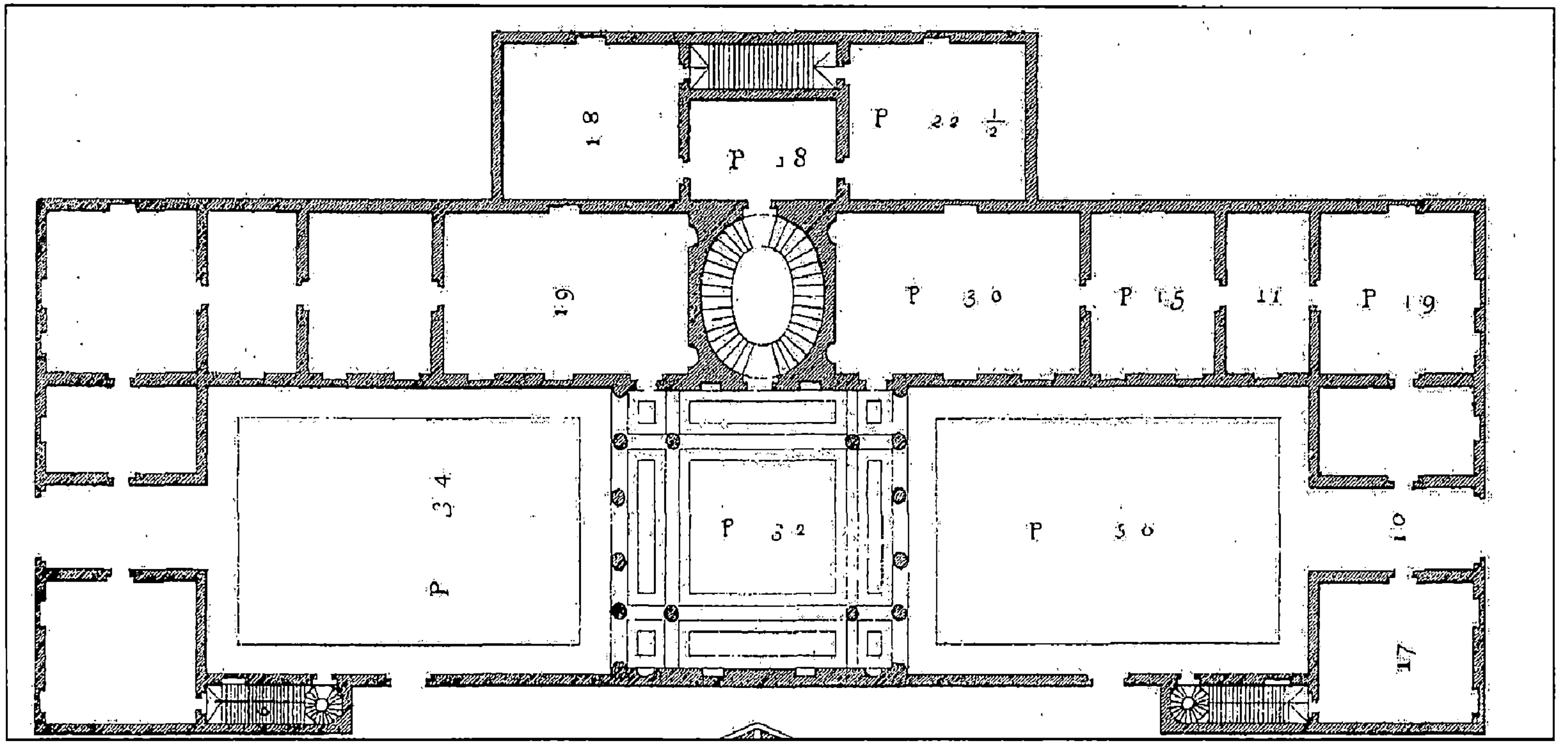


Figure 4.16 Plan Of GioVanni Battista dalla Torre in Verona Scanned From Plate 007, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

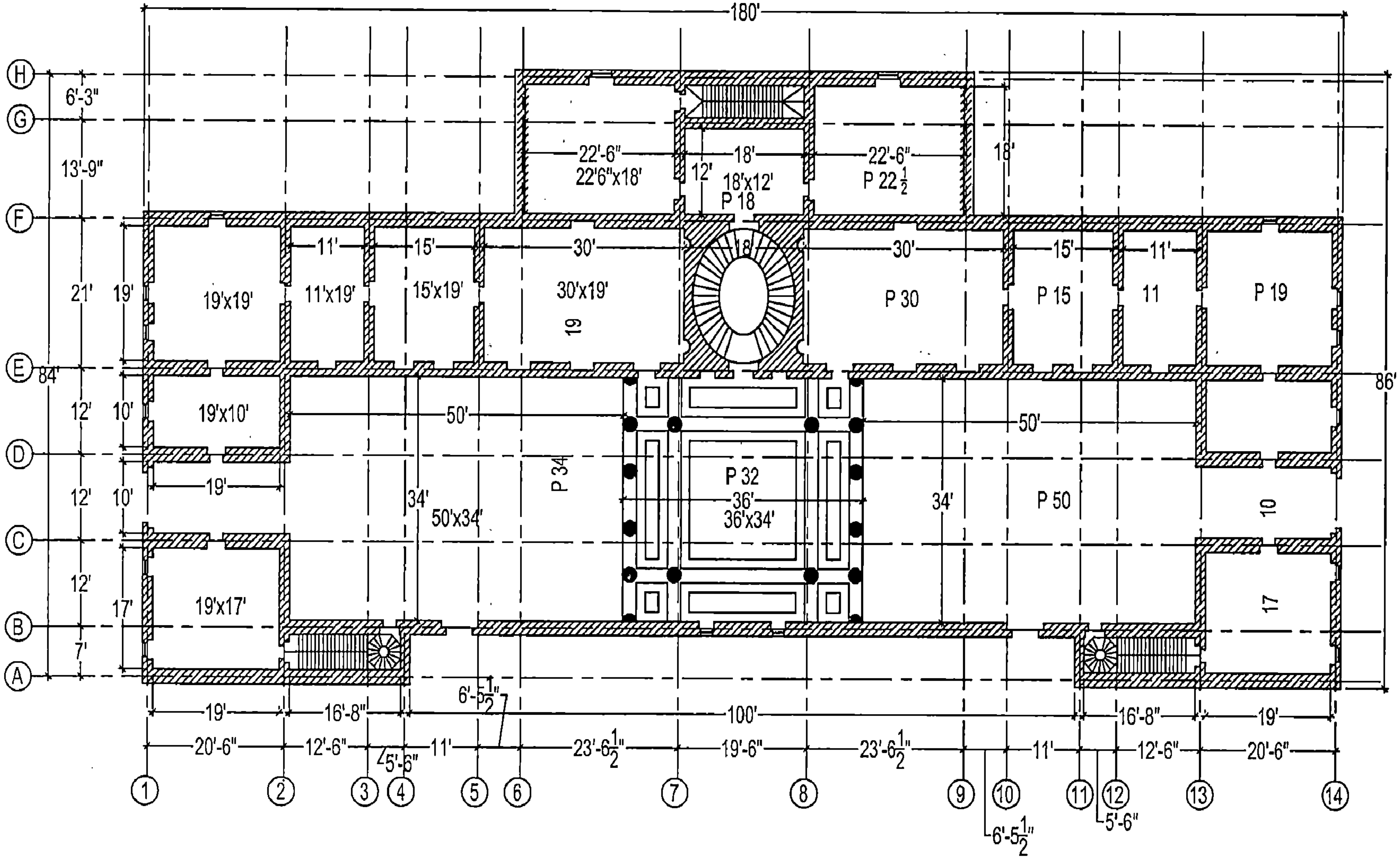


Figure 4.17 Plan Of GioVanni Battista dalla Torre in Verona Redrawn From Plate 007,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

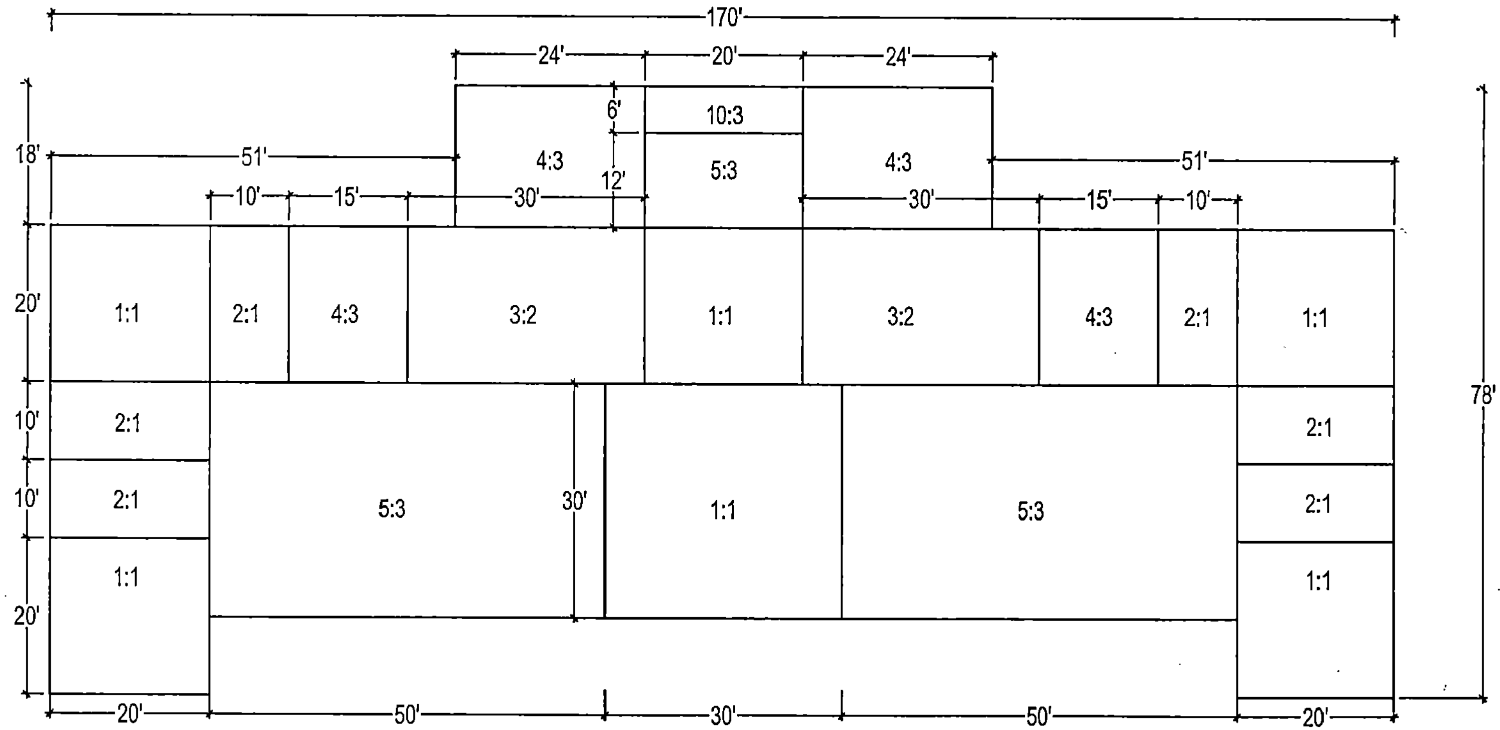


Figure 4.18 Schematic Analysis GioVanni Battista dalla Torre in Verona, Plate 007, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

PLATE 07, PALAZZO GIOVANNI BATTISTA DELLA TORRE

We can infer the following from schematic line diagram analysis:

- The building whole is 170'x78'
- The central court yards are 50'x30' which is 5:3
- The building wings on either sides of central court yard are 70'x60' making the whole layout symmetrical on central axis.
- Main room sizes and ratios observed are 20'x20', 30'x20', 20'x15' and 30'x30' which could be interpreted as 1:1, 3:2, 4:3 and 1:1.
- No non standard room ratios are identified.

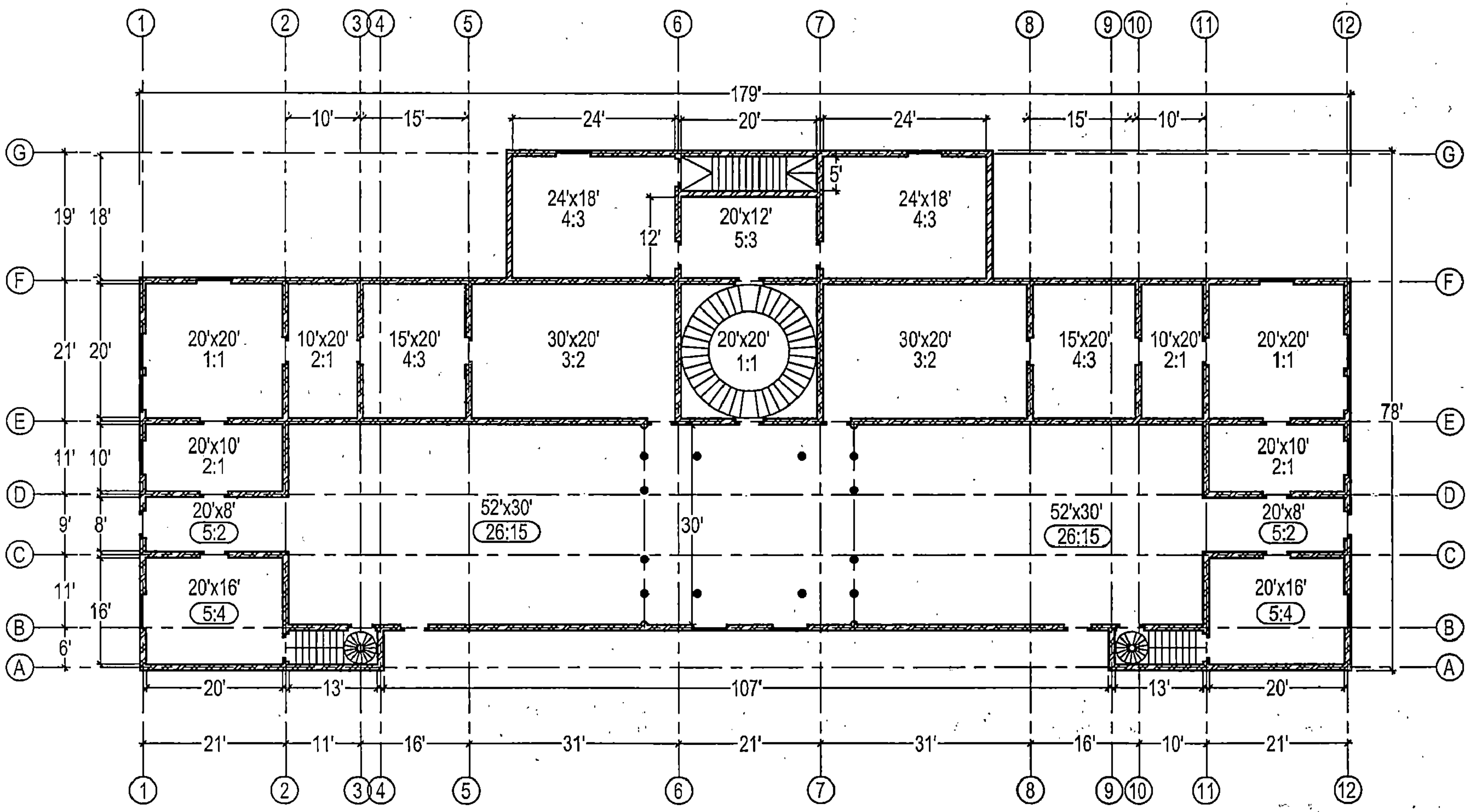
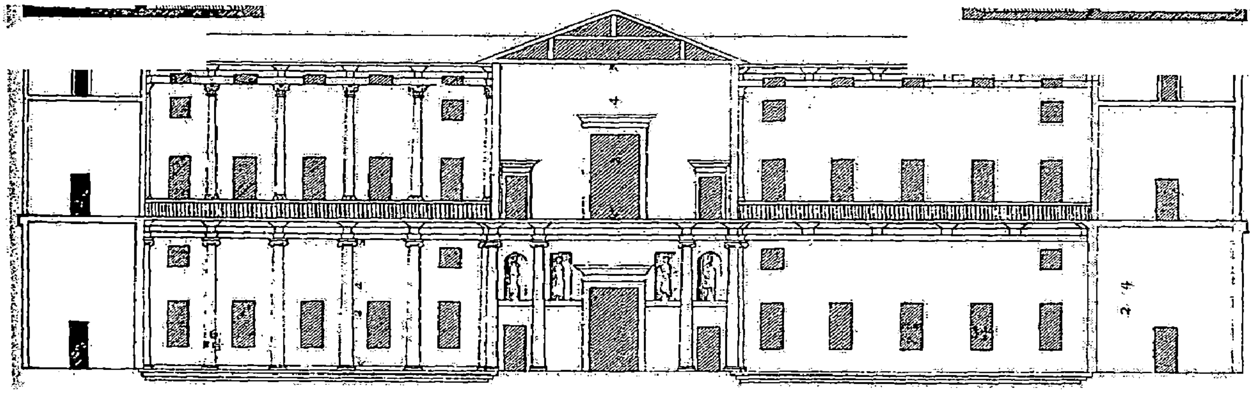


Figure 4.19 Plan of GioVanni Battista dalla Torre in Verona, developed on the basis of schematic analysis

Scale 1" = 24'



Source: Plate 07 Palazzo Giovanni Battista Della Torre at Verona in cross section

Source: Constant Caroline, 'The Palladio Guide', pg. 59
Figure 4.20 Elevation & View of Palazzo Giovanni Battista Della Torre

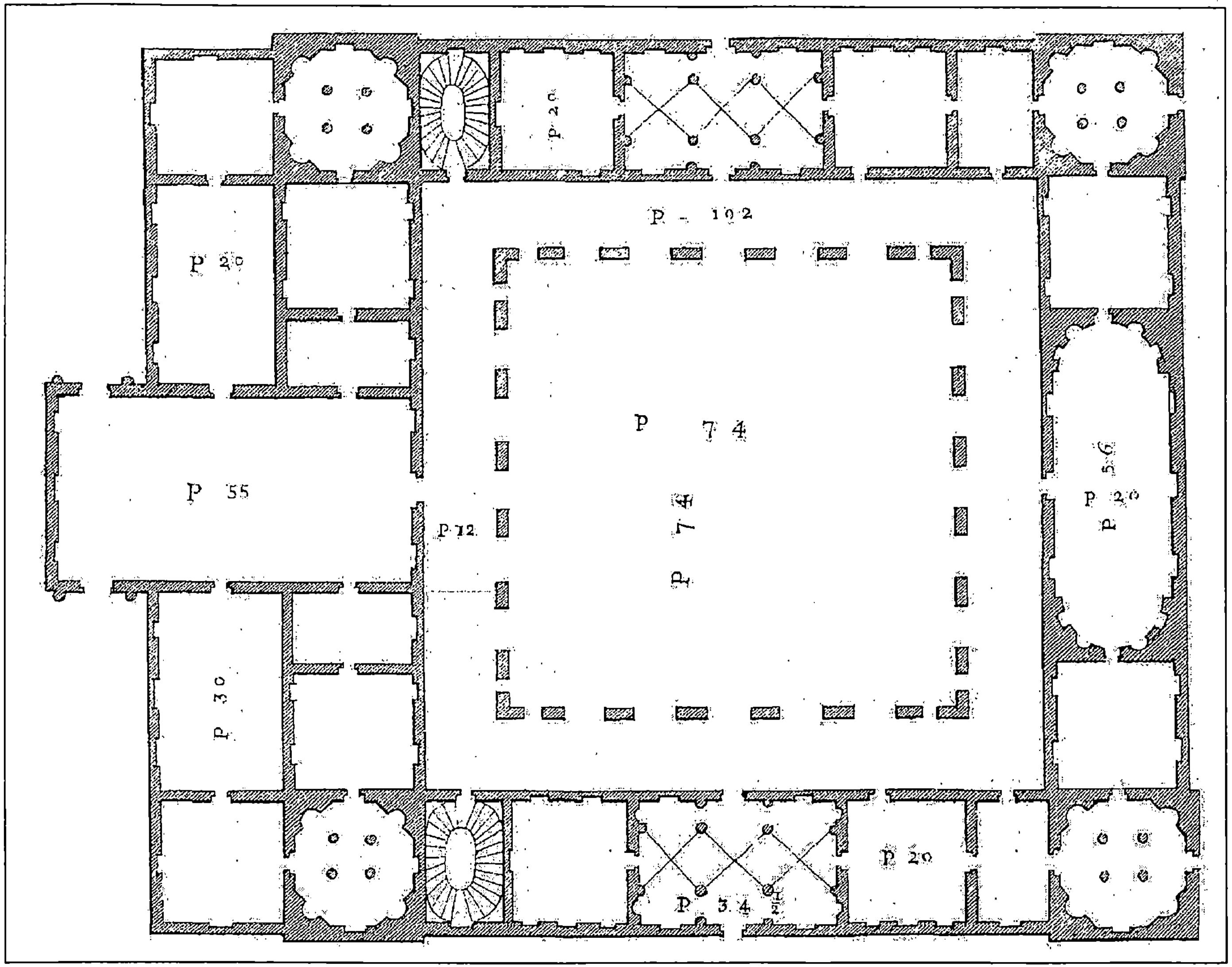


Figure 4.21 Plan Of Ottavio de Thieni in Vicenza Scanned From Plate 008, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 28'

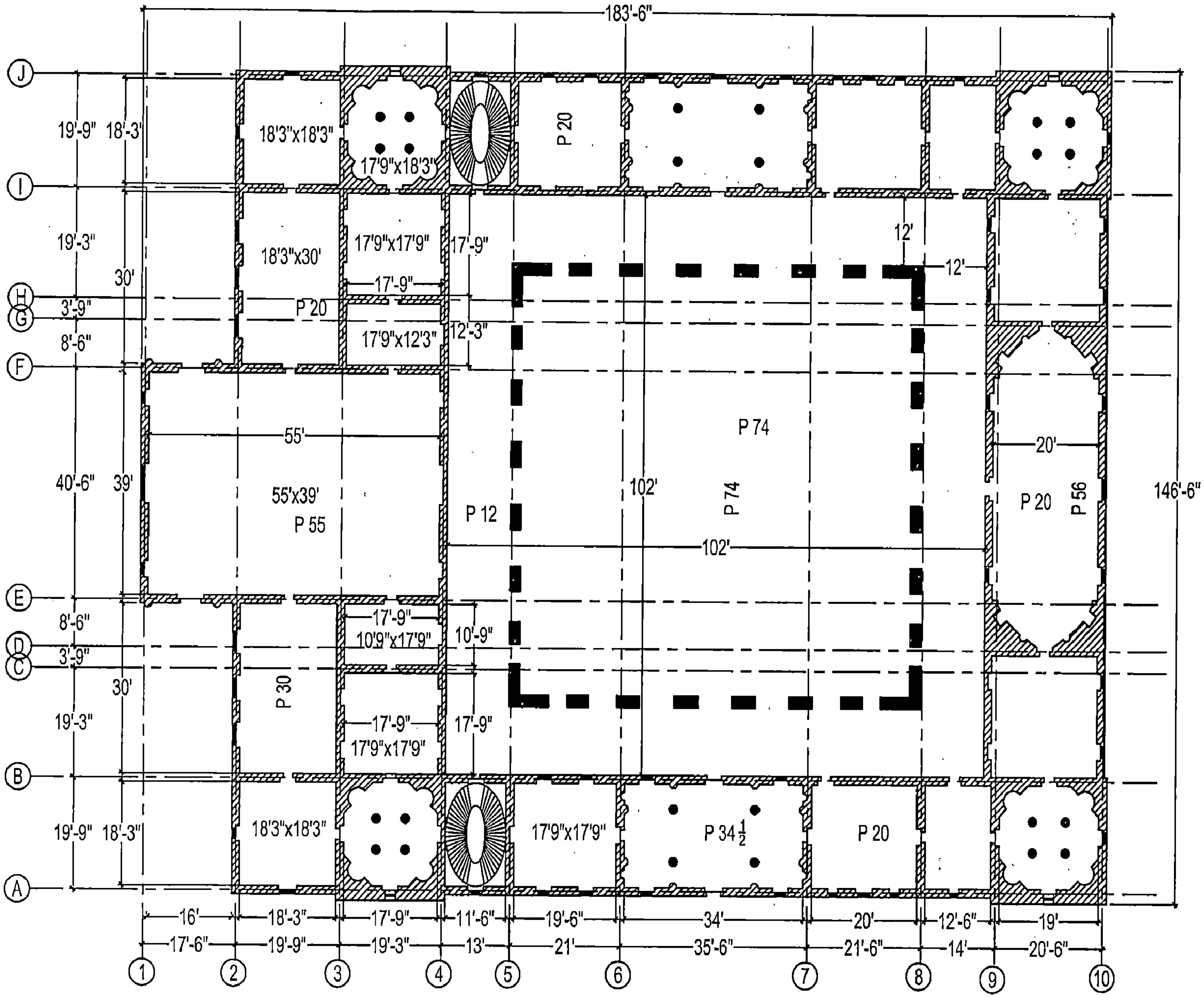


Figure 4.22 Plan Of Ottavio de Thieni in Vicenza Redrawn From Plate 008, 'I Quattro Libri Dell' Architecttura', Book-2 Page No 48

Scale 1" = 28'

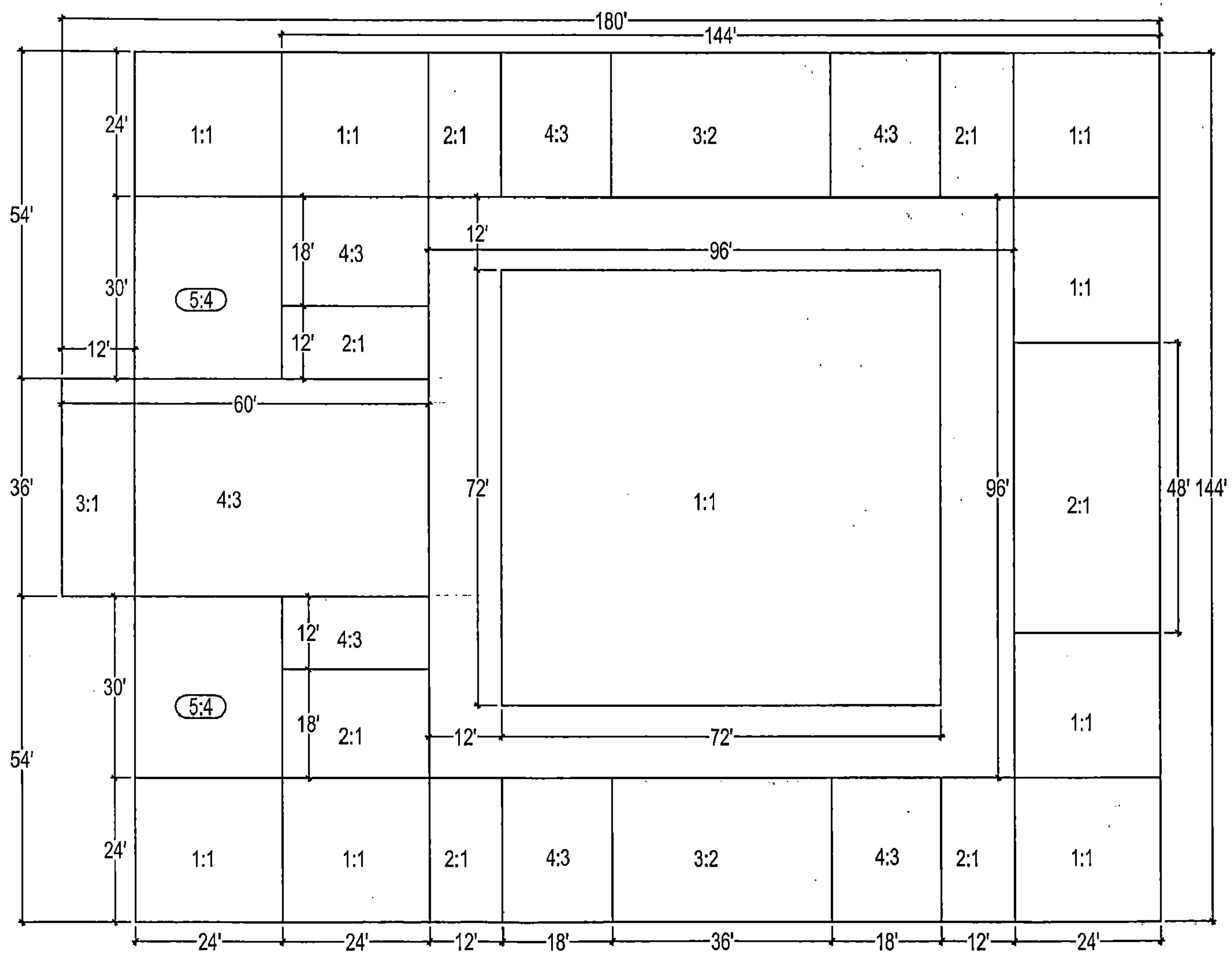


Figure 4.23 Schematic Analysis Ottavio de Thieni in Vicenza, Plate 008,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 28'

PLATE 08, PALAZZO OTTAVIO DE' THIENE AT VICENZA.

We can infer the following from schematic line diagram analysis:

- The main building whole is 144'x144' which is 1:1
- The front is divided into 24':24':48':24':24' which is 1:1:2:1:1 and symmetrical on central axis. 144' side is divided in 24':12':18':36':18':12':24' which is 4:2:3:6:3:2:4 and symmetrical on central axis.
- The central court yards are 72'x72' which is 1:1
- The Main planning principal seems to be square with three main squares formed by 72'x72', 96'x96' and 144'x144' which are related by harmonic proportion as 3:4:6.
- Main room sizes and ratios observed are 24'x12', 24'x18', 24'x24', 48'x24' and 60'x36'which could be interpreted as 2:1, 4:3, 4:3, 1:1, 2:1 and 4:3
- Non standard room ratios like 5:4 is identified which could be understood as square and one fourth.

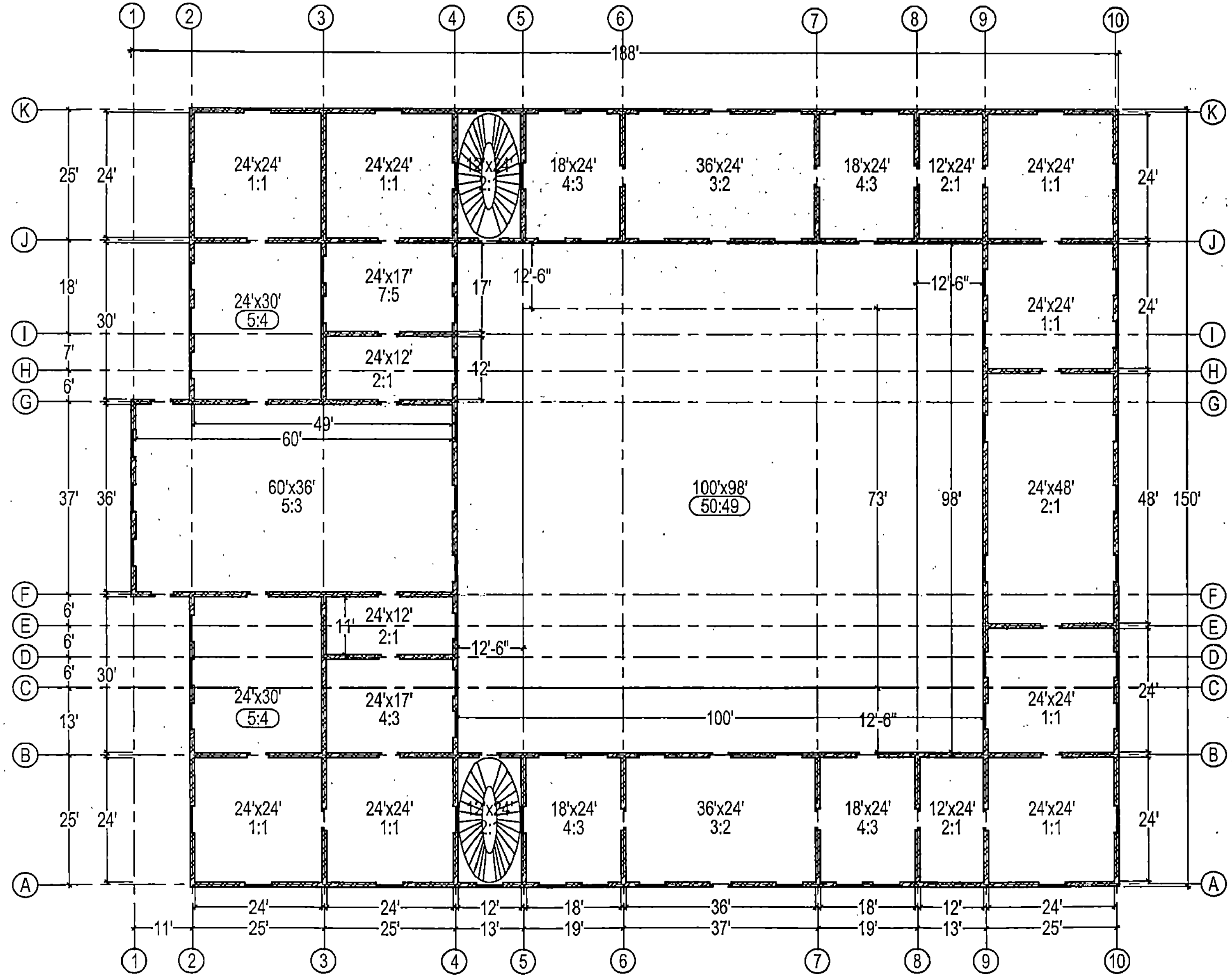
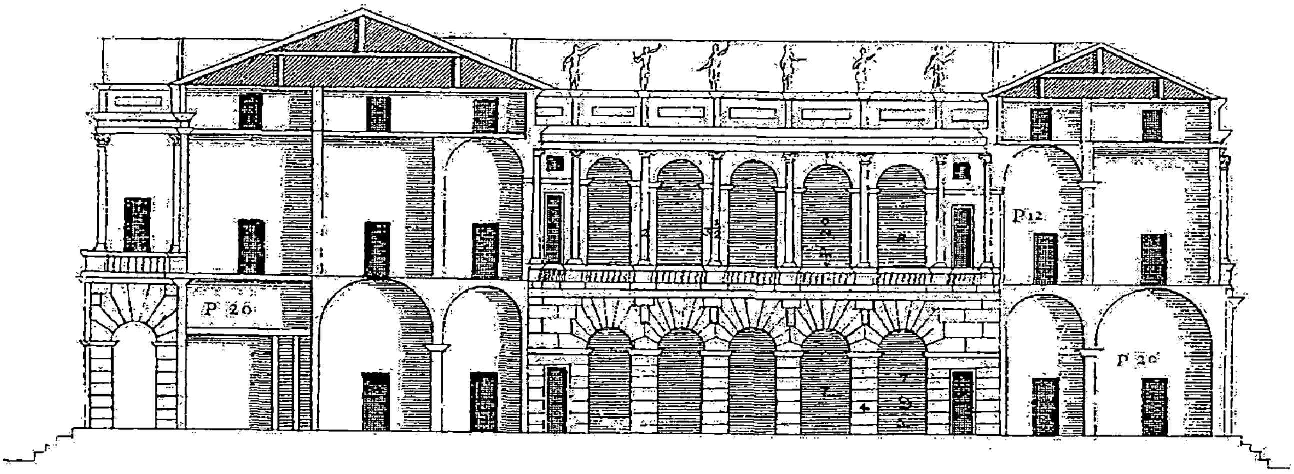
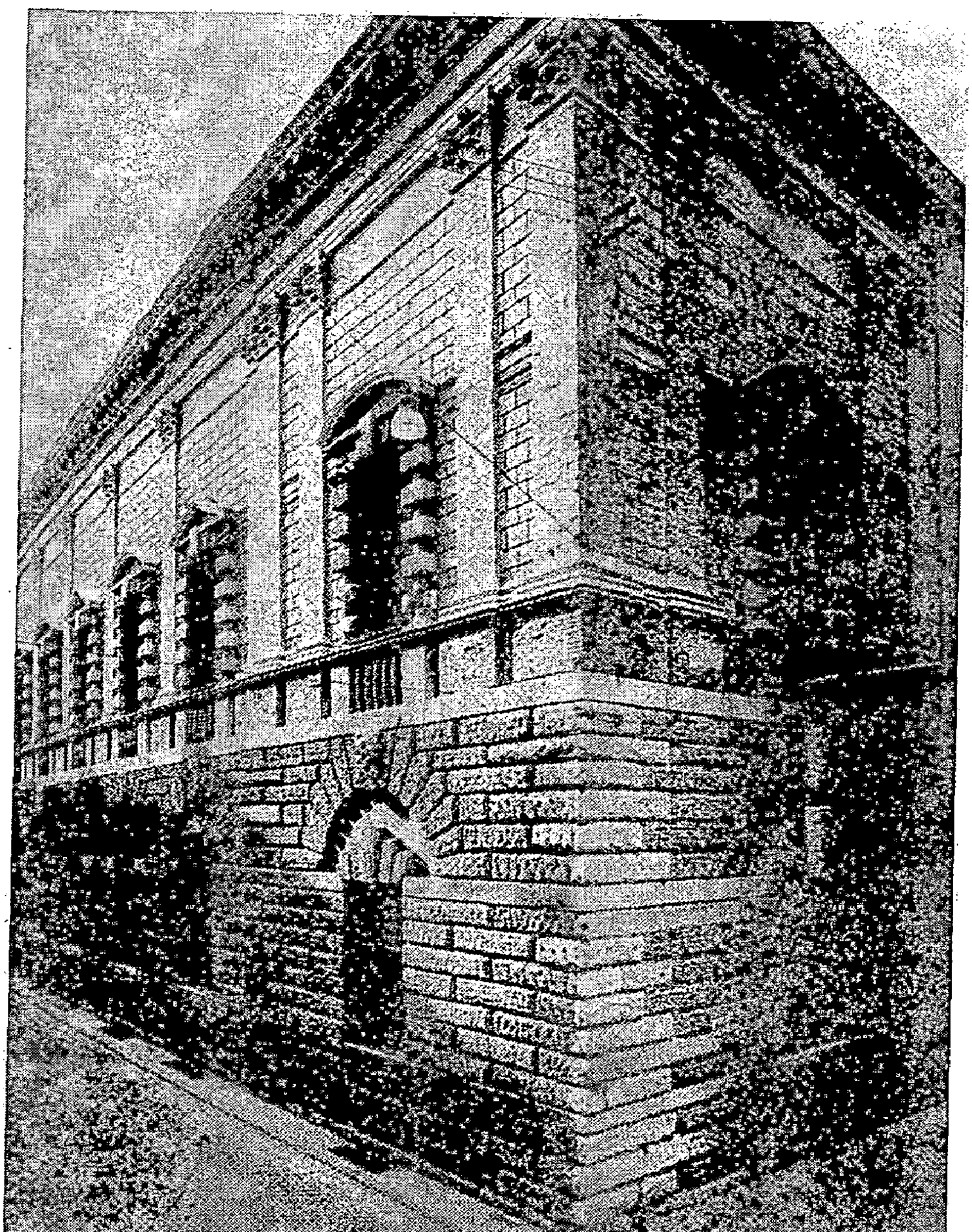


Figure 4.24 Plan of Ottavio de Thieni in Vicenza, developed on the basis of schematic analysis

Scale 1" = 28'



Source: Plate 08 Palazzo Ottavio de' Thiene at Vicenza ground sectional elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 35
Figure 4.25 Elevation & View of Palazzo Ottavio De' Thiene

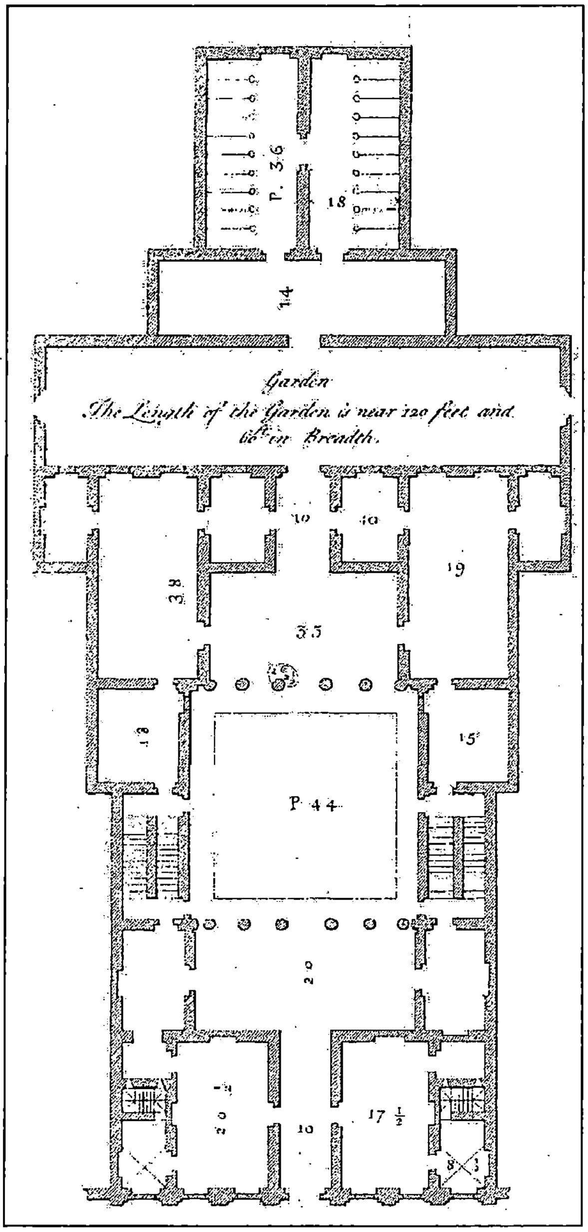


Figure 4.26 Plan Of Valmarana in Vicenza Scanned From Plate 011,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

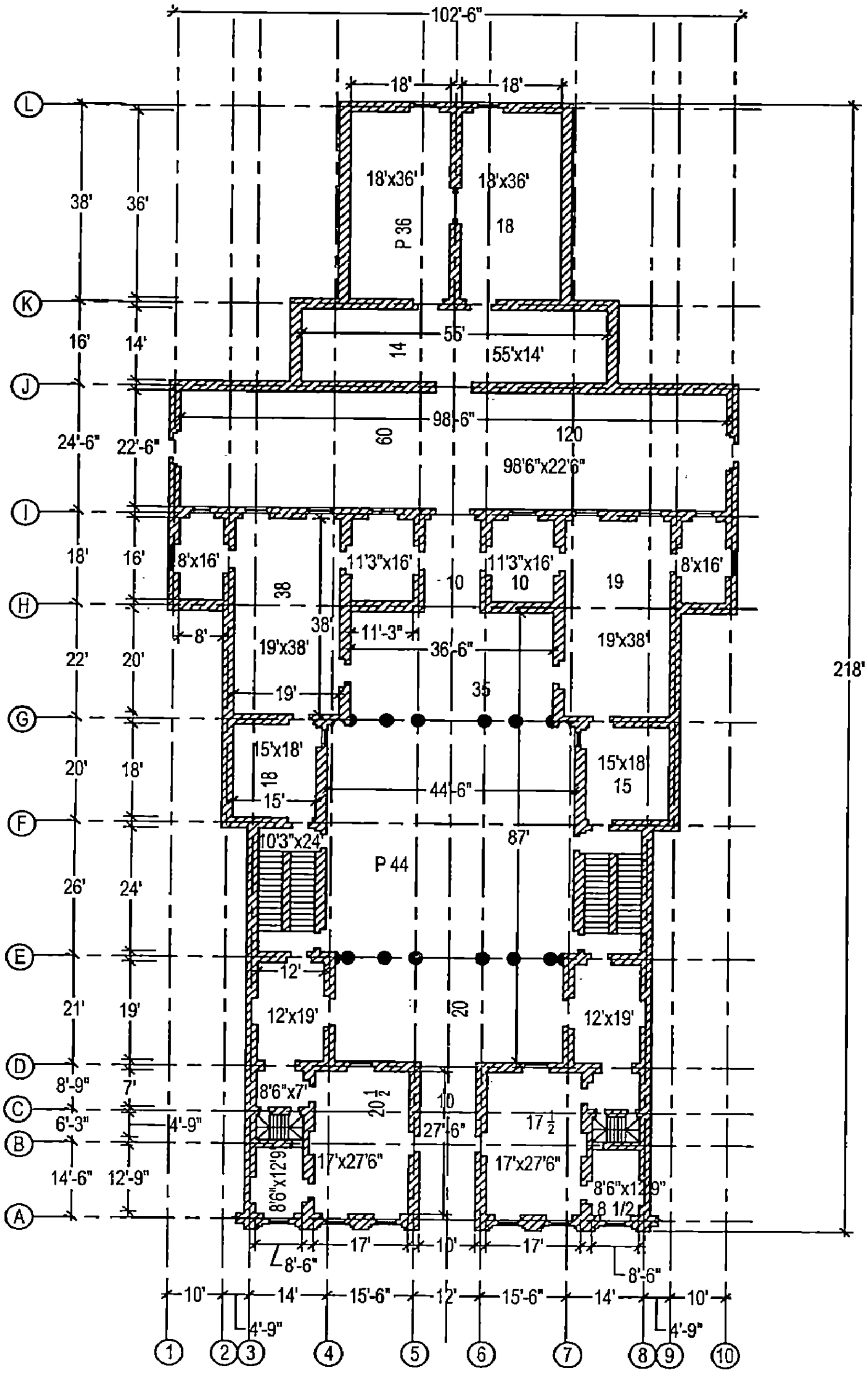


Figure 4.27 Plan Of Valmarana in Vicenza Redrawn From Plate 011, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

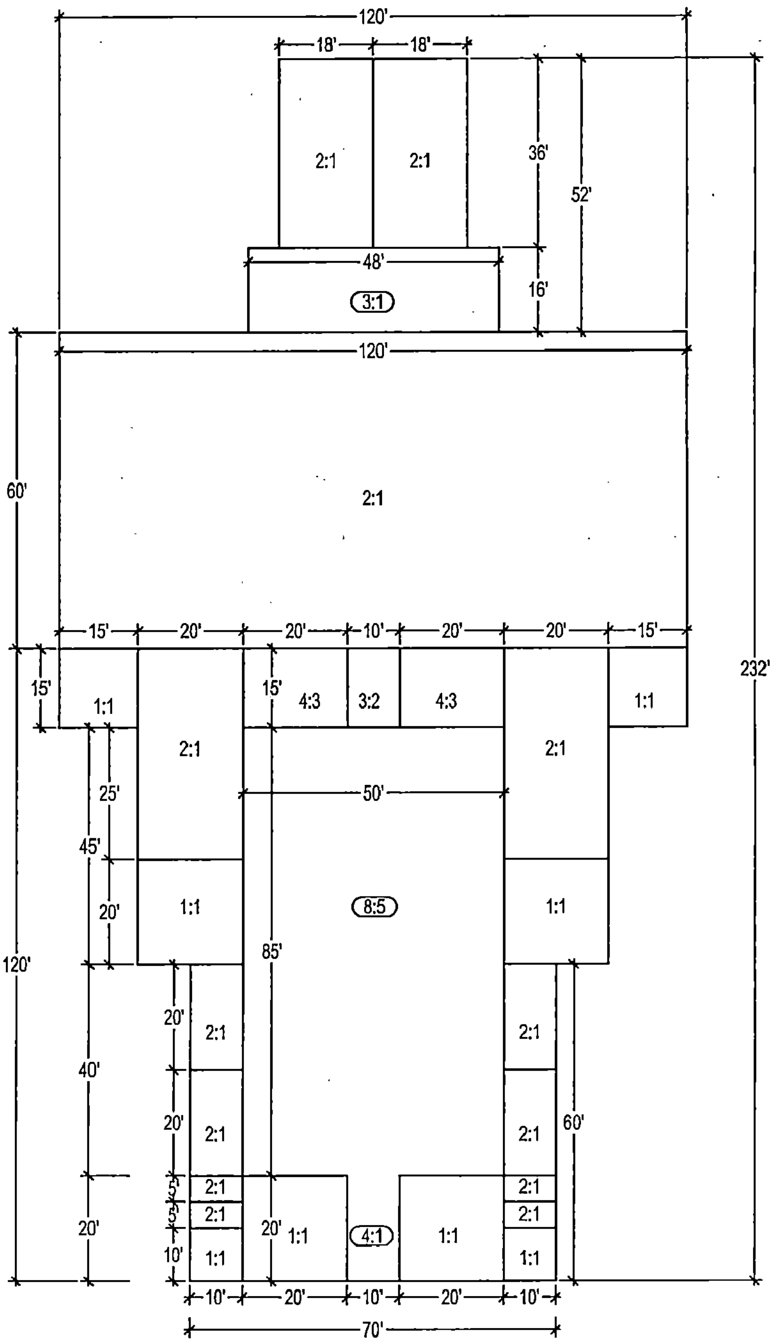


Figure 4.28 Schematic Analysis Valmarana in Vicenza, Plate 011, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

PLATE 11, PALAZZO VALMARANA AT VICENZA.

We can infer the following from schematic line diagram analysis:

- The main building whole is 232'x120' which is 1.93:1, very close to 2:1
- The plan is divided in three parts: Main structure in front which is 120'x70', central garden (which is wrongly depicted in the original plate in book 2) is 120'x60' which also is 2:1 and rear end structure is 36'x36' which is 1:1
- The Main planning principal seems to be two squares as main rooms formed by 20'x10', 40'x20' and 36'x18' which all are 2:1.
- Other main room sizes and ratios observed are 10'x10'and 20'x20'which could be interpreted as 1:1 and 1:1.
- Non standard room ratios like 8:5, 4:1 and 3:1 are identified. 4:1 and 3:1 could be referred to Alberti's theory of long room ratios. 4:1 could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 2:1 = 4:1 (a:b x c:d = ac:bd). 3:1 could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

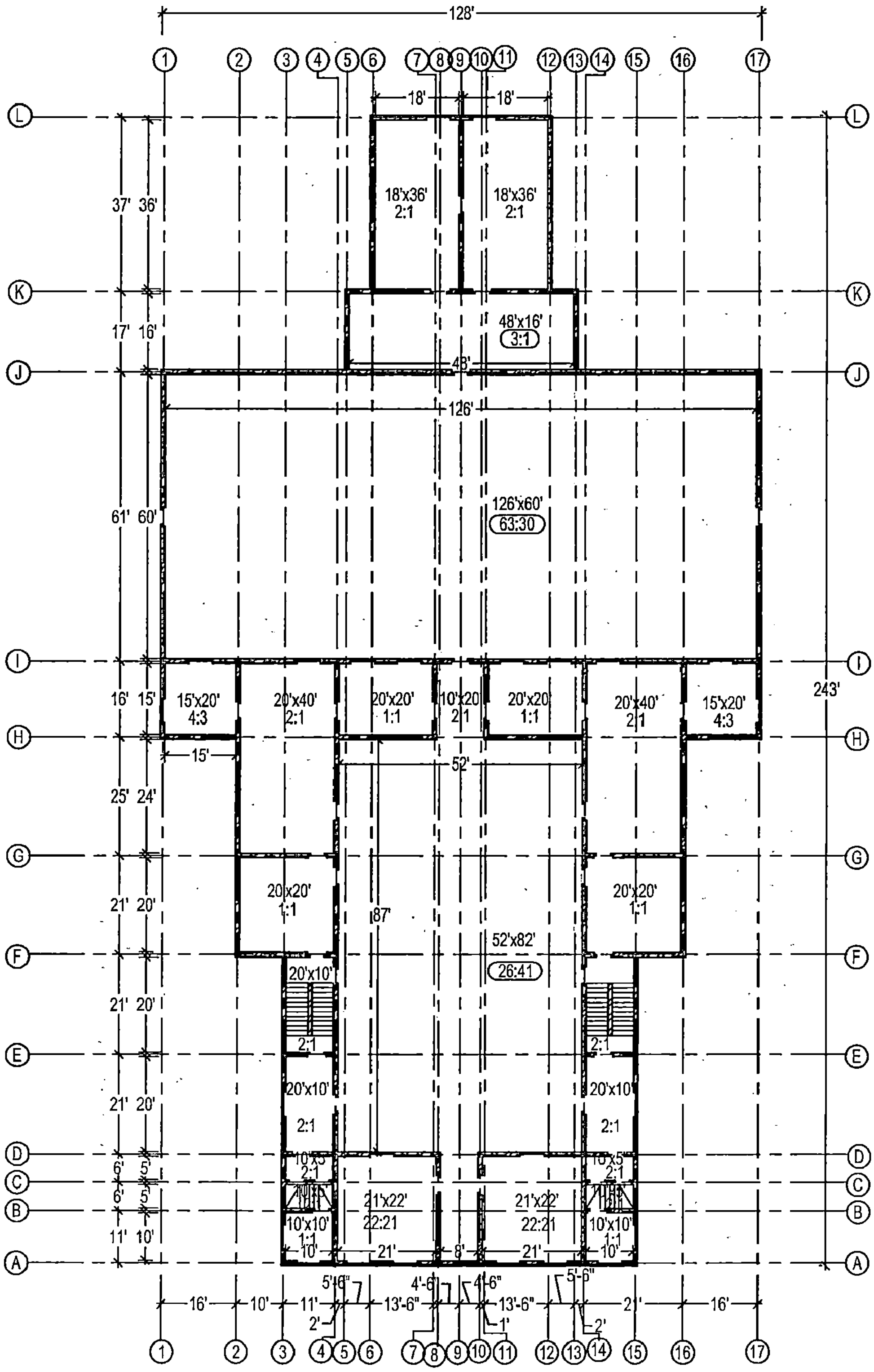
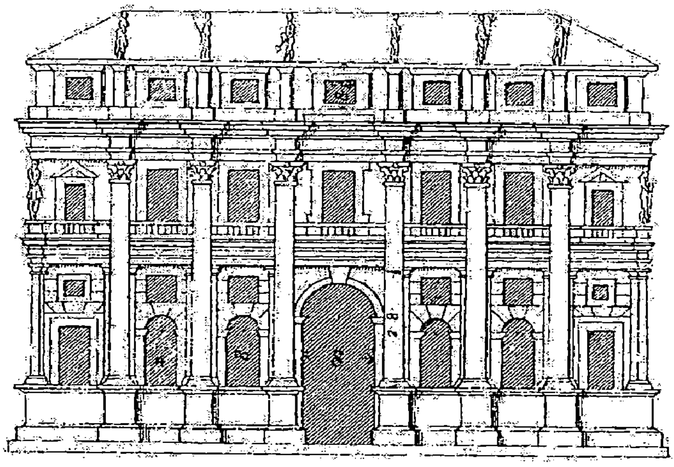
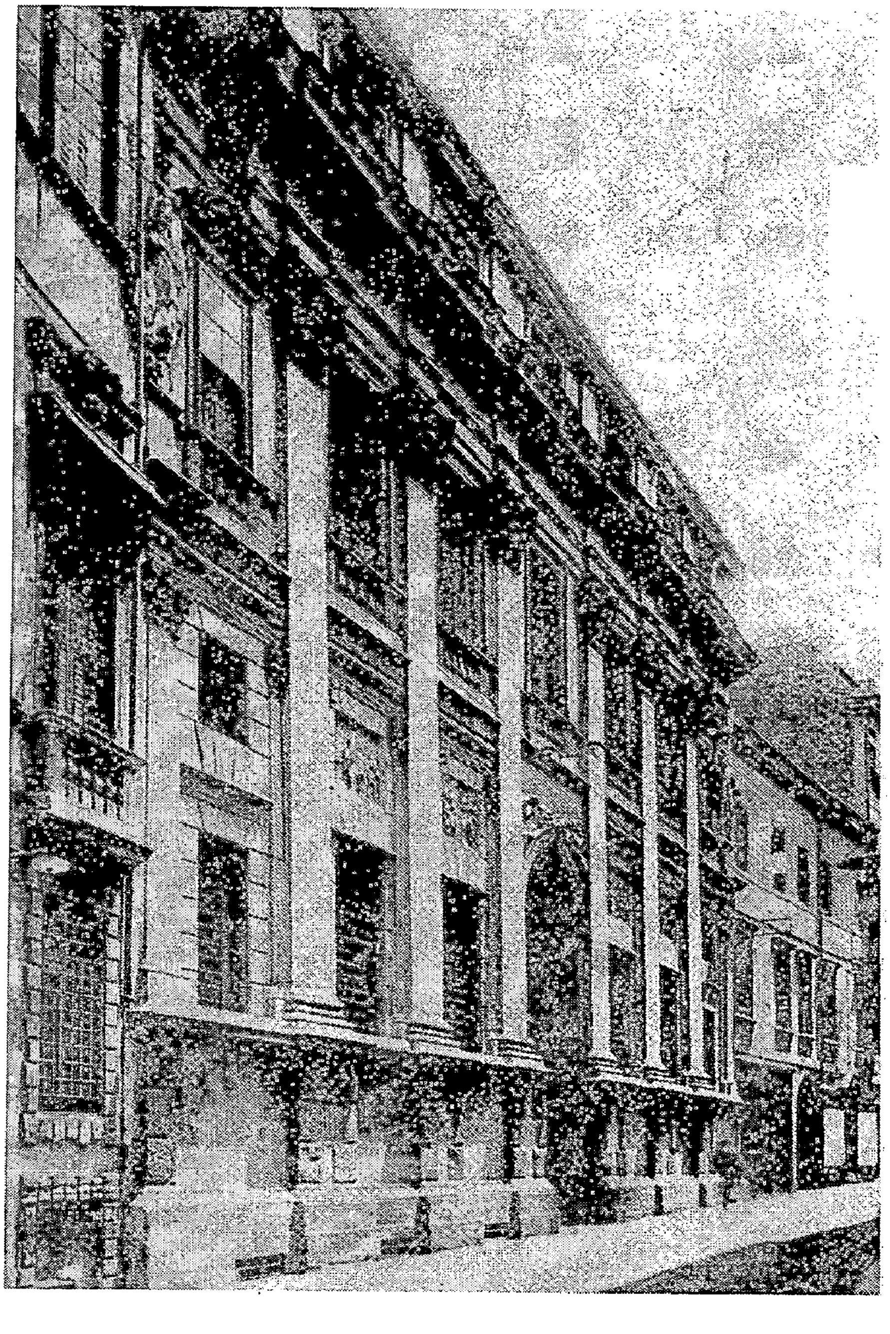


Figure 4.29 Plan of Valmarana in Vicenza, developed on the basis of schematic analysis

Scale 1" = 36'



Source: Plate 11 Palazzo Valmarana at Vicenza in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 73
Figure 4.30 Elevation & View of Palazzo Valmarana

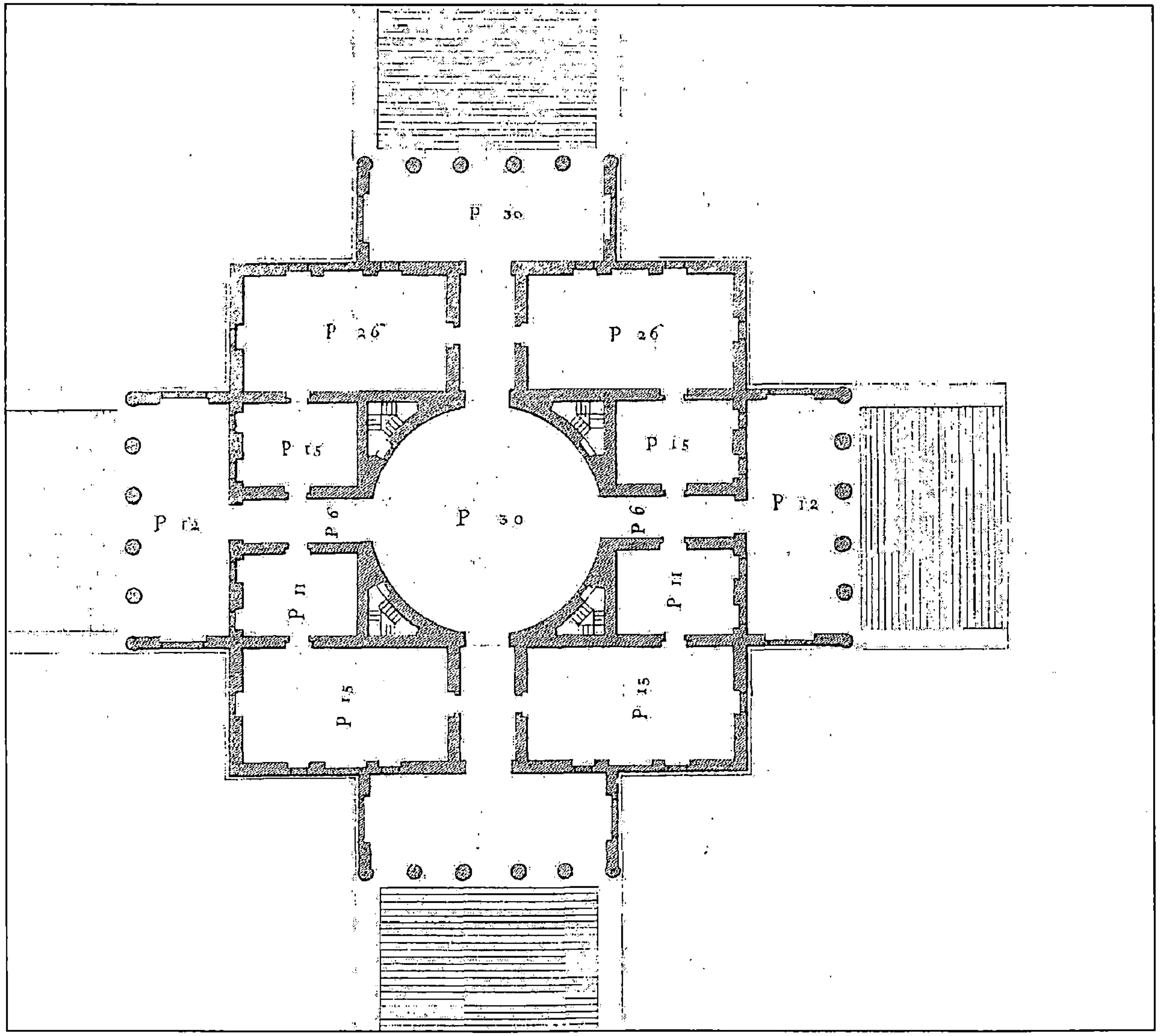


Figure 4.31 Plan Of Paolo Almerico in Vicenza Scanned From Plate 013,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

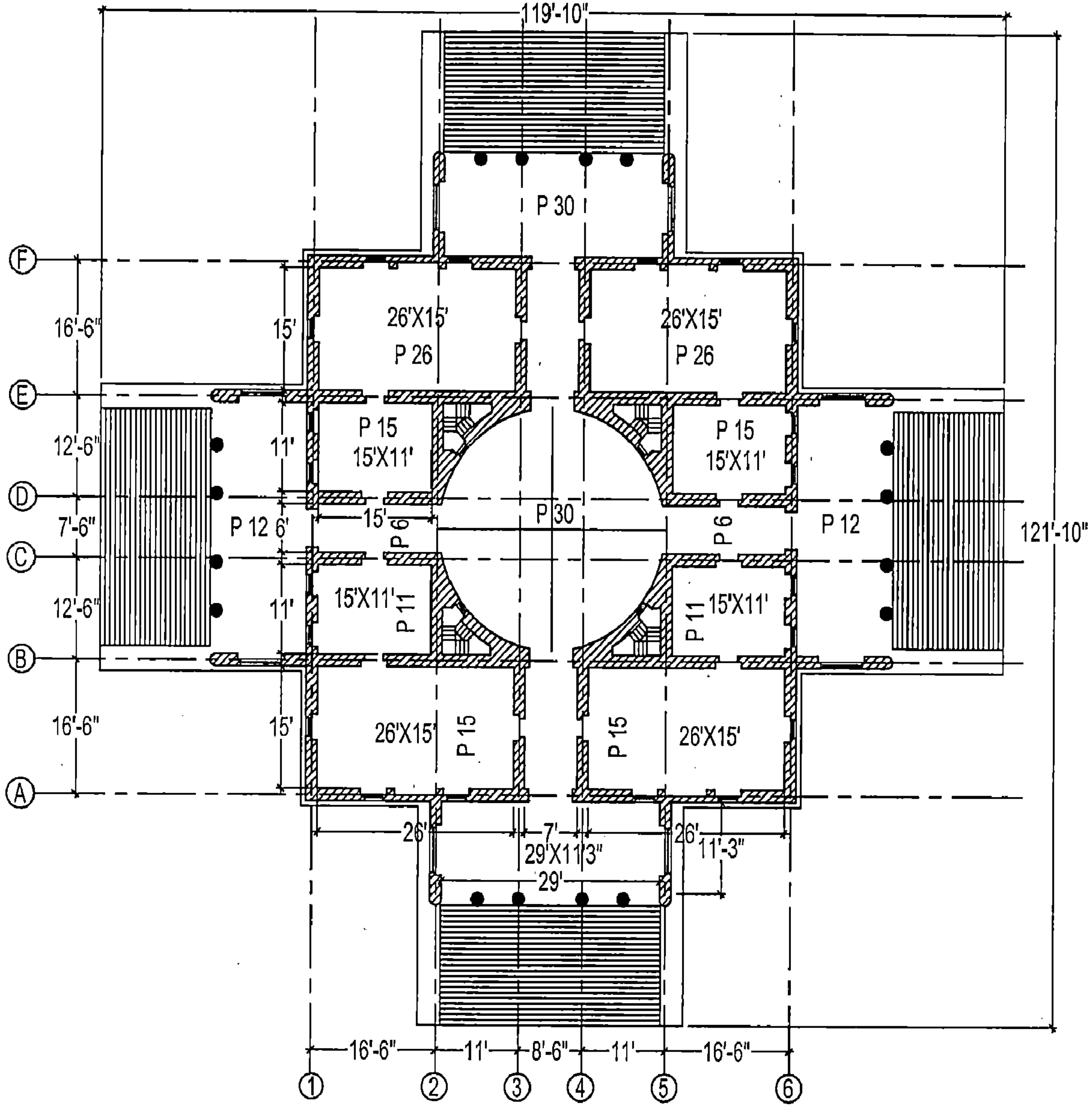


Figure 4.32 Plan Of Paolo Almerico in Vicenza Redrawn From Plate 013, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

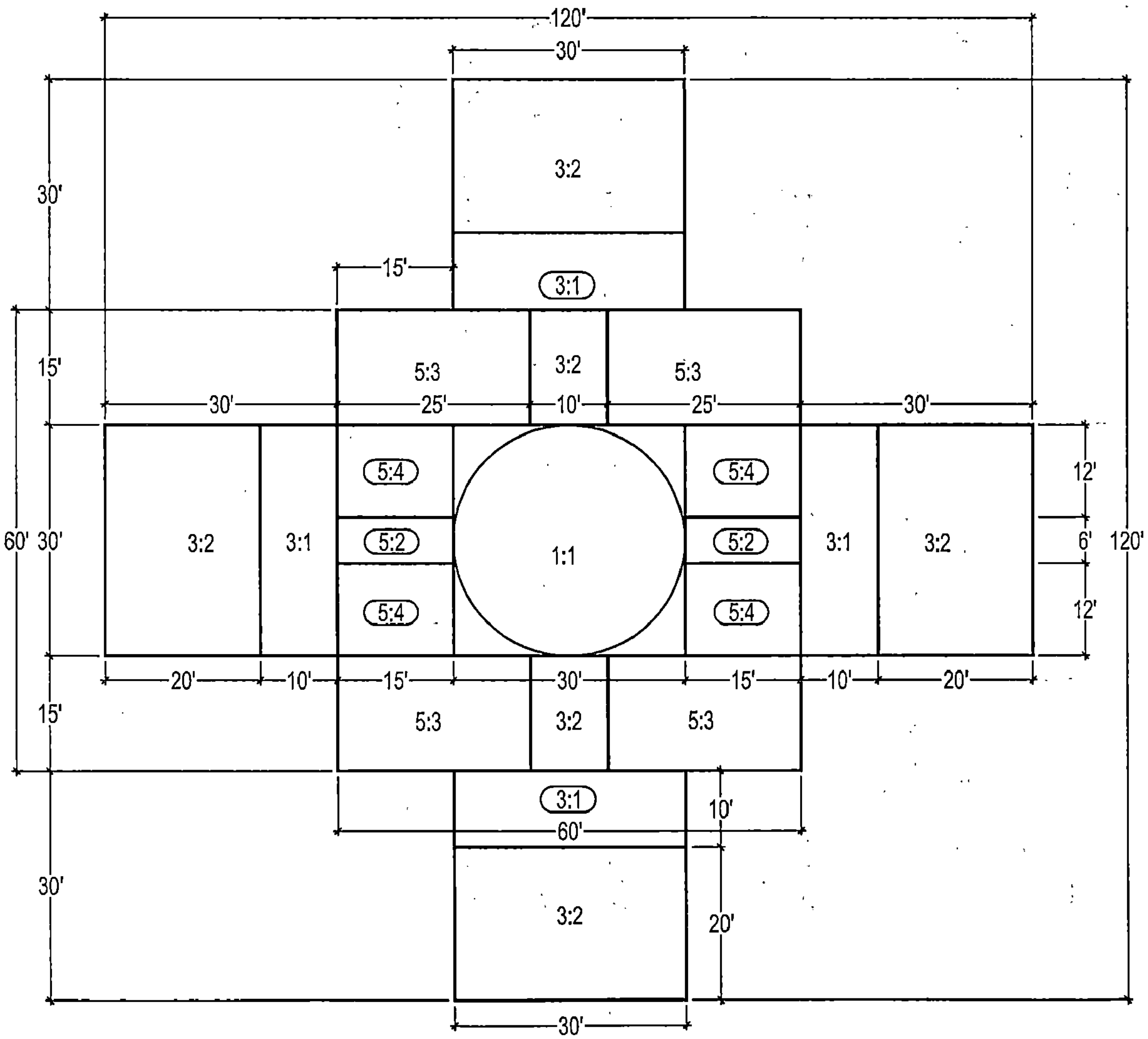


Figure 4.33 Schematic Analysis Paolo Almerico in Vicenza, Plate 013, 'I Quattro Libri Dell' Architecttura', Book-2

PLATE 13, VILLA PAOLO ALMERICO NEAR VICENZA.

We can infer the following from schematic line diagram analysis:

- This is the first plate in book two that shows the use of circle in plan.
- The main building whole is 120'x120' which is 1:1
- The Main planning principal seems to be square as main geometry of layout is formed by central area of 30'x30', main structure of 60'x60'with stair plinths of 30'x30' which all are 1:1 and are related as 1:2:1. Central core (30'x30'), main structure (60'x60') and the building whole (120'x120') which are related by geometric proportion as 1:2:4.
- The structure is symmetrical on both axis as elevations of all four sides are identical.
- Other main room sizes and ratios observed are 15'x10'and 25'x15'which could be interpreted as 3:2 and 5:3
- Non standard room ratios like 5:4, 5:2 and 3:1 are identified

  5:4 could be understood as square and a fourth. It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc: ad).

  5:2 could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).

  3:1 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

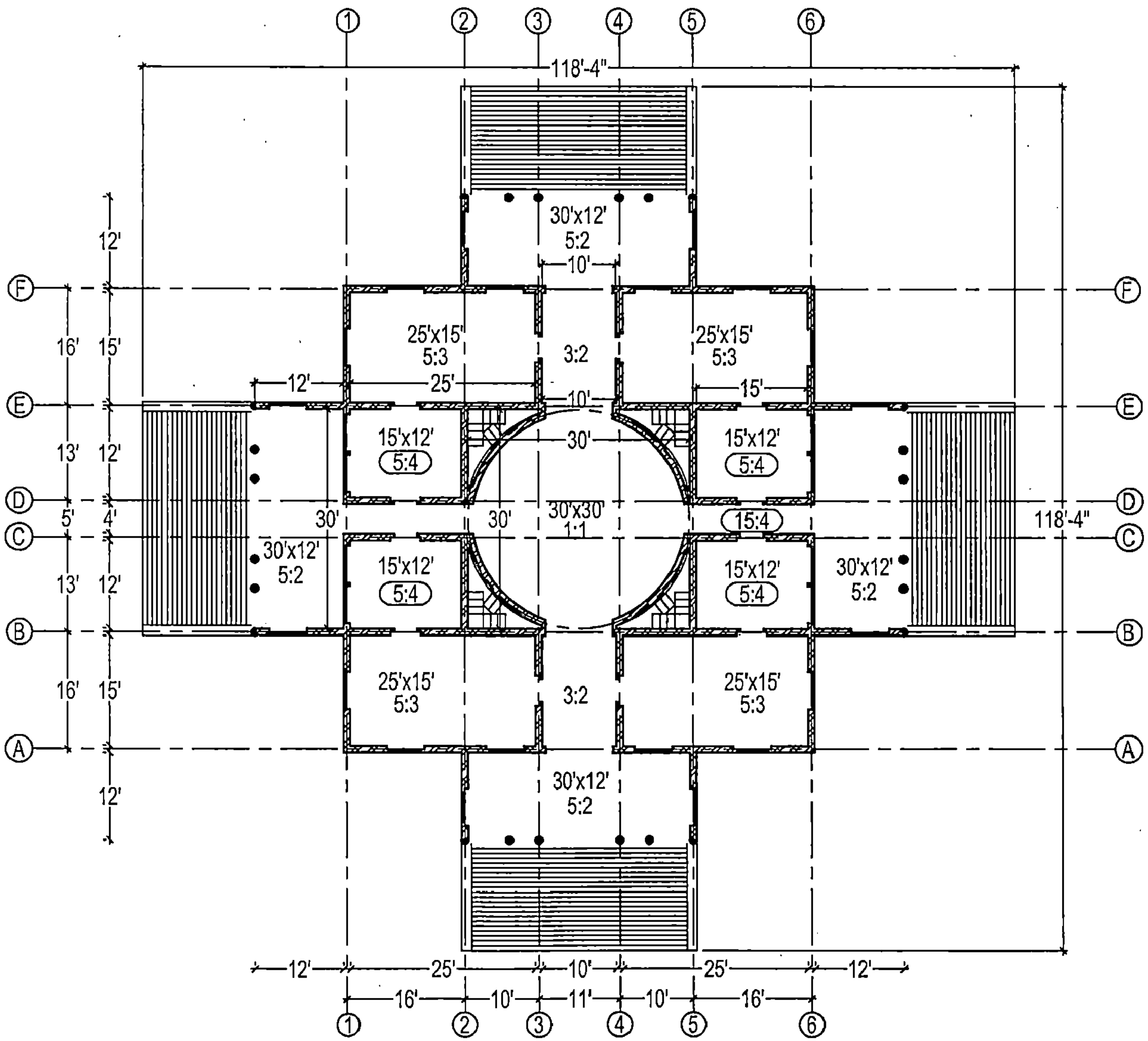
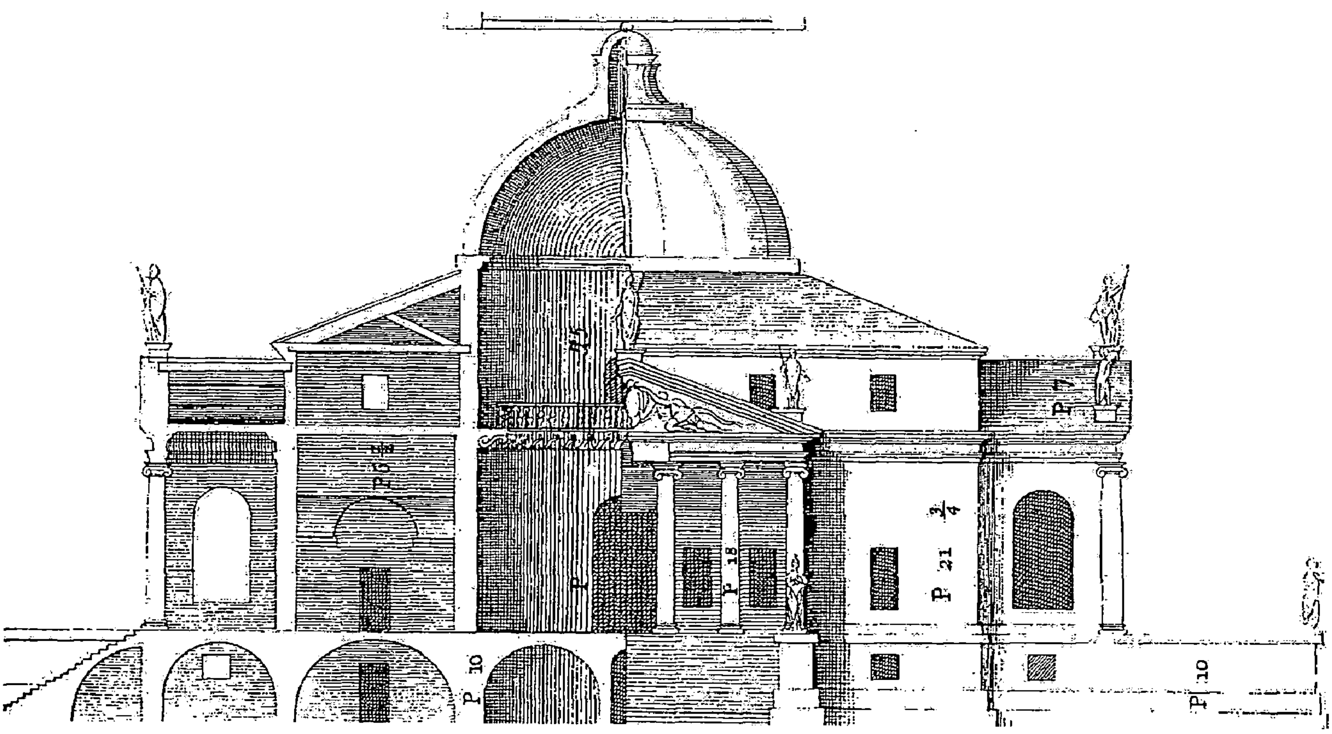
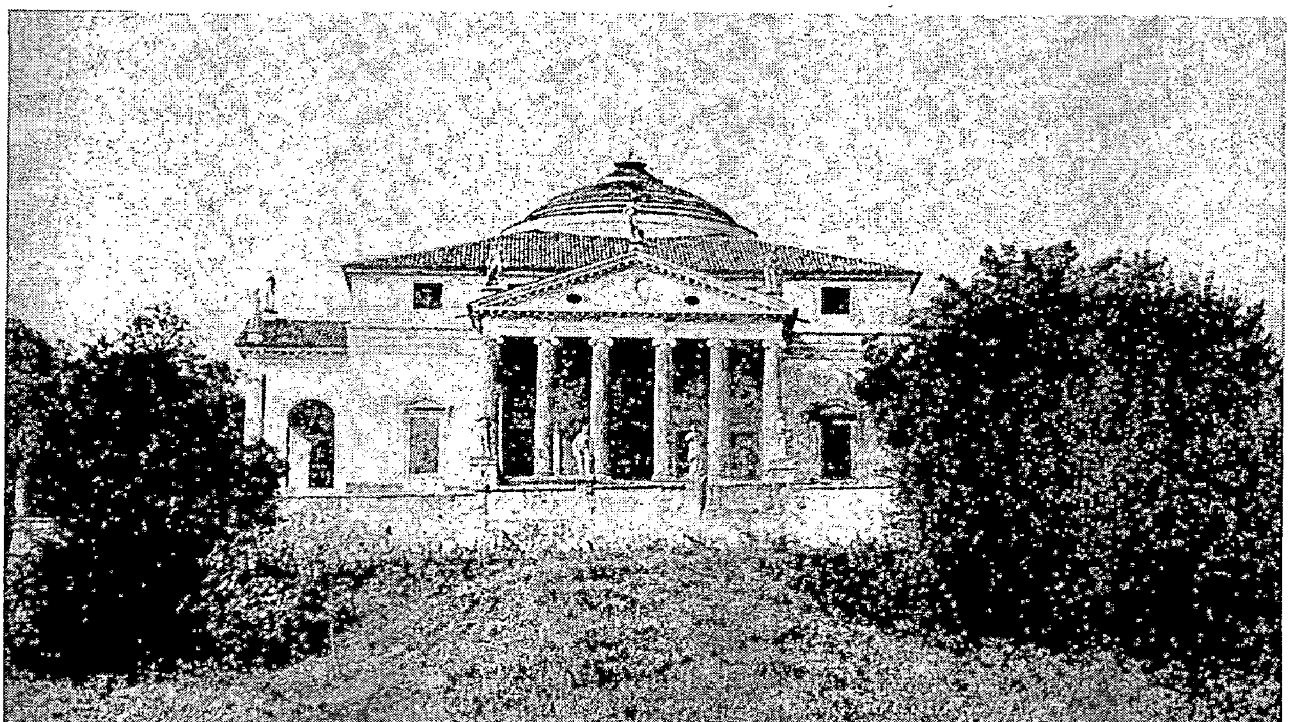


Figure 4.34 Plan of Paolo Almerico in Vicenza, developed on the basis of schematic analysis

Scale 1" = 24'



Source: Plate 13 Villa Paolo Almerico near Vicenza in half-elevation half-section



Source: Constant Caroline, 'The Palladio Guide', pg. 107
Figure 4.35 Elevation & View of Villa Paolo Almerico

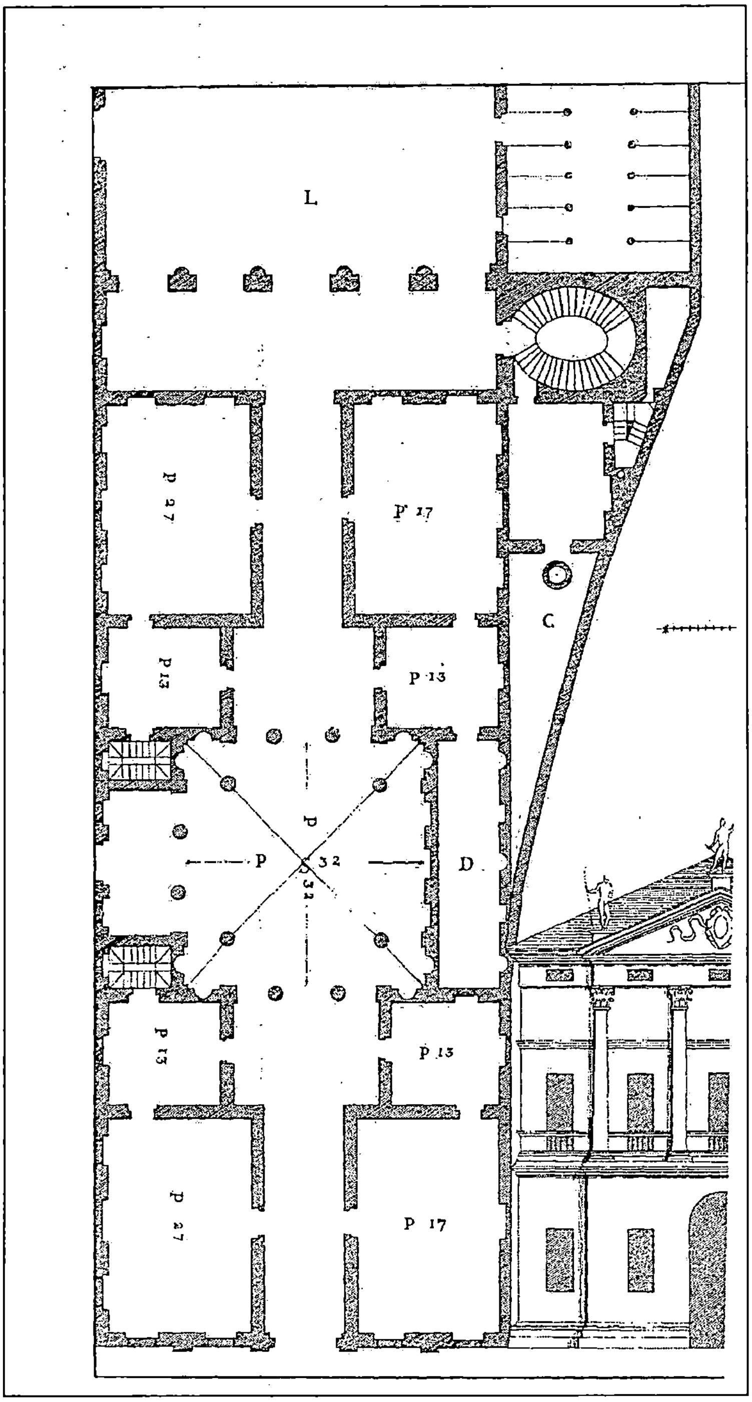


Figure 4.36 Plan Of Giulio Capra in Vicenza Scanned From Plate 014,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

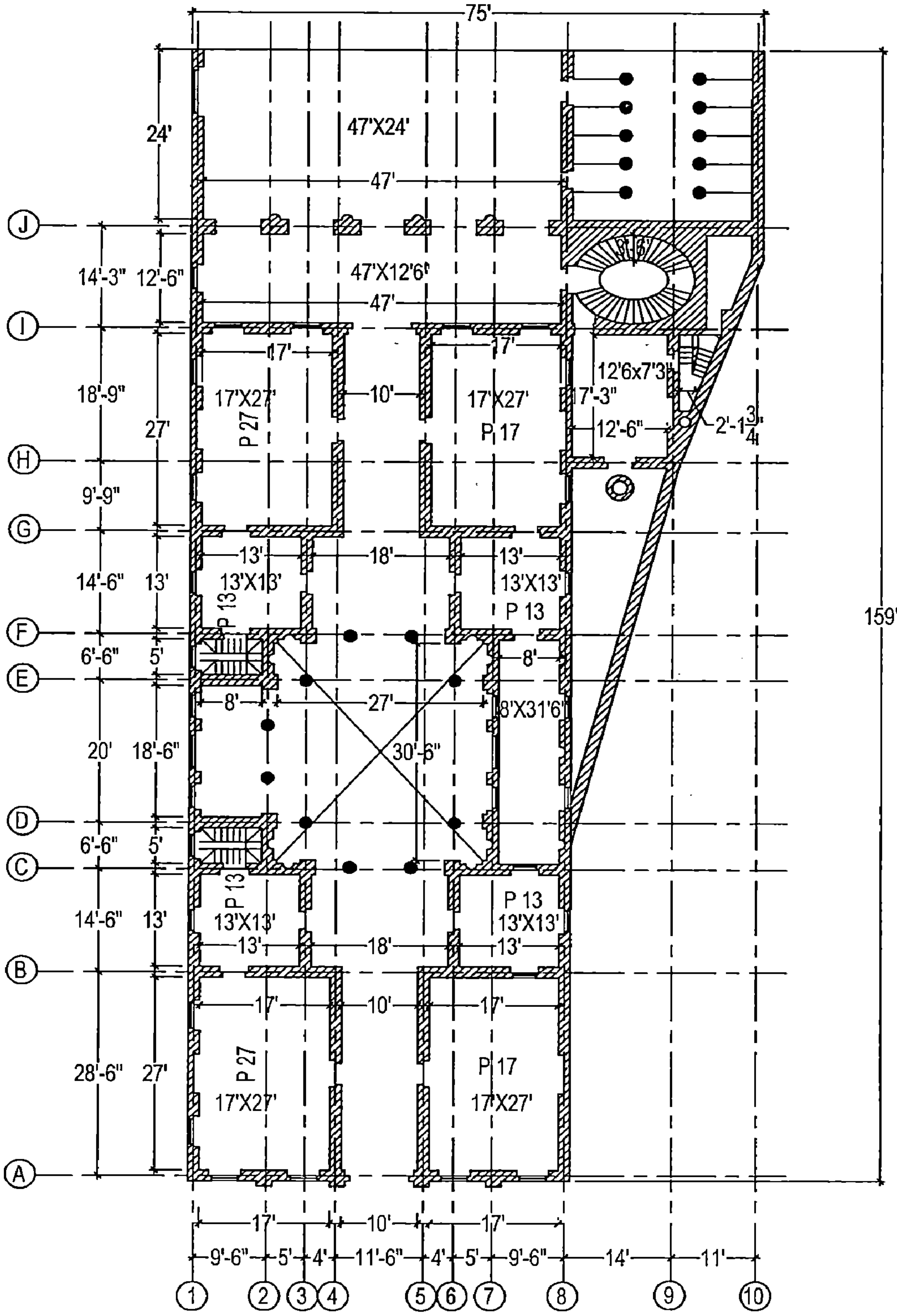


Figure 4.37 Plan Of Giulio Capra in Vicenza Redrawn From Plate 014,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

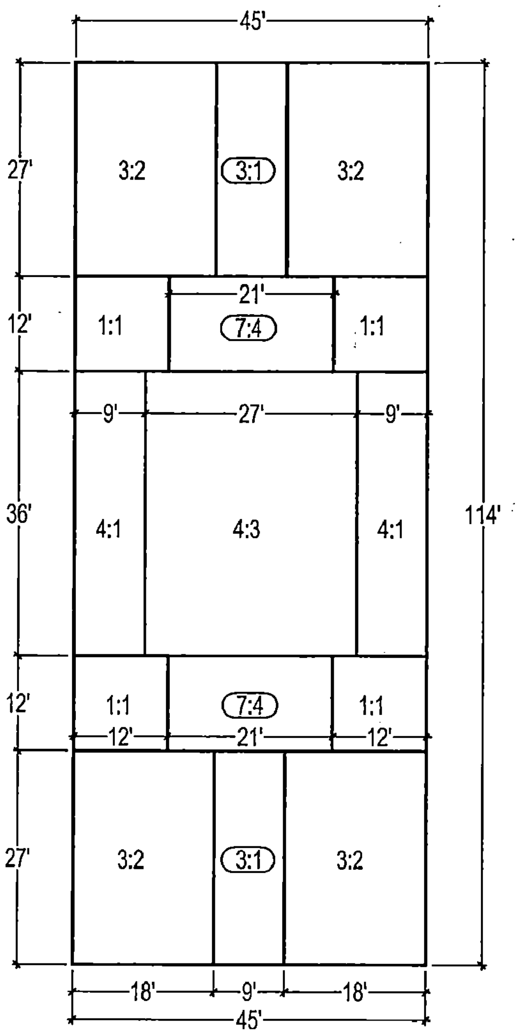


Figure 4.38 Schematic Analysis Giulio Capra in Vicenza, Plate 014, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

PLATE 14, PALAZZO GIULIO CAPRA AT VICENZA.

We can infer the following from schematic line diagram analysis:

- The main building whole is 114'x45' which is close to one is to; two and a half squares
- The central planning of main structure is symmetrical along central axis
- The front is divided into 18', 9', and 18' which is 2:1:2
- Main room sizes and ratios observed are 12'x12'and 27'x18'which could be interpreted as 1:1 and 3:2
- Non standard room ratios like7:4 and 3:1 are identified.

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

  3:1It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

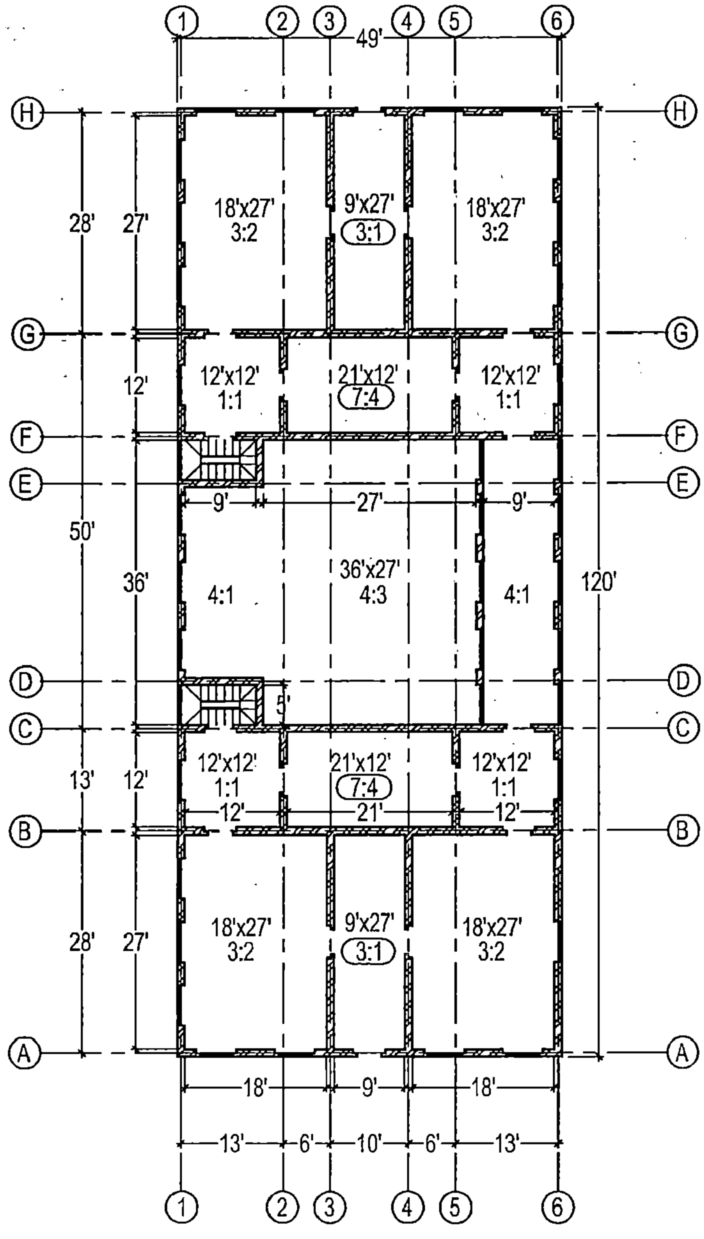
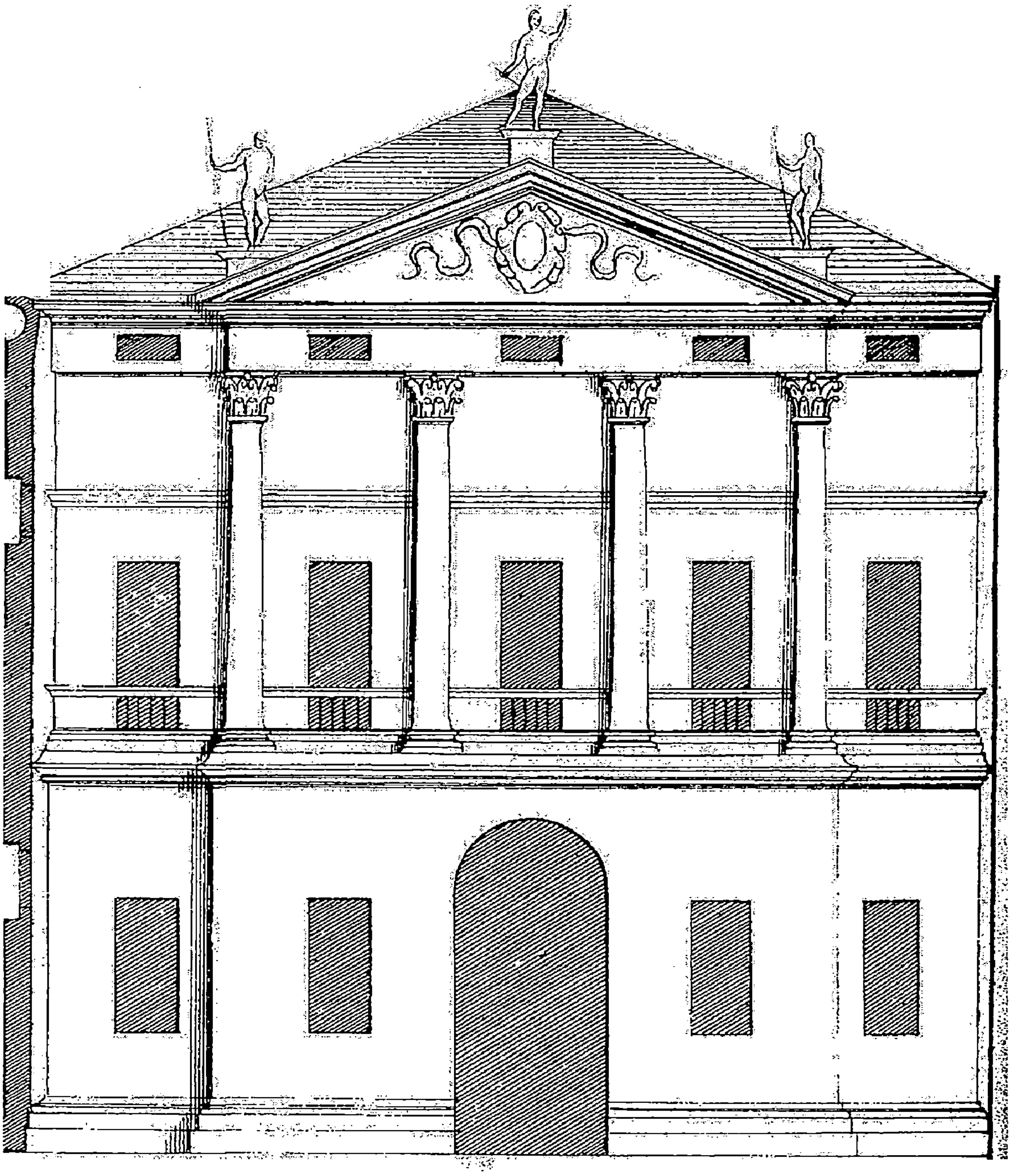


Figure 4.39 Plan of Giulio Capra in Vicenza, developed on the basis of schematic analysis

Scale 1" = 24'



Source: Plate 14 Palazzo Giulio Capra at Vicenza in elevation
Figure 4.40 Elevation of Palazzo Giulio Capra at Vicenza

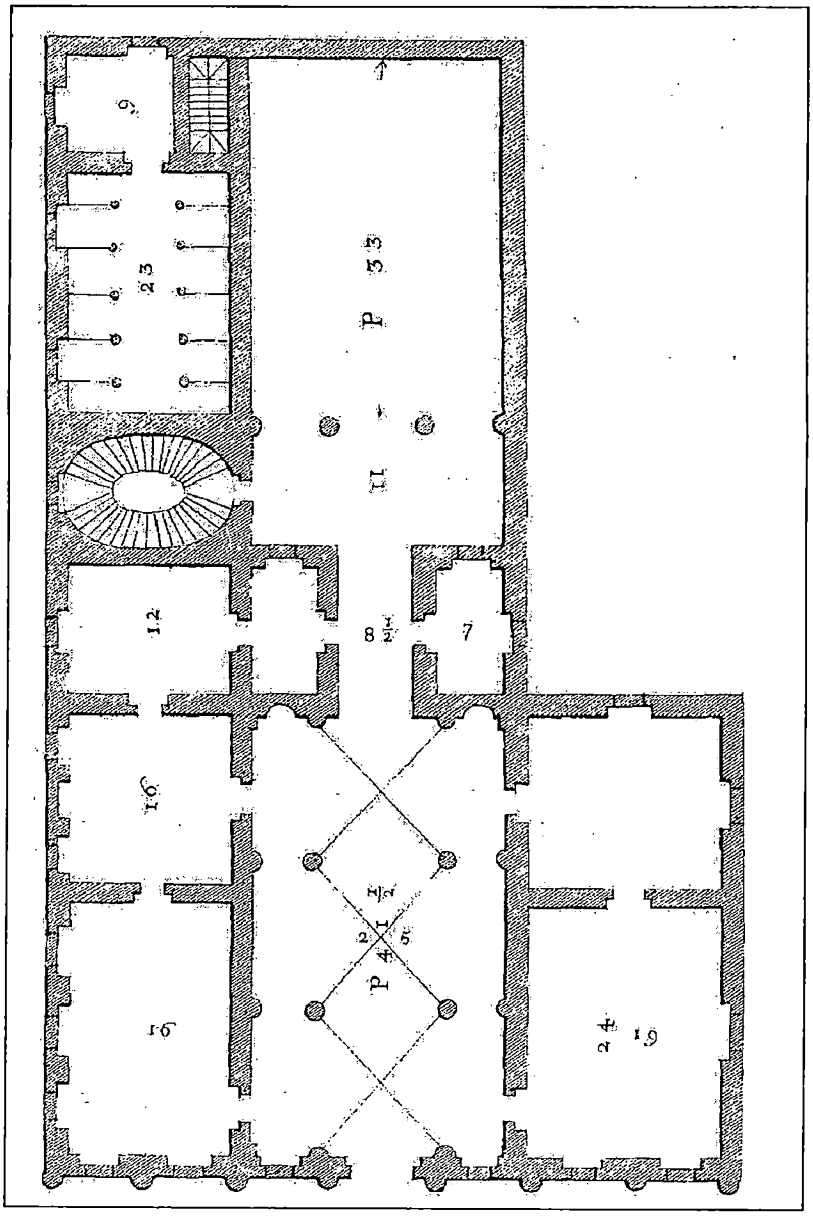


Figure 4.41 Plan Of Montano Barbarano in Vicenza Scanned From Plate 015, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

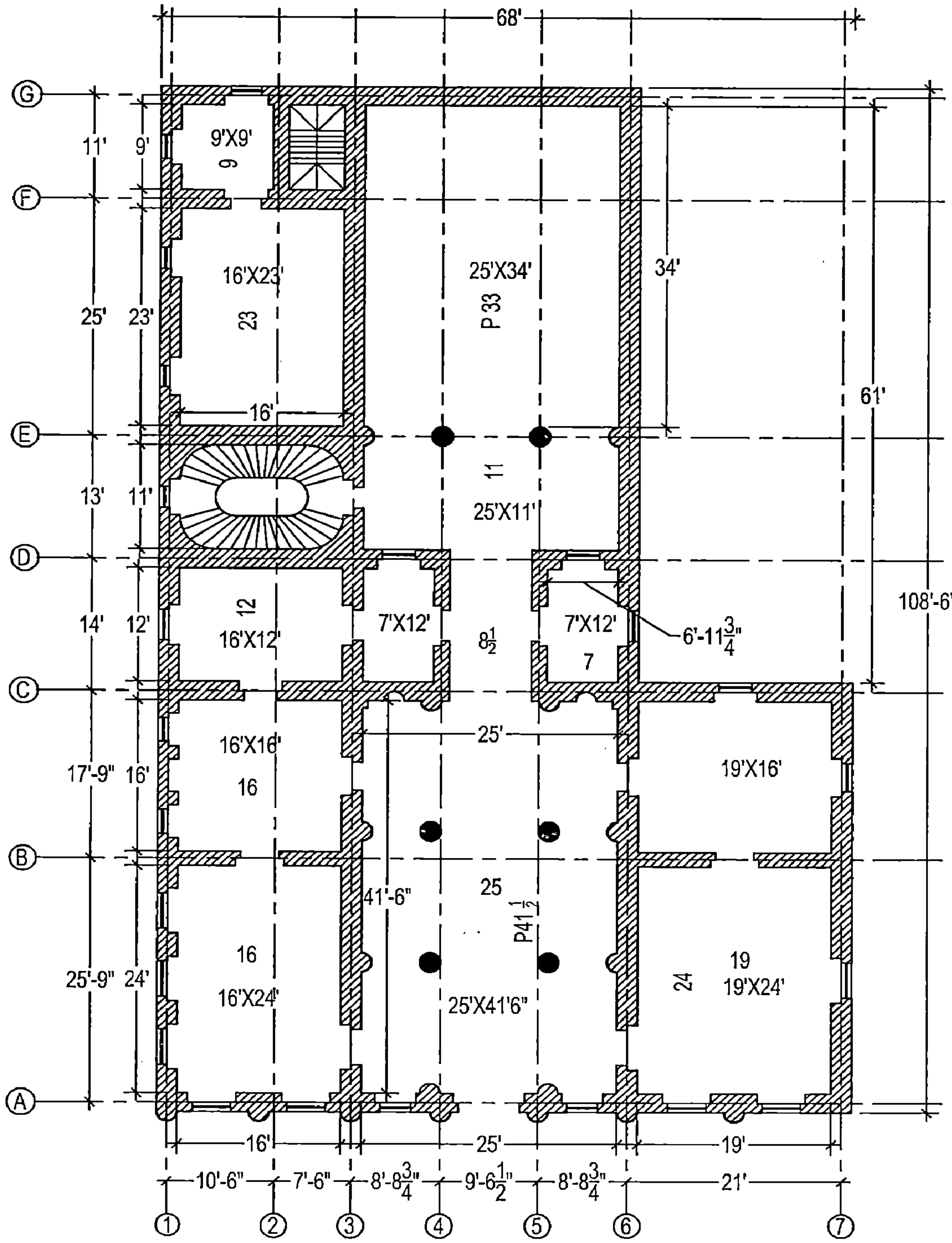


Figure 4.42 Plan Of Montano Barbarano in Vicenza Redrawn From Plate 015, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

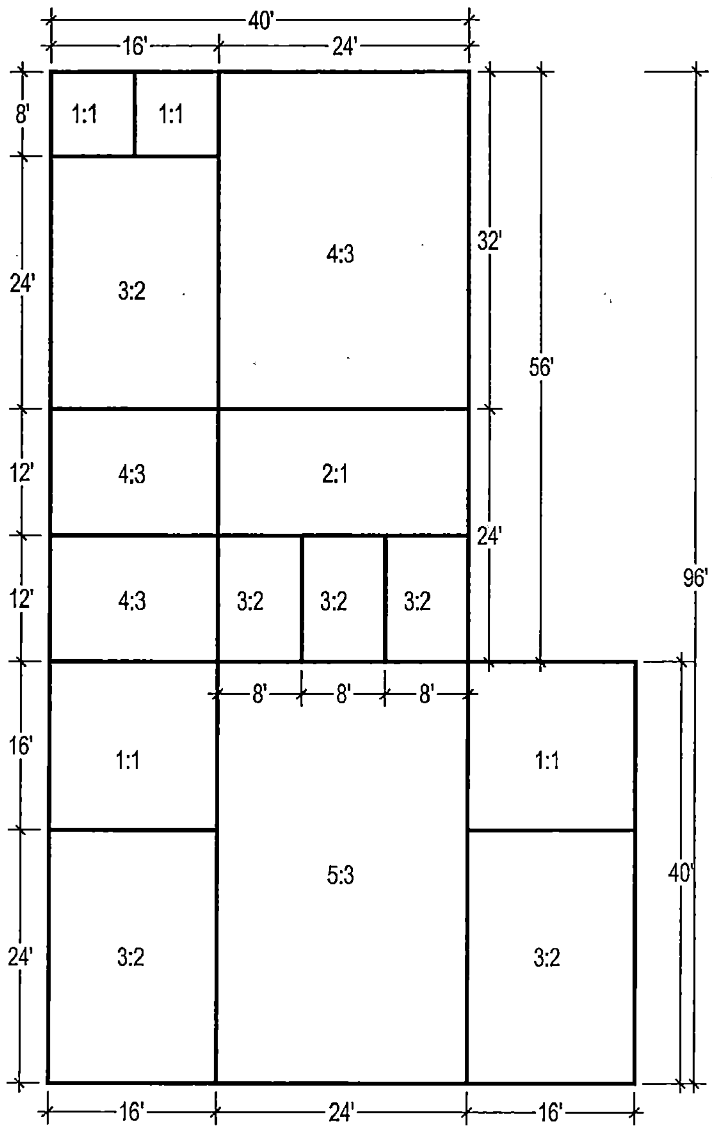


Figure 4.43 Schematic Analysis Montano Barbarano in Vicenza, Plate 015, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 15, PALAZZO MONTANO BARBARANO AT VICENZA.

We can infer the following from schematic line diagram analysis:

- From the commentary by Palladio it could be inferred that 19' wide room is typographical error and should be 16'
- The 'L' shaped plan can be broadly divided into base of 56'x40'and identical the arm of 56'x40', both of which are 7:5.
- Being 'L' shaped, the structure is not symmetrical on any axis.
- Side of lower arm is divided into 24':16' which is 3:2 and same for upper arm too. Front of lower arm is divided into 16':24':16' which is 2:3:2. Front of upper arm is divided into 32':24' which is 4:3.
- Main room sizes and ratios observed are 12'x8', 16'x12', 16'x16', 24'x12', 24'x16', 32'x24'and 40'x24'which could be interpreted as 3:2, 4:3, 1:1, 2:1, 3:2, 4:3 and 5:3.
- No non standard room ratios are identified.

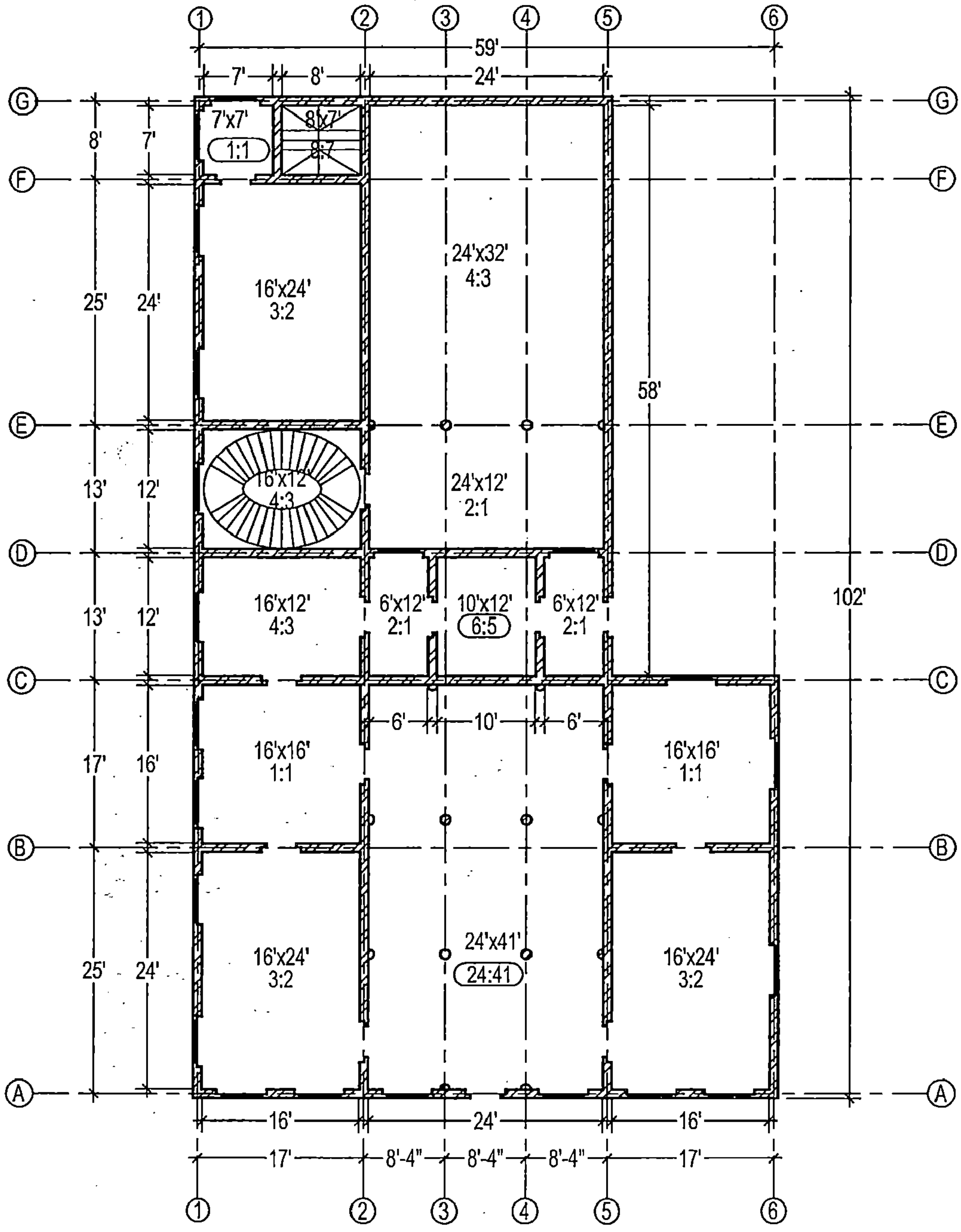
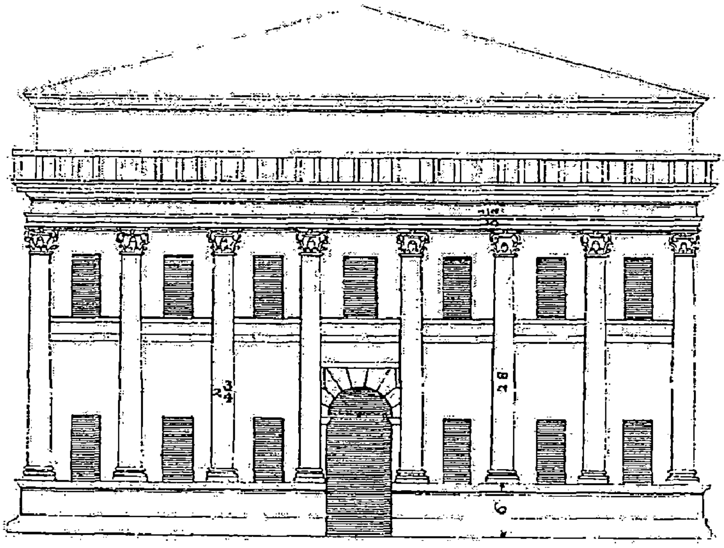
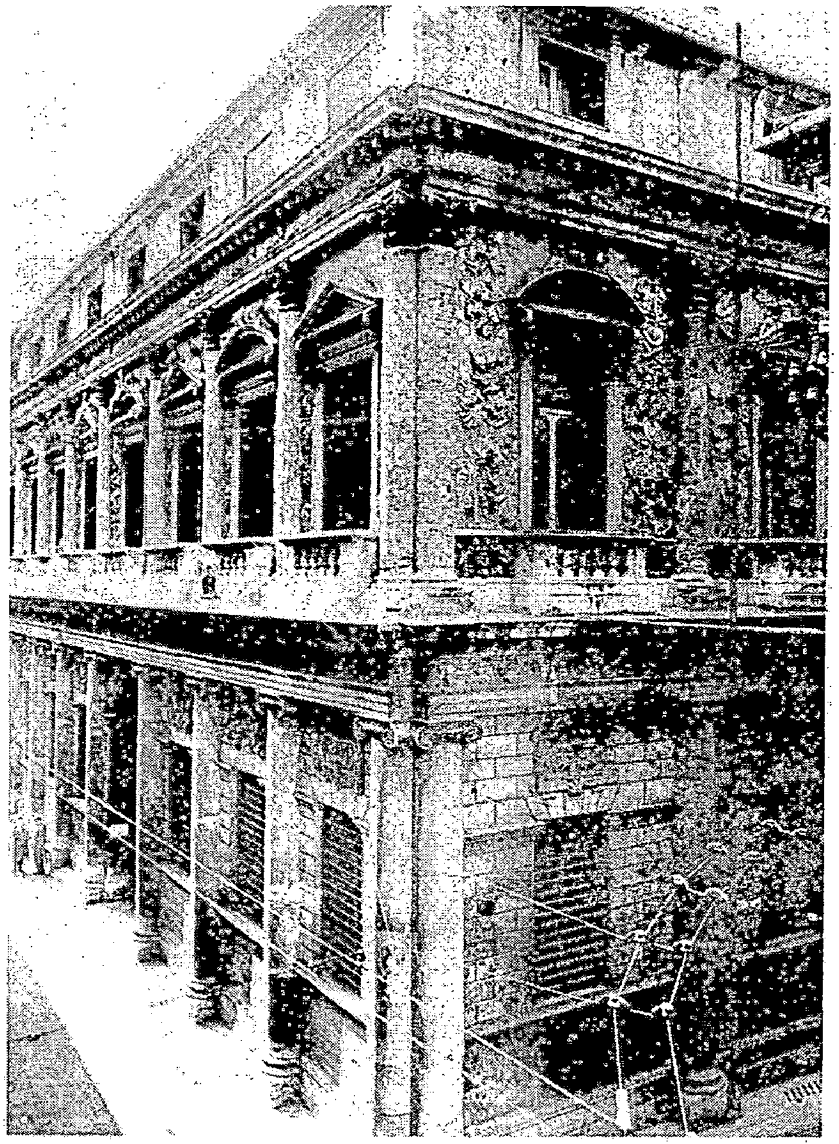


Figure 4.44 Plan of Montano Barbarano in Vicenza, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 15 Palazzo Montano Barbarano at Vicenza in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 116
Figure 4.45 Elevation & View of Palazzo Montano Barbarano

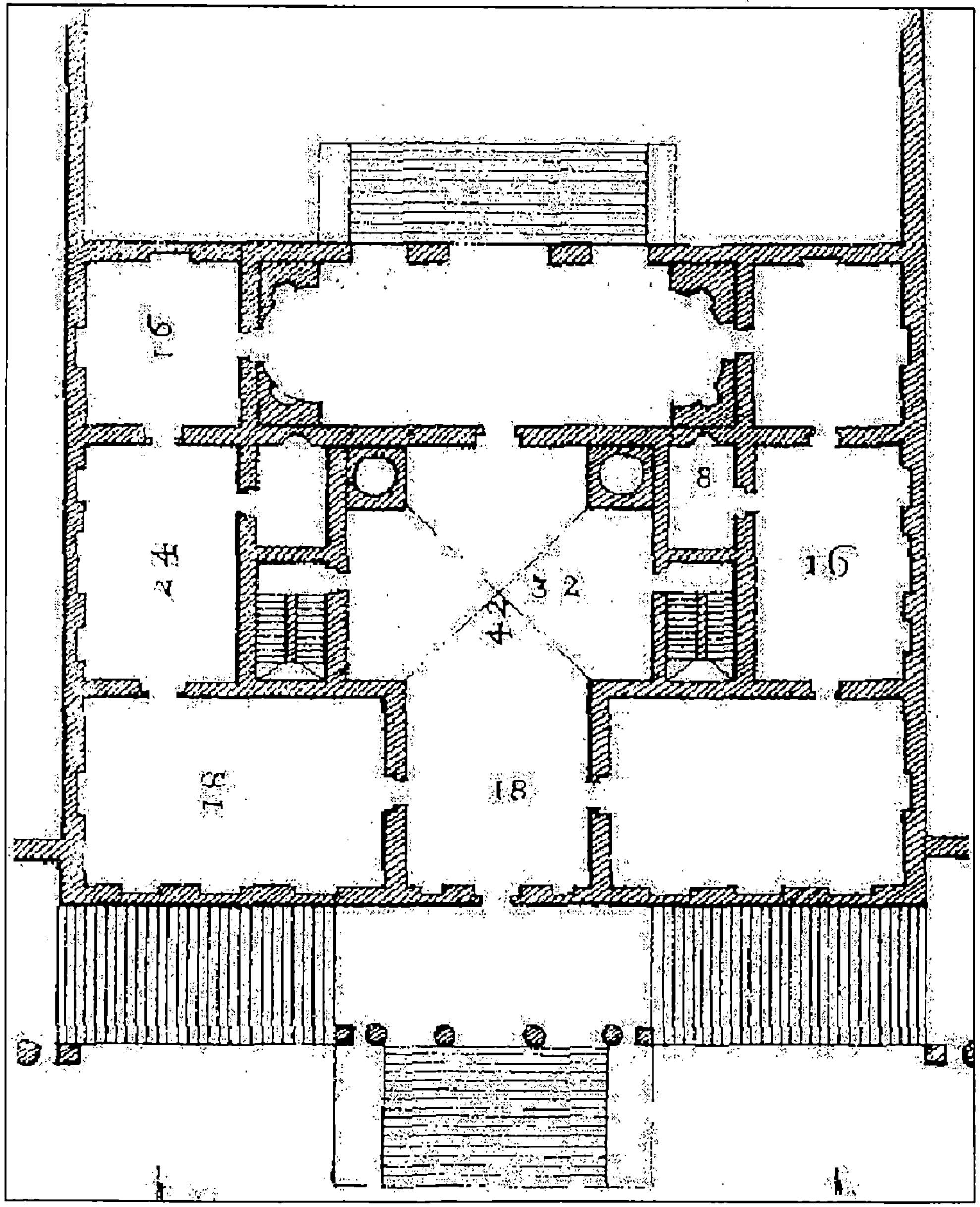


Figure 4.46 Plan Of Vittore Marco & Daniele de Pisani at Bagnolo Scanned From Plate 030, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

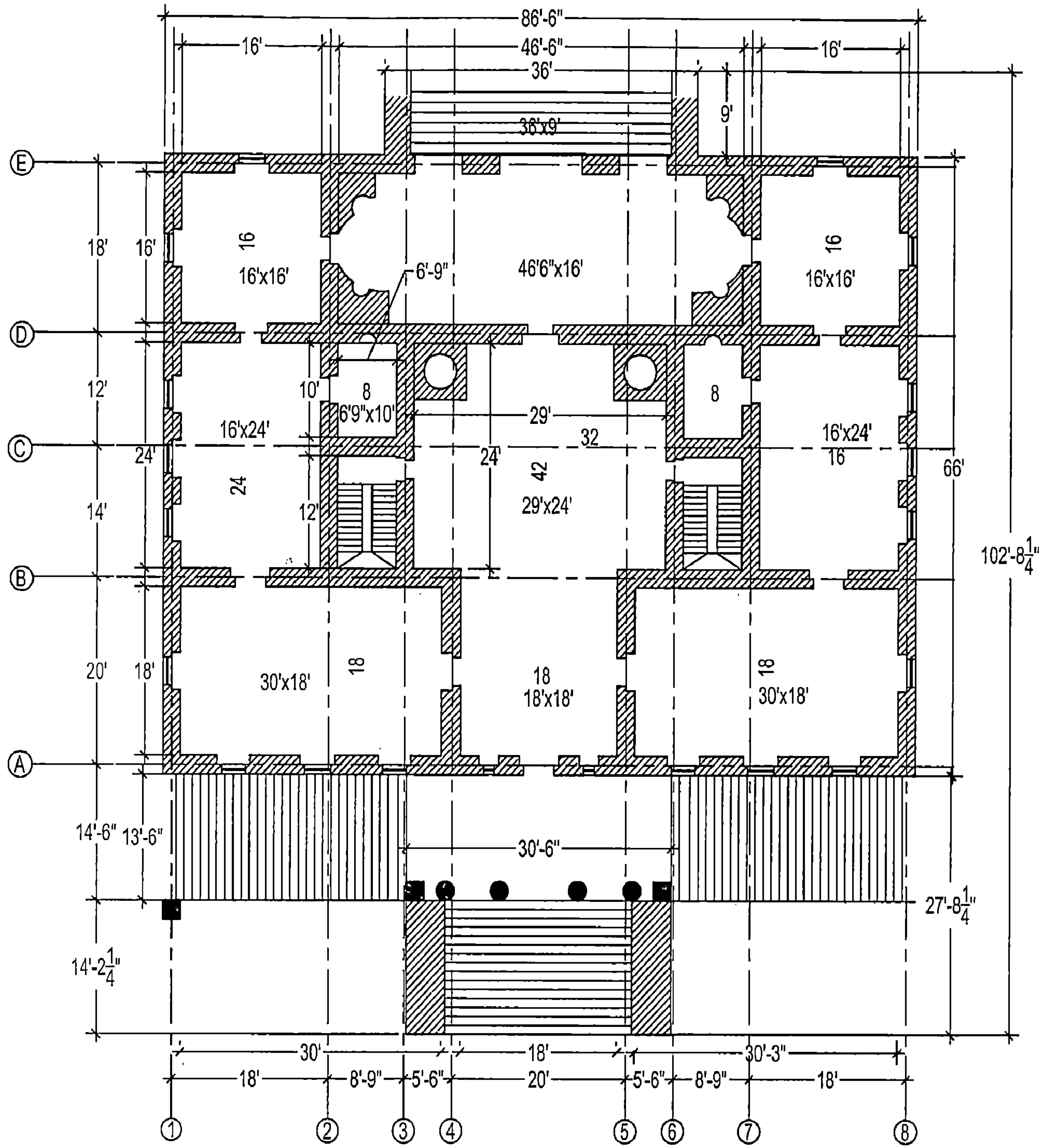


Figure 4.47 Plan Of Vittore Marco & Daniele de Pisani at Bagnolo Redrawn From Plate 030, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

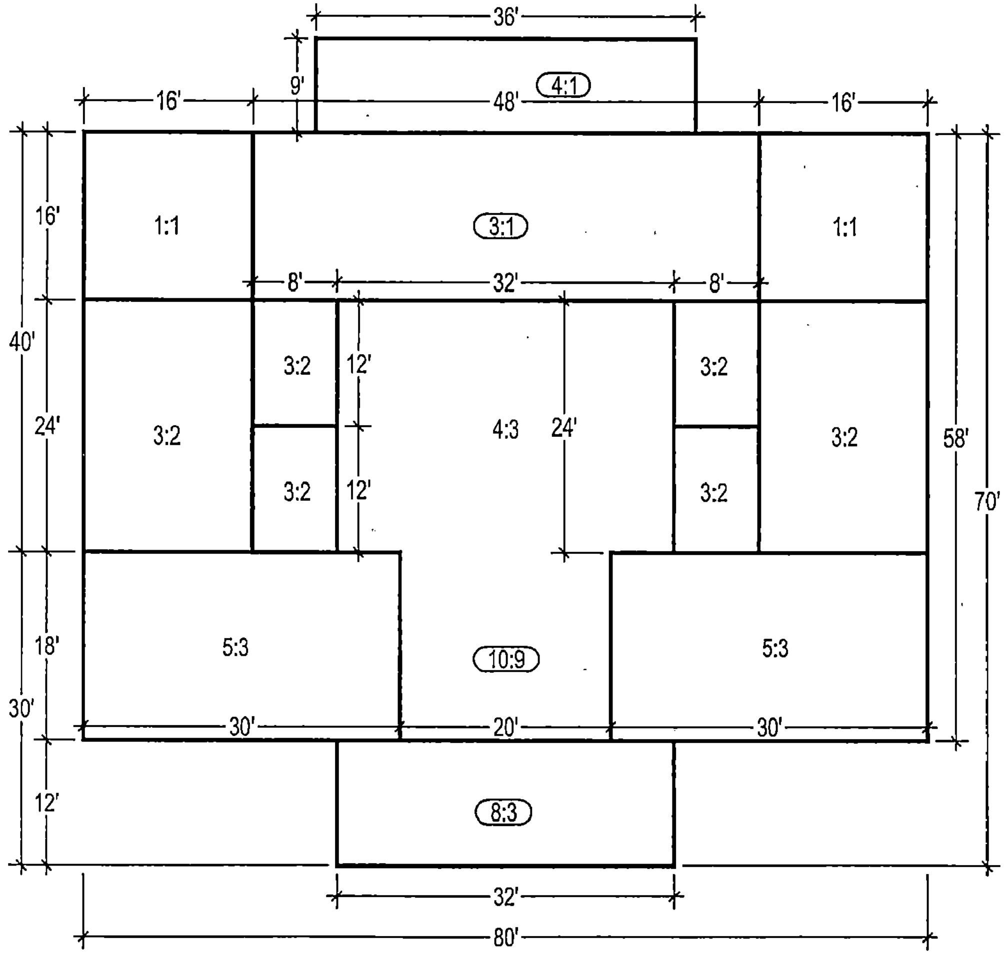


Figure 4.48 Schematic Analysis Vittore Marco & Daniele de Pisani at Bagnolo, Plate 030, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 30, VILLA VITTORE, MARCO AND DANIELE PISANI AT BAGNOLO NEAR LONIGO.

From the commentary by Palladio it could be inferred that this is first of country house to be illustrated in book two.

We can infer the following from schematic line diagram analysis:

- The main building whole (excluding portico) is 80'x58' which is close to 7:5 (84'x60')
- The central planning of main structure is symmetrical along central axis
- Main room sizes and ratios observed are 12'x8', 16'X16', 24'x16' and 30'x 18'which could be interpreted as 3:2, 1:1, 3:2 and 5:3.
- Non standard room ratios like 10:9, 8:3, 4:1 and 3:1 are identified. 10:3 could be interpreted as ratio formed from division of basic ratio 5:3 / 3:2 = 10:9 (a:b / c:d = bc: ad). 8:3 could be referred to Alberti's theory of long room ratios. 4:1 and 3:1 could be referred to Alberti's theory of long room ratios. 4:1 and 3:1 could be referred to Alberti's theory of long room ratios. 4:1 could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 2:1 = 4:1 (a:b x c:d = ac:bd). 3:1 could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

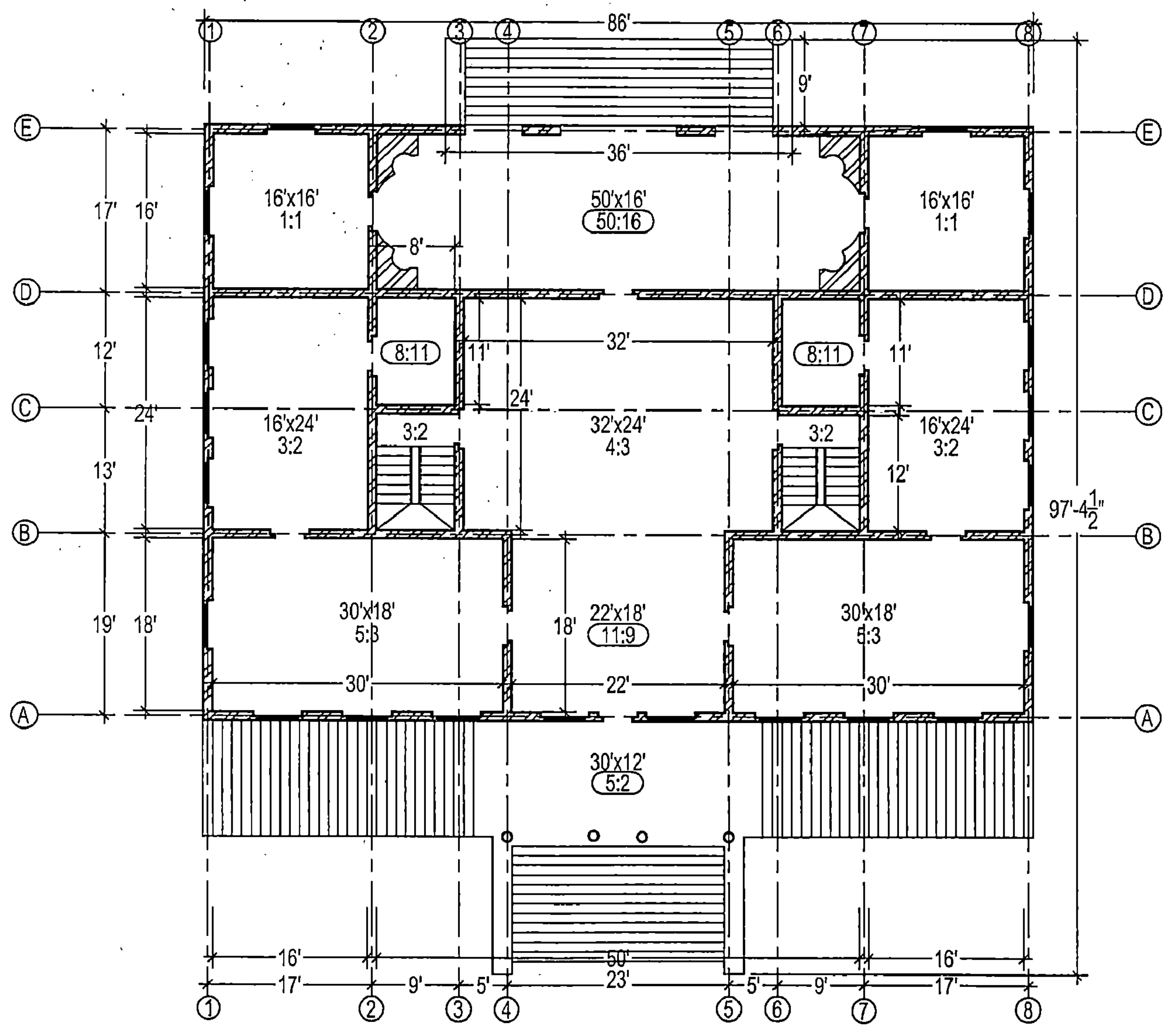
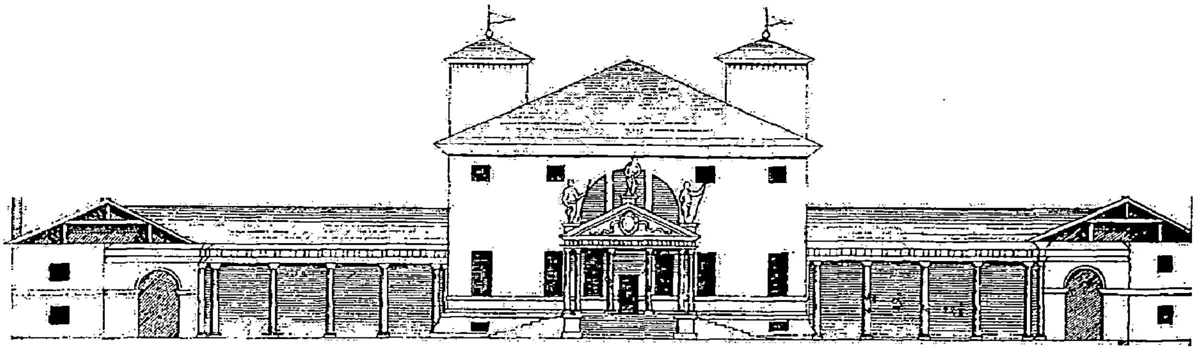
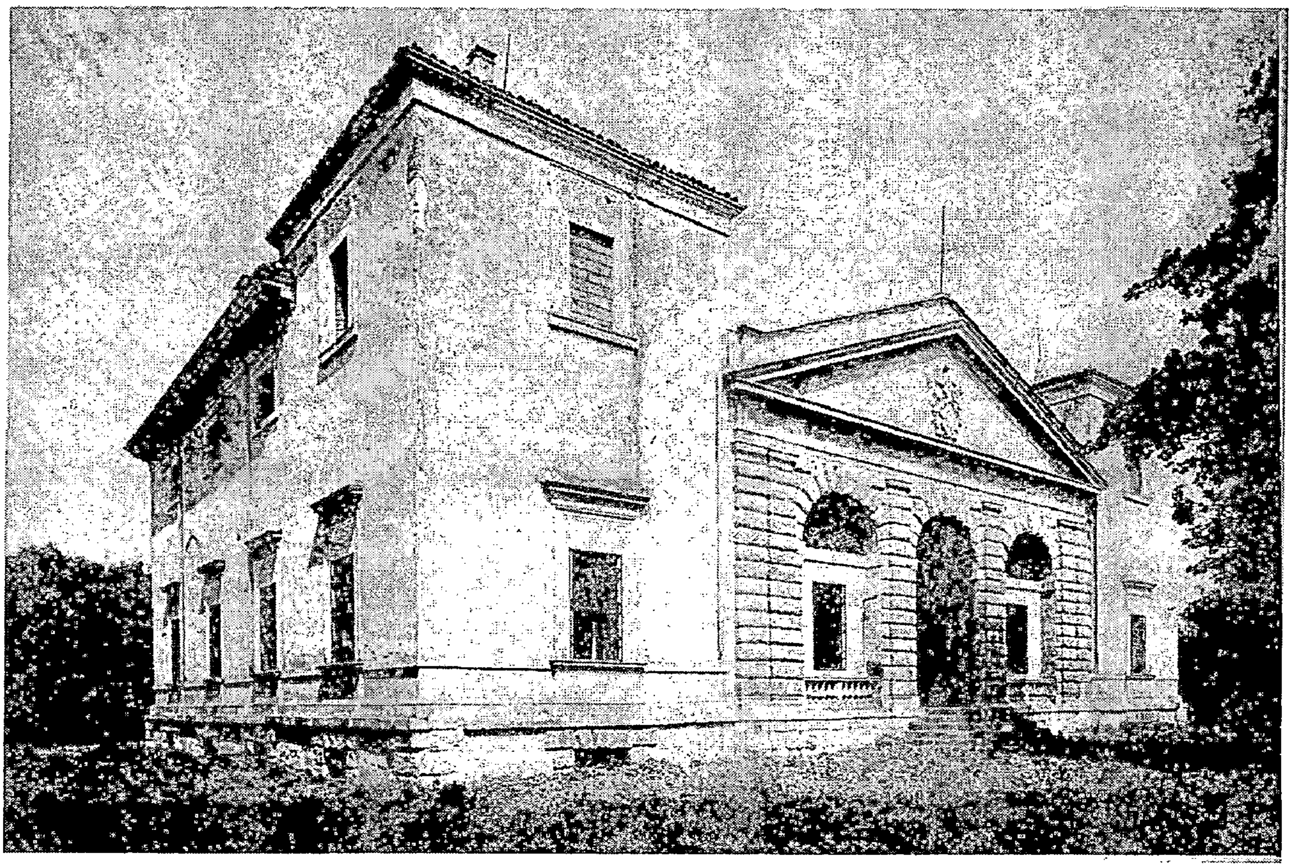


Figure 4.49 Plan of Vittore Marco & Daniele de Pisani at Bagnolo, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 30 Villa Vittore Marco and Daniele Pisani at Bagnolo near Lonigo in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 32
Figure 4.50 Elevation & View of Villa Vittore Marco and Daniele Pisani

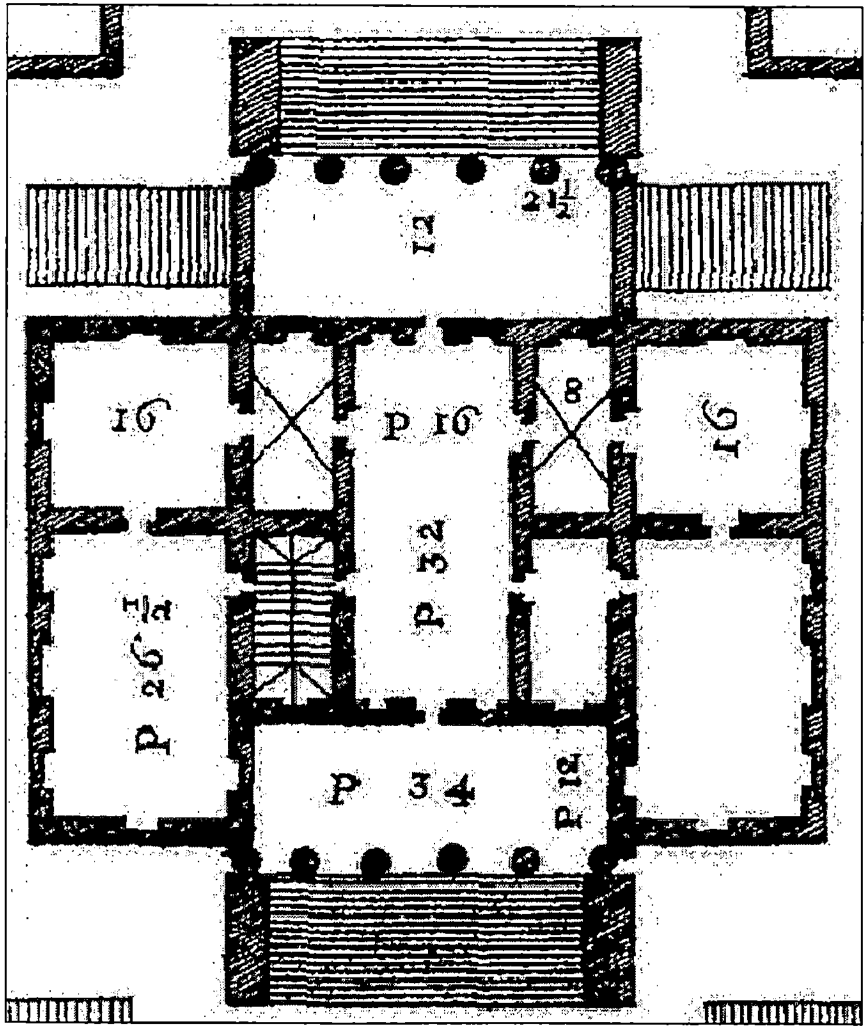


Figure 4.51 Plan Of Francesco Badoero at Polesine Scanned From Plate 031, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

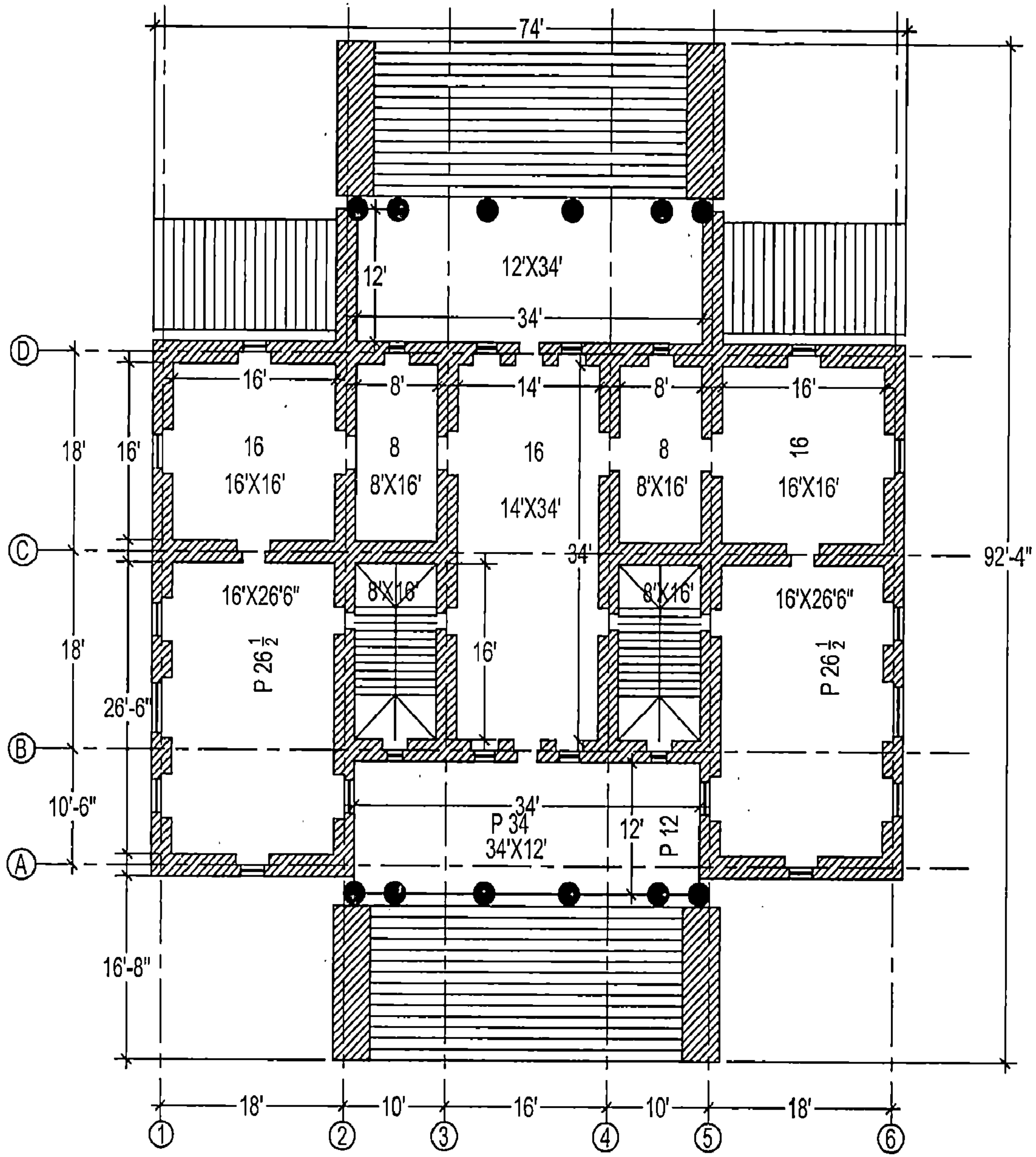


Figure 4.52 Plan Of Francesco Badoero at Polesine Redrawn From Plate 031, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

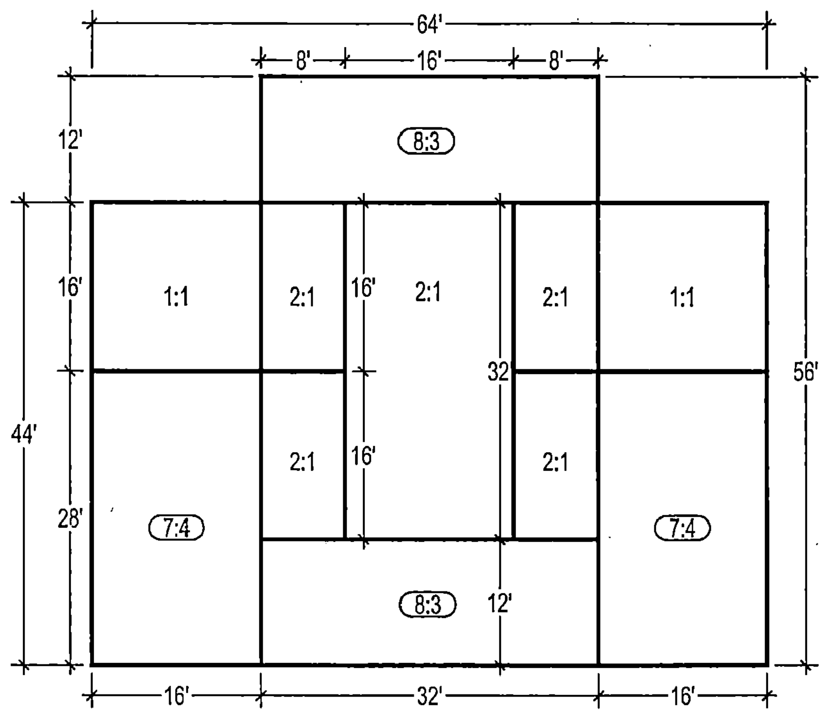


Figure 4.53 Schematic Analysis Francesco Badoero at Polesine, Plate 031, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 31, VILLA FRANCESCO BADOERO AT POLESINE

We can infer the following from schematic line diagram analysis:

- The main building whole is 64'x56' which is 8:7
- The central planning of main structure is symmetrical along central axis
- The front is divided in to 16': 32' : 16' which is 1:2:1 and symmetrical on central axis. While side on central core is divided in to 12':16': 16':12' which is 3:4:4:3 which is symmetrical on central axis.
- Main room sizes and ratios observed are 8'X16', 16'X16' and 16'x32'which could be interpreted as 2:1, 1:1, 2:1
- Non standard room ratios like 8:3 and 7:4 are identified.

  8:3 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

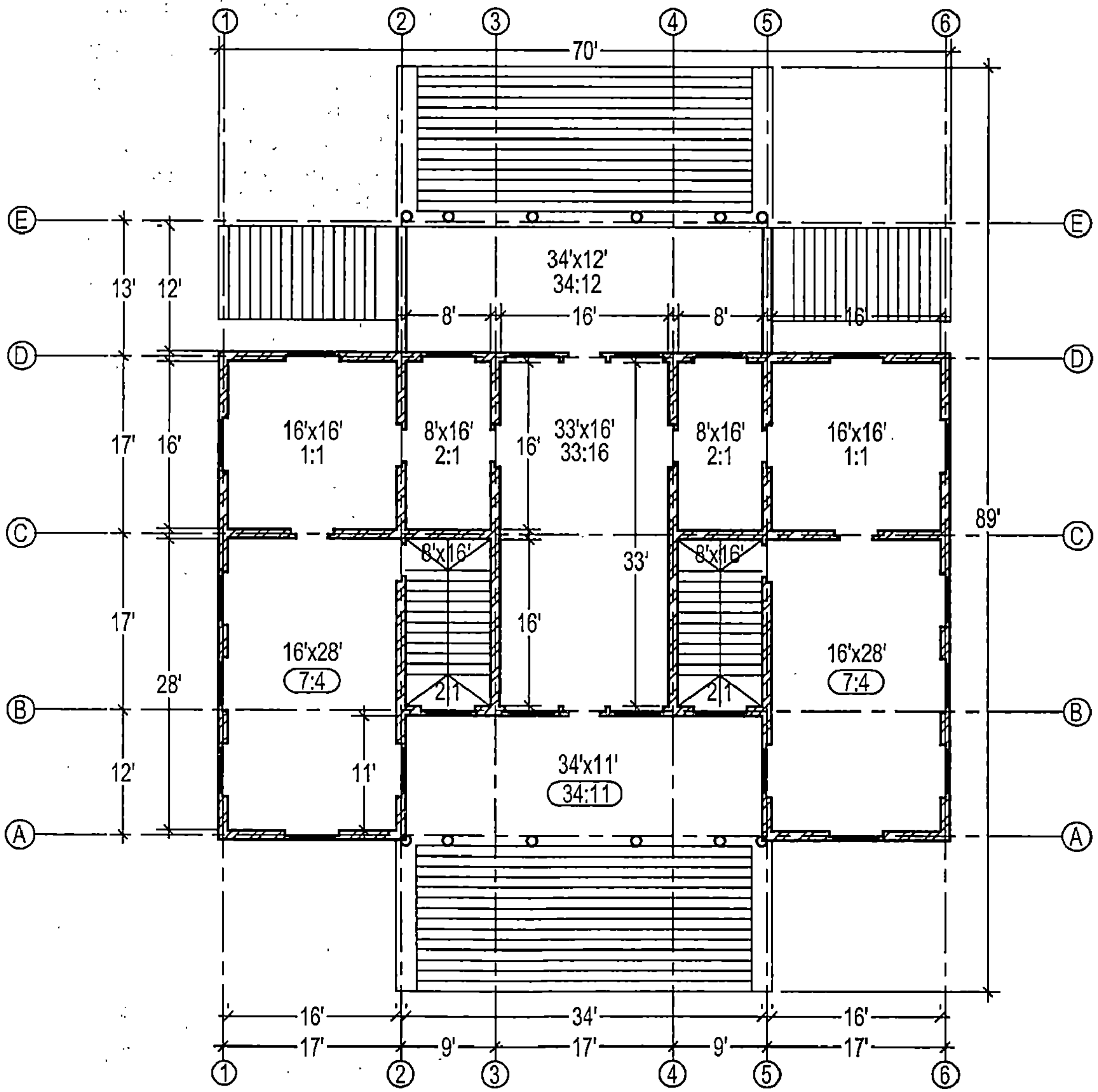
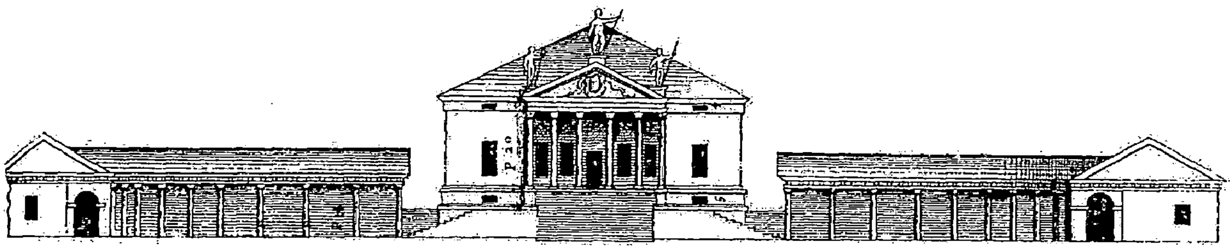
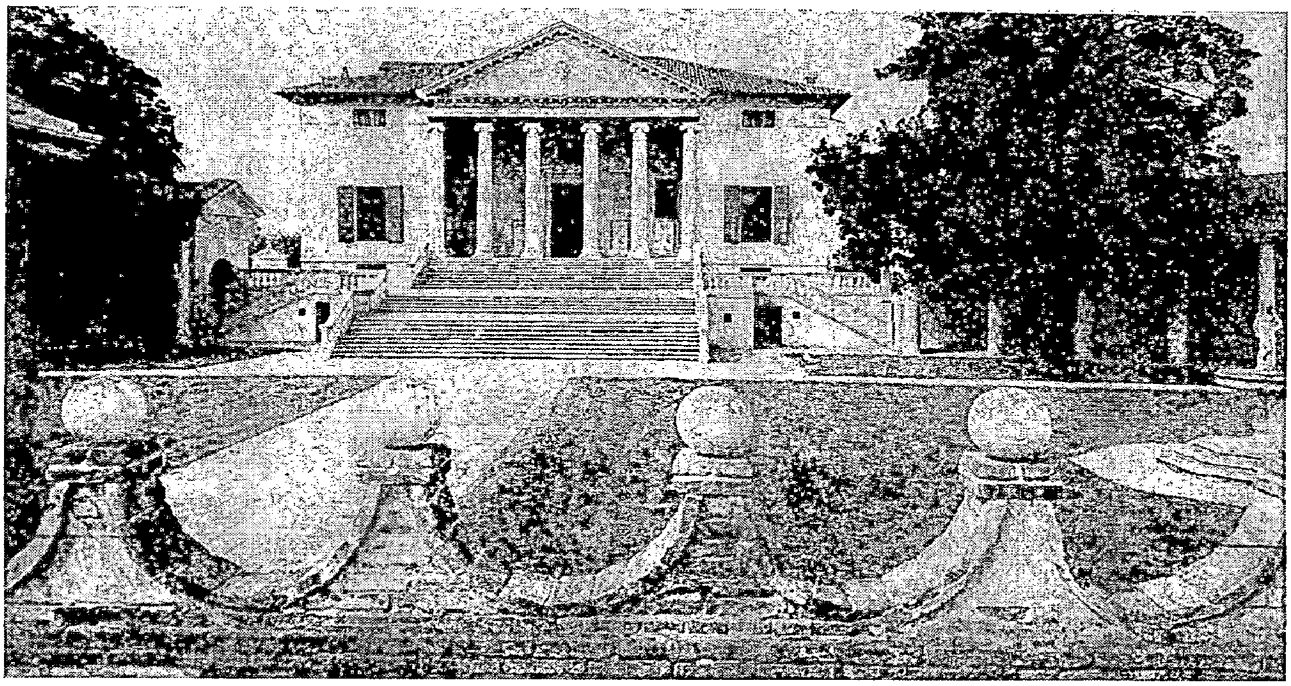


Figure 4.54 Plan of Francesco Badoero at Polesine, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 31 Villa Francesco Badoero at Polesine in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 80
Figure 4.55 Elevation & View Of Villa Francesco Badoero

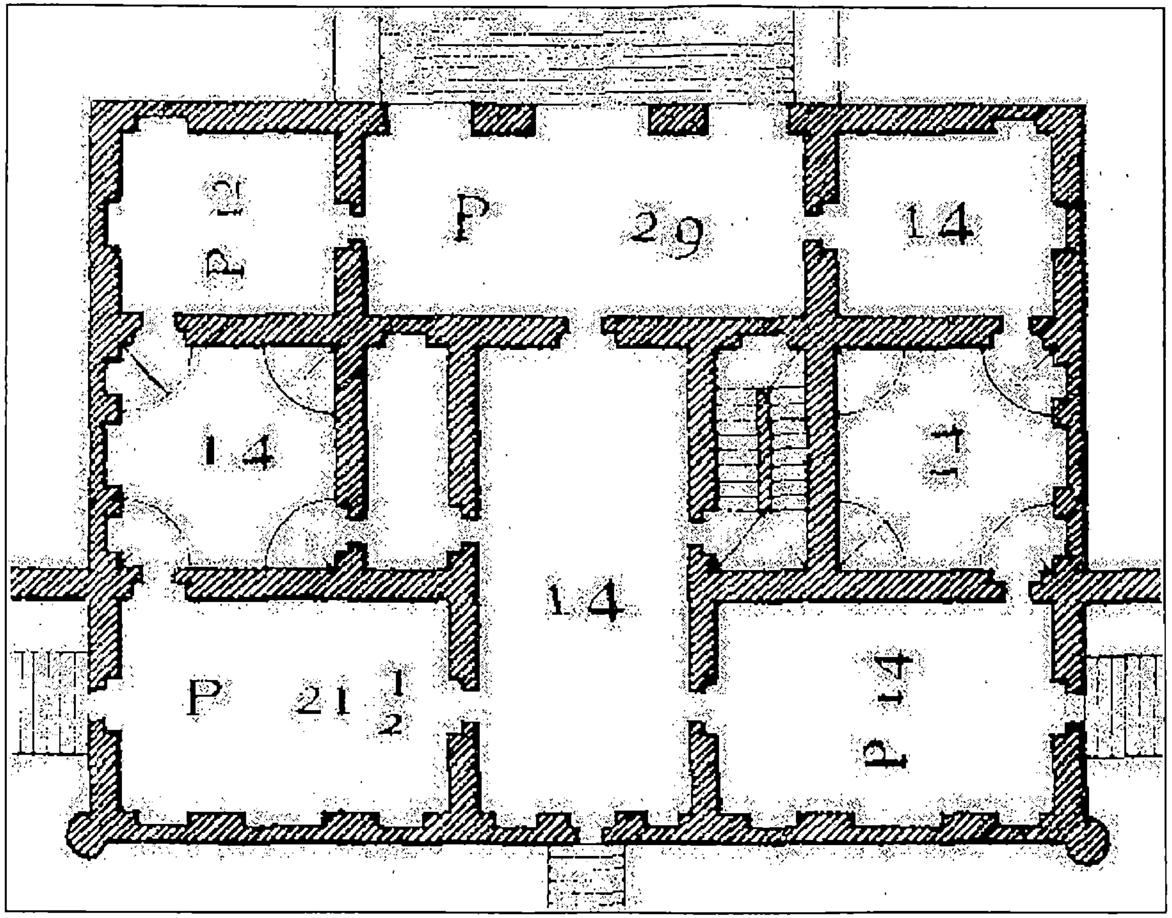


Figure 4.56 Plan Of Marco Zeno at Cesalto Scanned From Plate 032,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

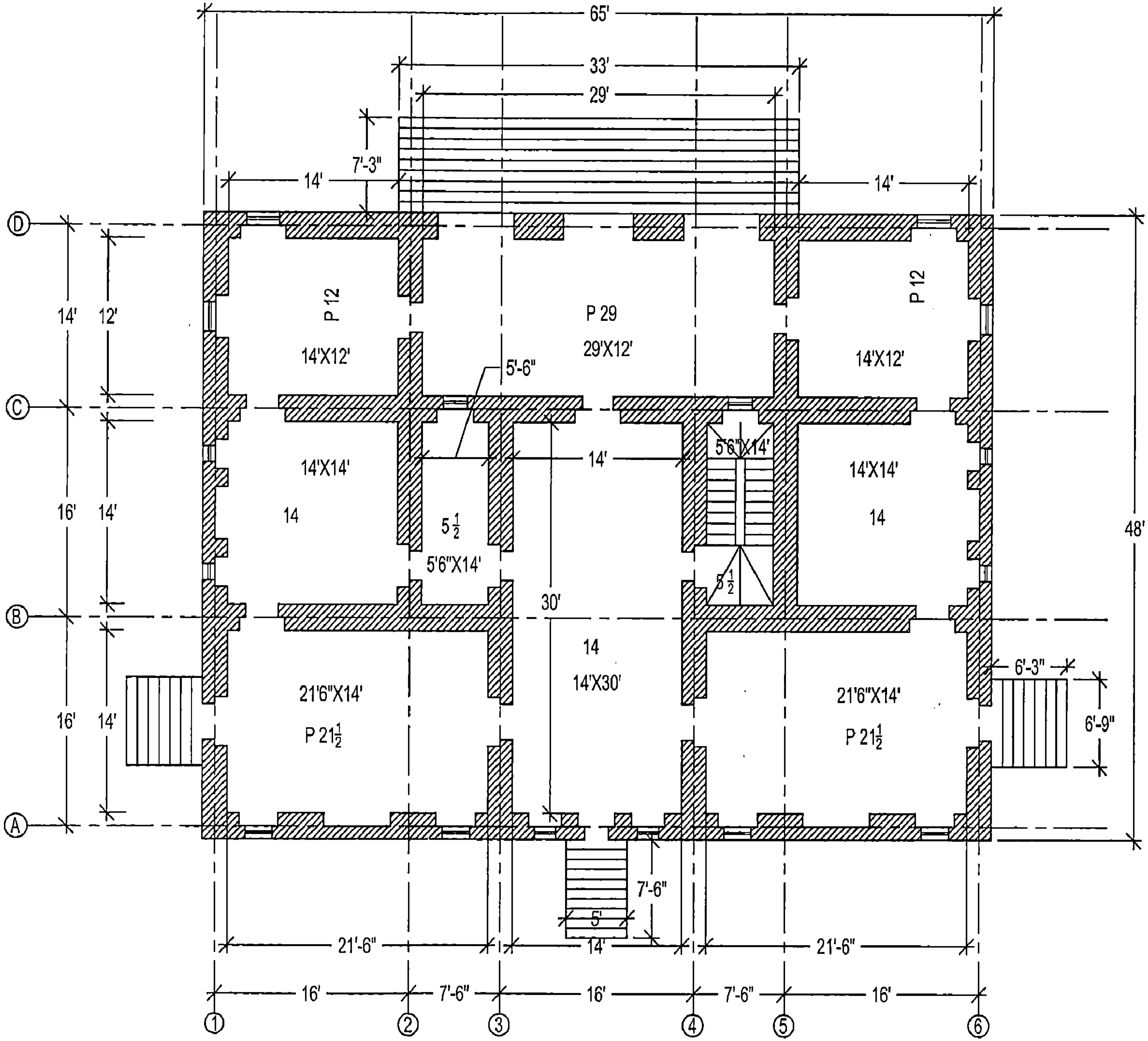


Figure 4.57 Plan Of Marco Zeno at Cesalto Redrawn From Plate 032, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

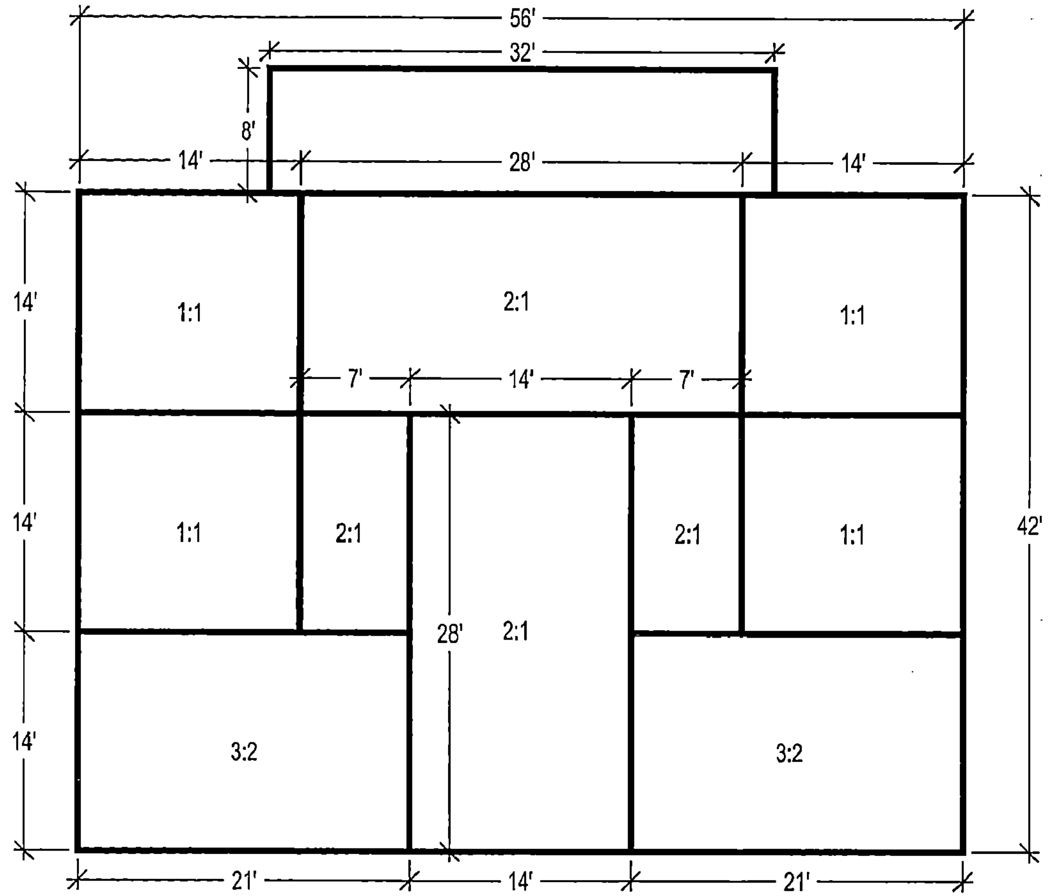


Figure 4.58 Schematic Analysis Marco Zeno at Cesalto, Plate 032,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

PLATE 32, VILLA MARCO ZENO AT CESALTO

We can infer the following from schematic line diagram analysis:

- The main building whole is 56'x42' which is 7:5 or diagona4:3.
- The central planning of main structure is symmetrical along central axis
- The front is divided in to 14': 28' : 14' which is 1:2:1 and symmetrical on central axis. While side is divided in to 14':14': 14' which is 1:1:1 which asymmetrical on central axis. Main room sizes and ratios observed are 7'X14', 14'X14'and 21'X14' which could be interpreted as 2:1, 1:1and 3:2
- No non standard room ratios are identified

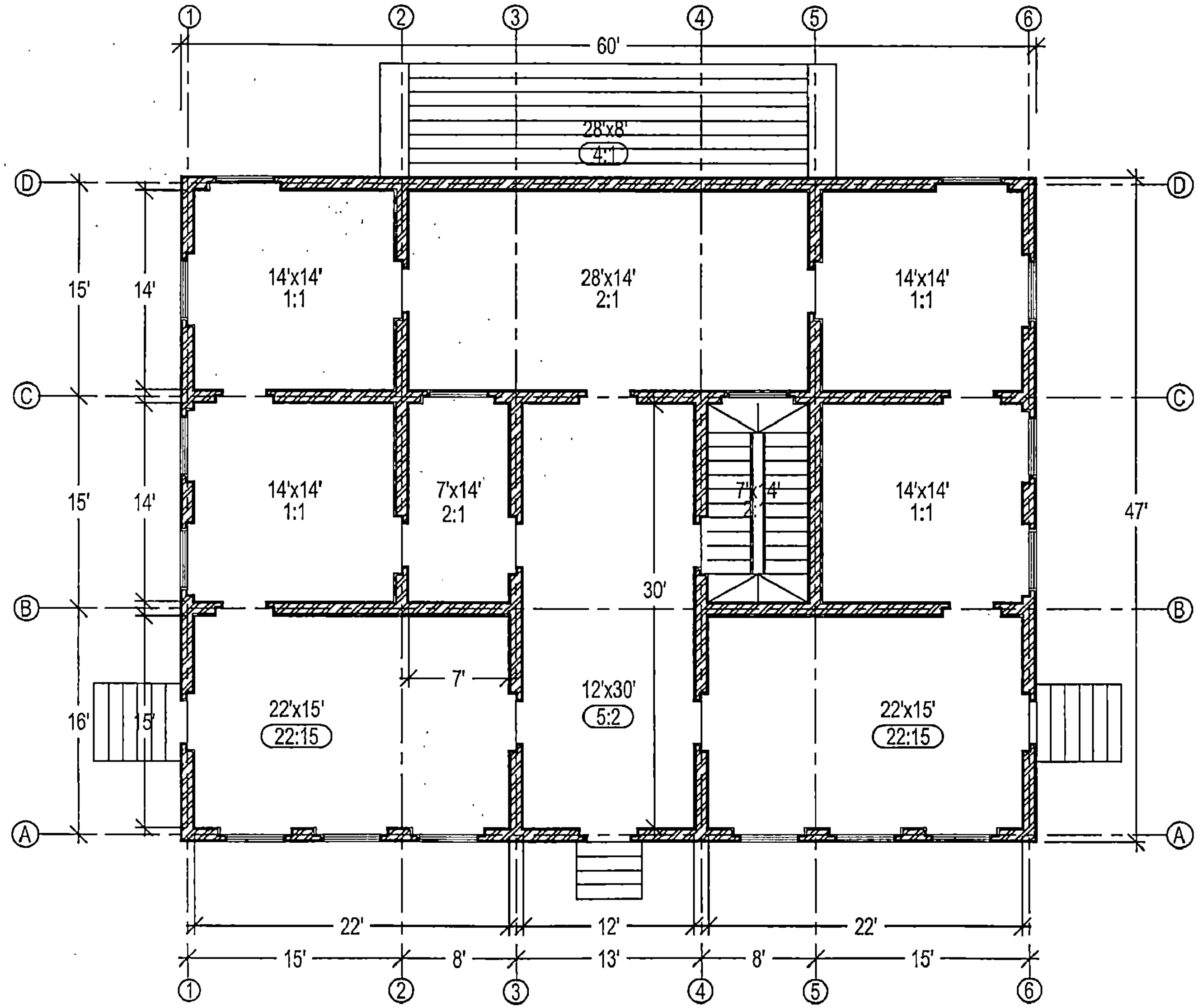
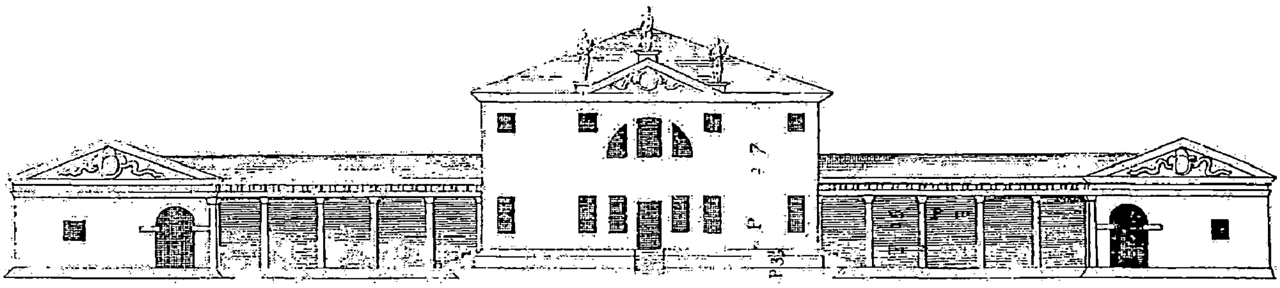
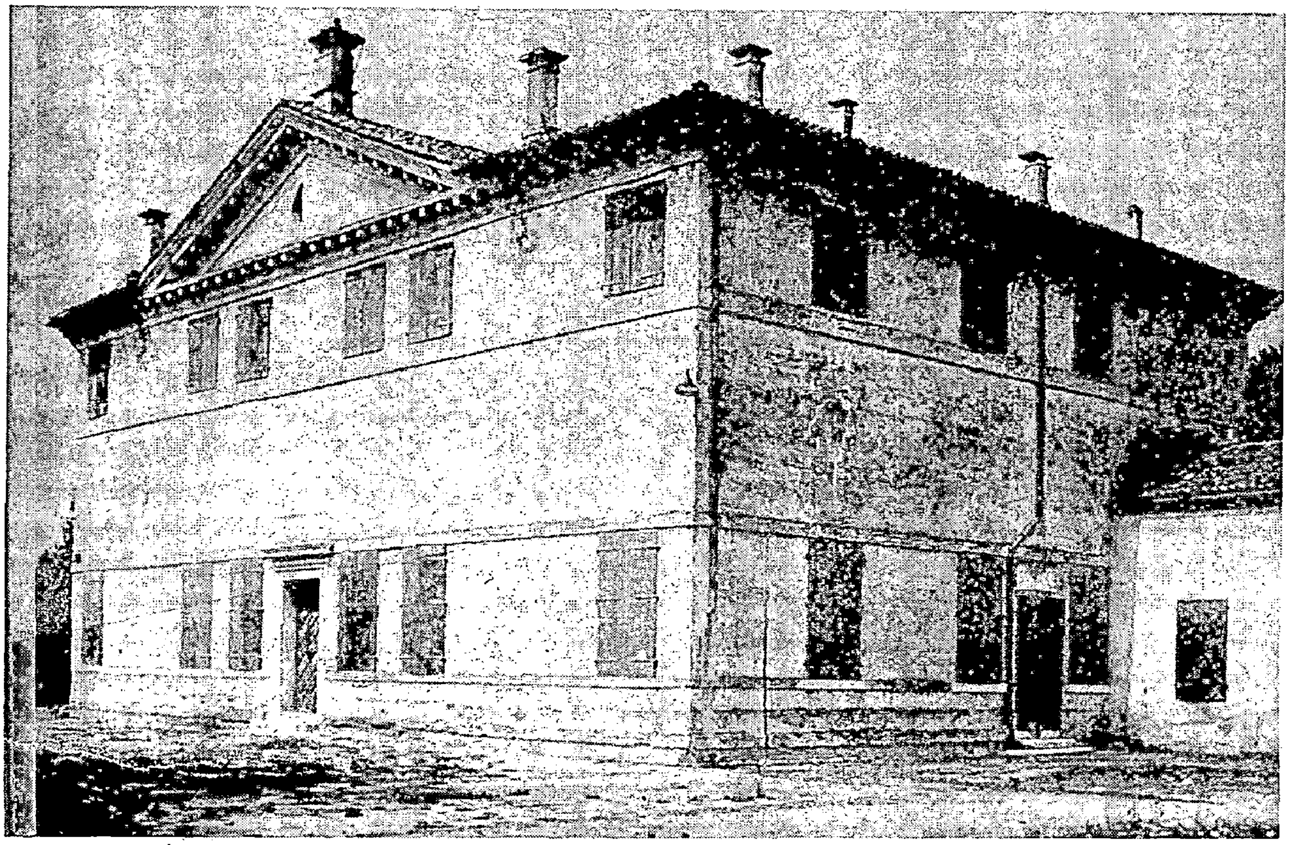


Figure 4.59 Plan of Marco Zeno at Cesalto, developed on the basis of schematic analysis

Scale 1" = 12'



Source: Plate 32 Villa Marco Zeno at Cesalto in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 85
Figure 4.60 Elevation & View of Villa Marco Zeno

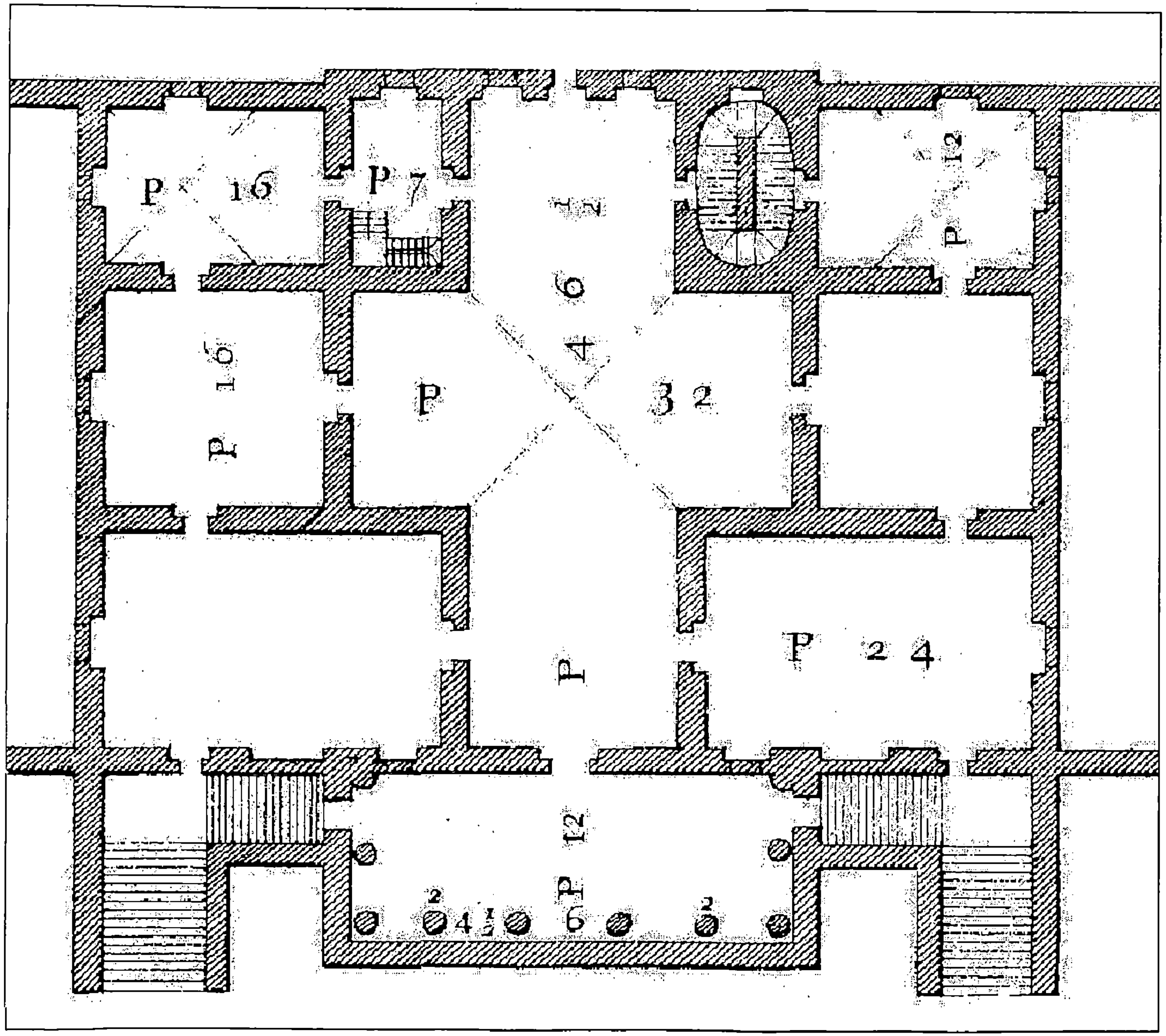


Figure 4.61 Plan Of Nicolo & Luigi de Foscari at Brenta Scanned From Plate 033, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

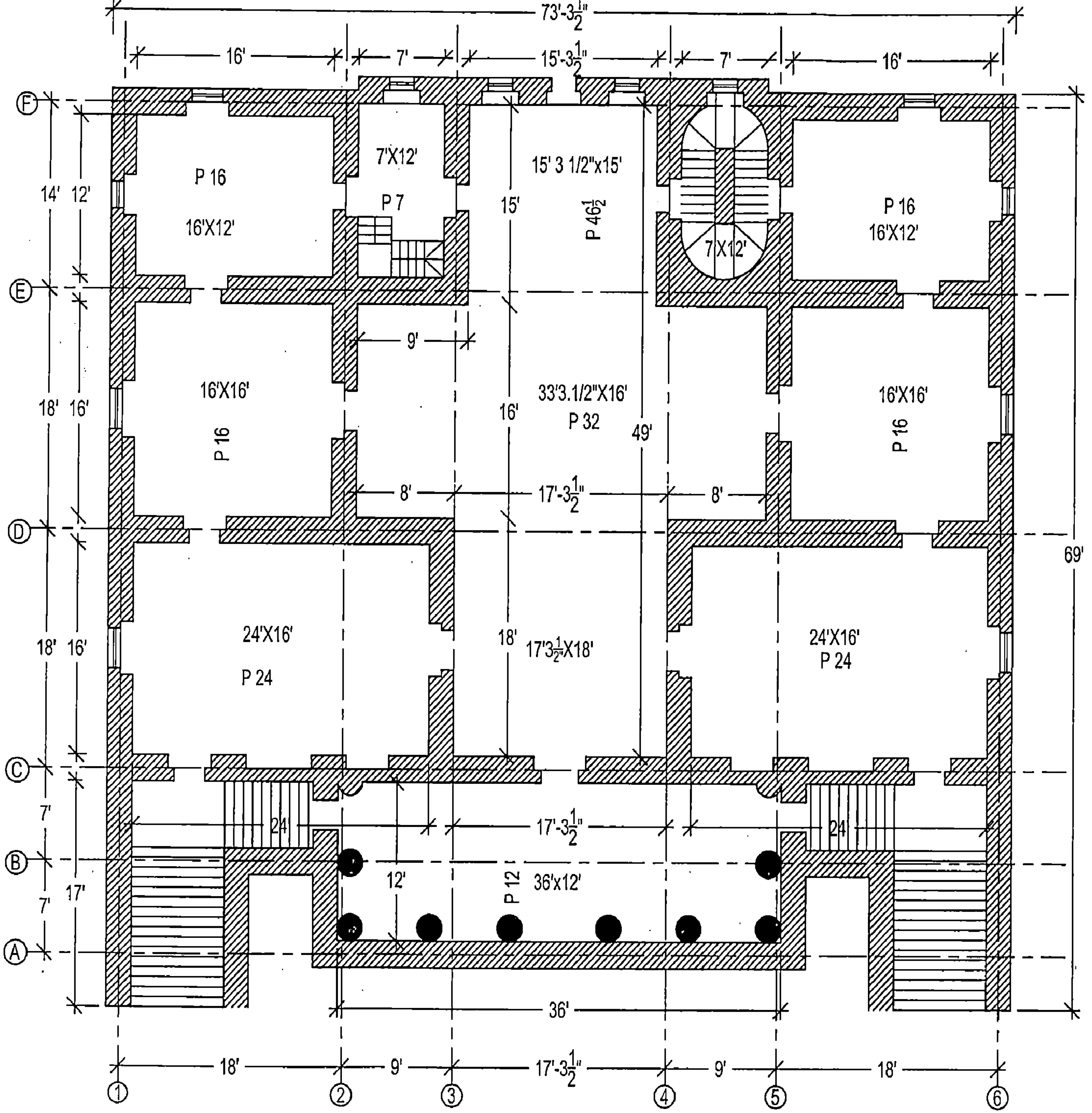


Figure 4.62 Plan Of Nicolo & Luigi de Foscari at Brenta Redrawn From Plate 033, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

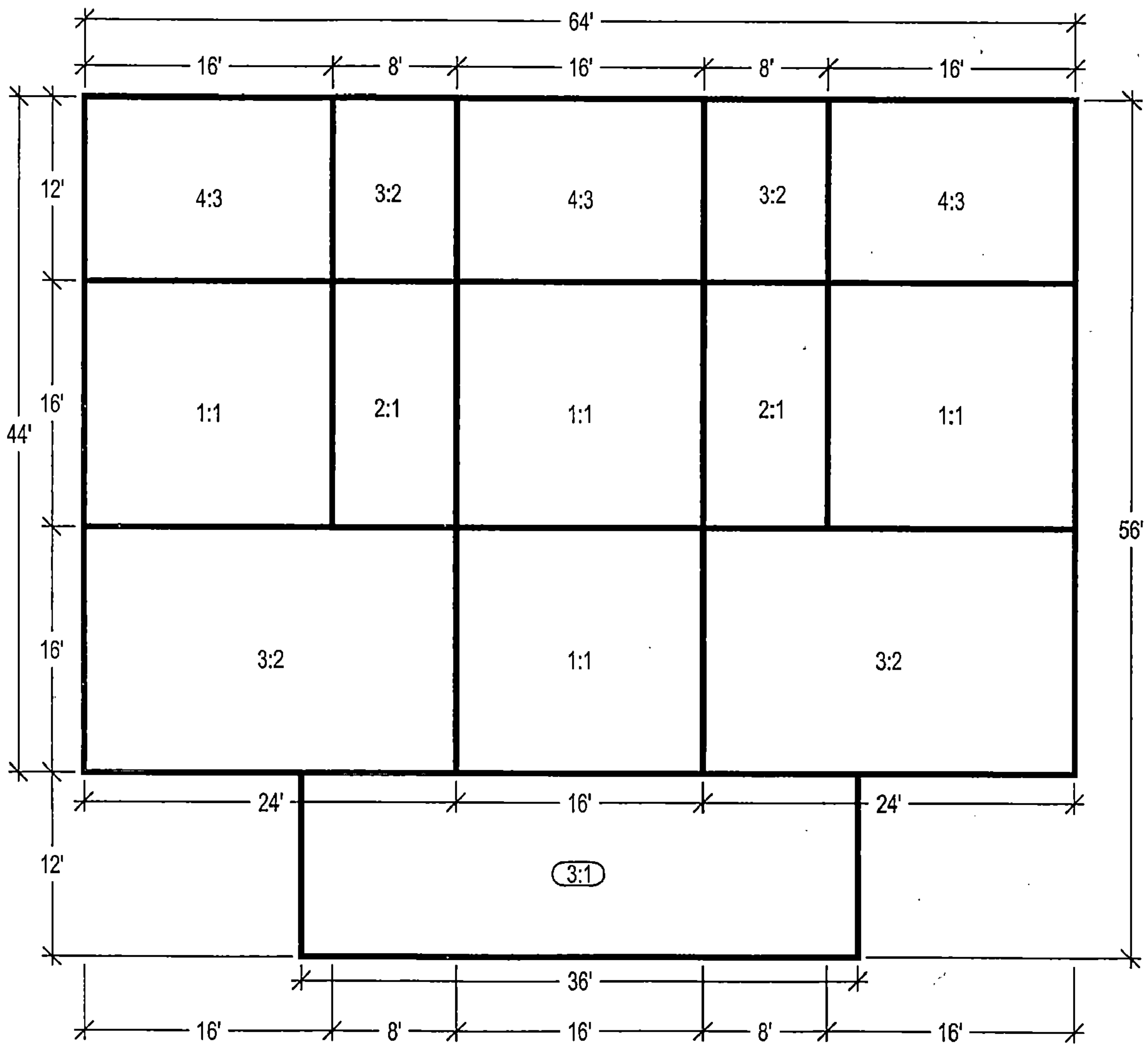


Figure 4.63 Schematic Analysis Nicolo & Luigi de Foscari at Brenta, Plate 033, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

PLATE 33, VILLA NICOLO AND LUIGI FOSCARI AT BRENTA

We can infer the following from schematic line diagram analysis:

- The main building whole is 64'x 56' which is 7:8. Which could be understood as square and one seventh.
- The central planning of main structure is symmetrical along central axis
- The front is divided in to 24': 16' : 24' which is 3:2:3 and symmetrical on central axis. While side is divided in to 12':16': 16':12' which is 3:4:4:3 which symmetrical on central axis.
- Main room sizes and ratios observed are 8'X12', 16'X12', 16'X16' and 24'X16' which could be interpreted as 3:2, 4:3, 1:1 and 3:2
- Non standard room ratio like 3:1 is identified. 3:1 could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

Scale 1" = 12'

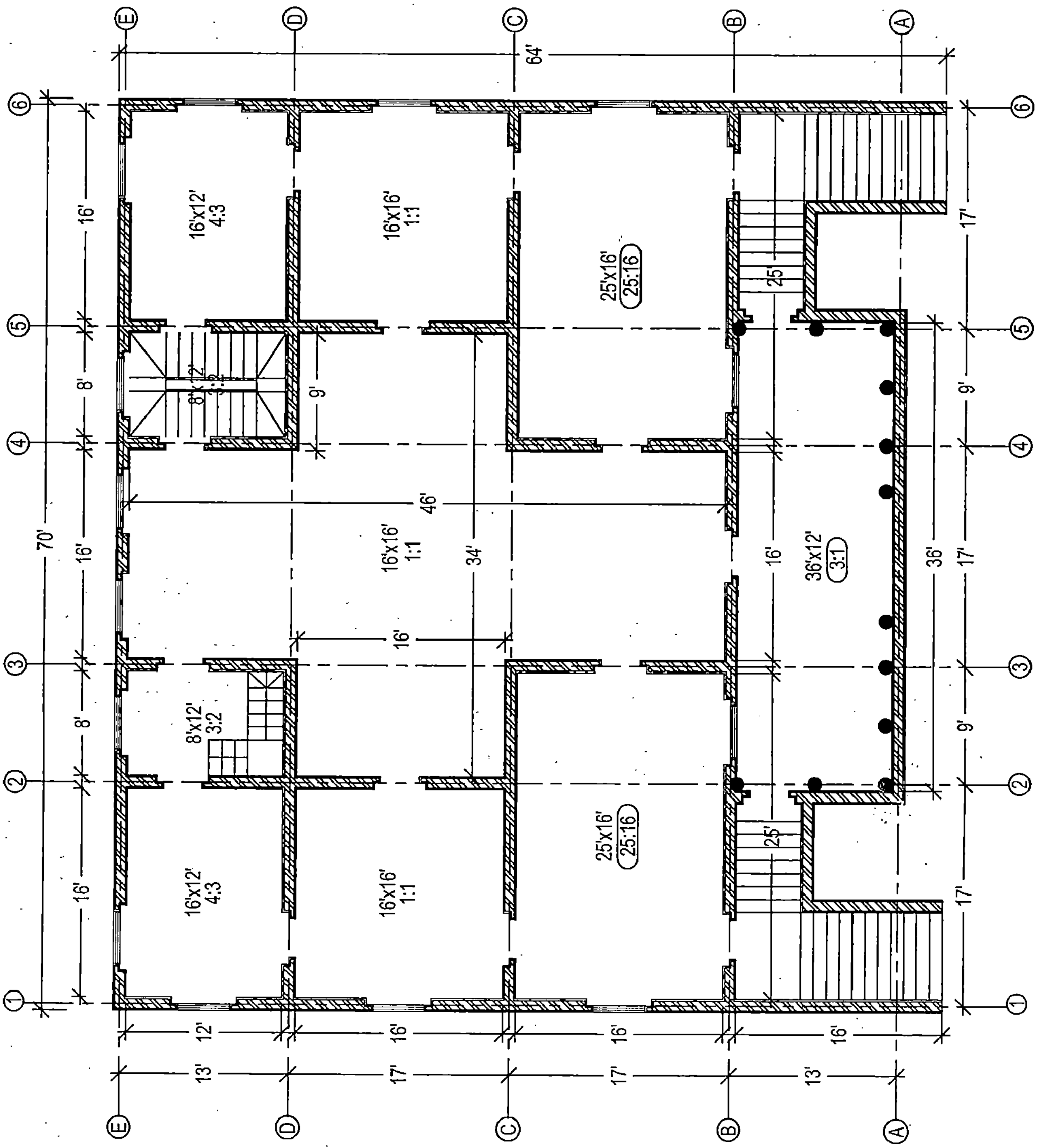
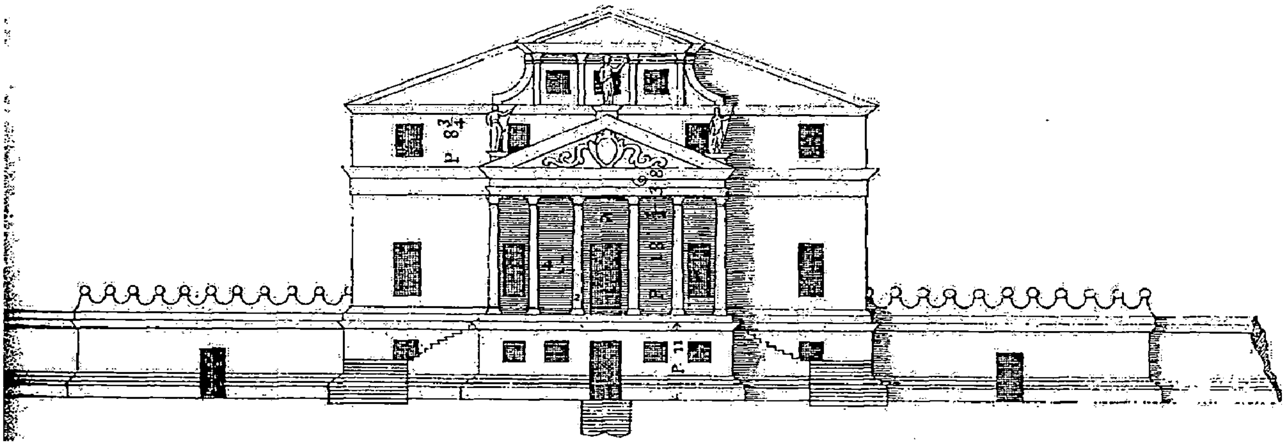
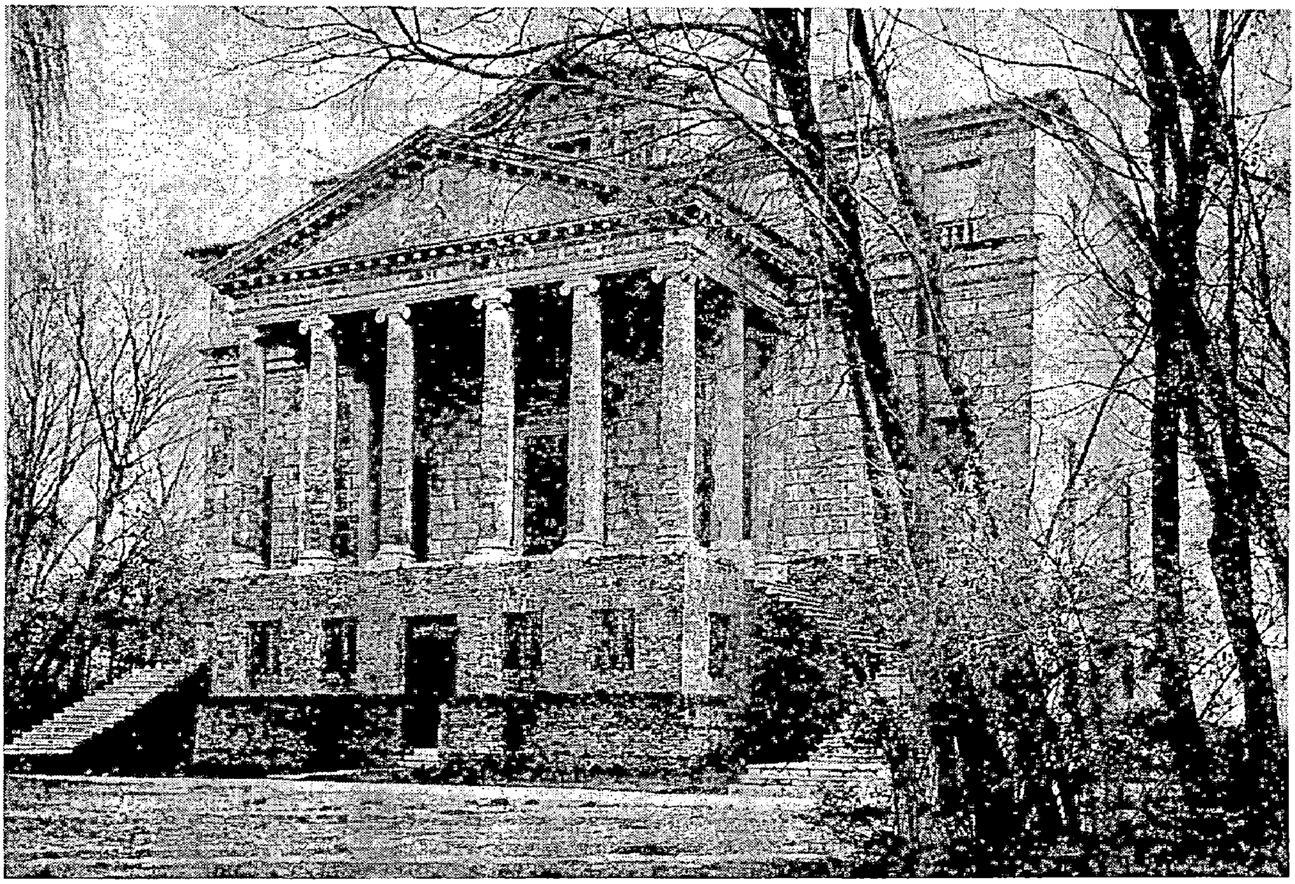


Figure 4.64 Plan of Nicolo & Luigi de Foscari at Brenta, developed on the basis of schematic analysis



Source: Plate 33 Villa Nicolo and Luigi Foscari at Brenta in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 83
Figure 4.65 Elevation & View of Villa Nicolo And Luigi Foscari

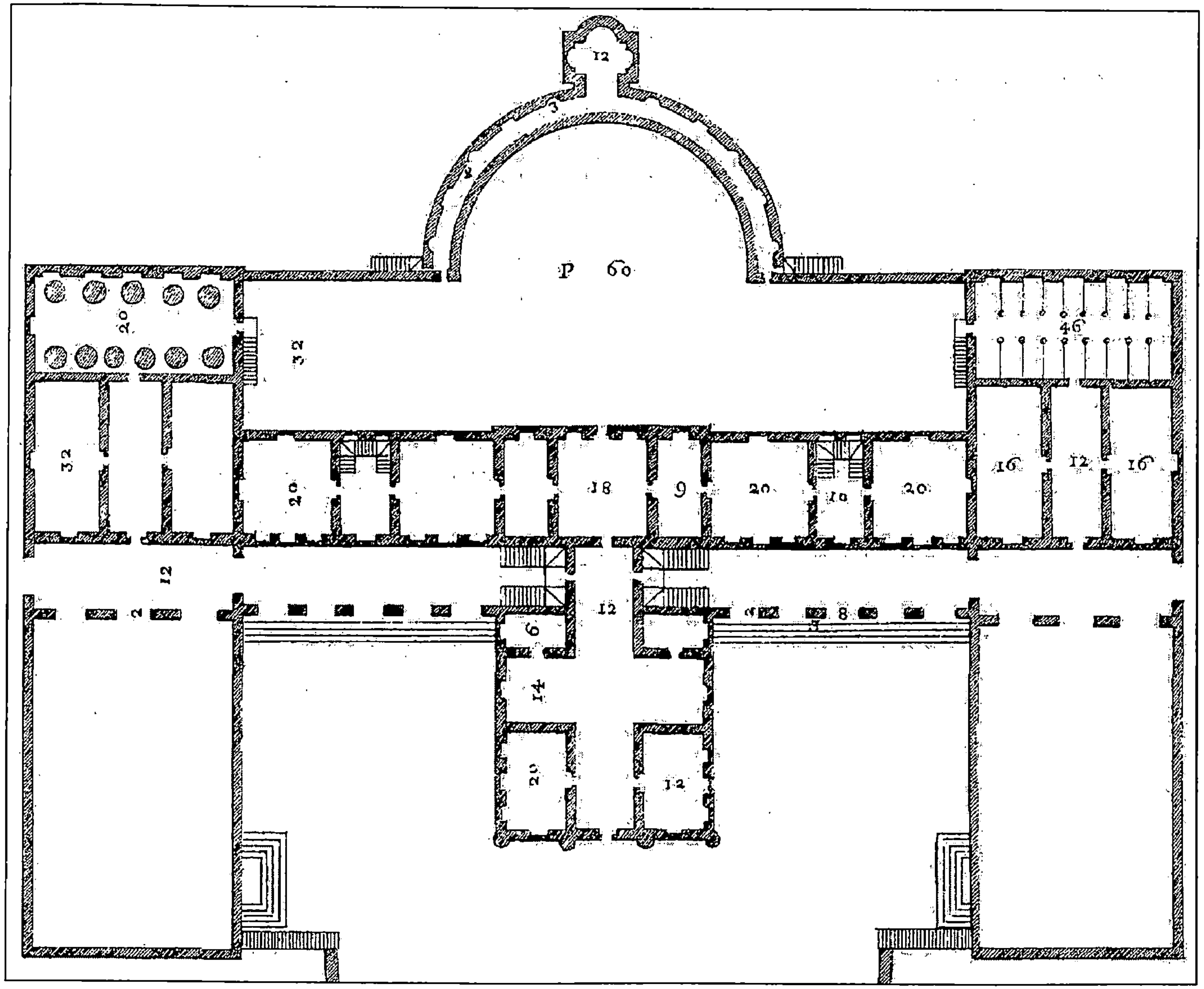


Figure 4.66 Plan Of Eletto di Aquileia daniele & Marc Antonio de Barbari at Masera Scanned From Plate 034, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

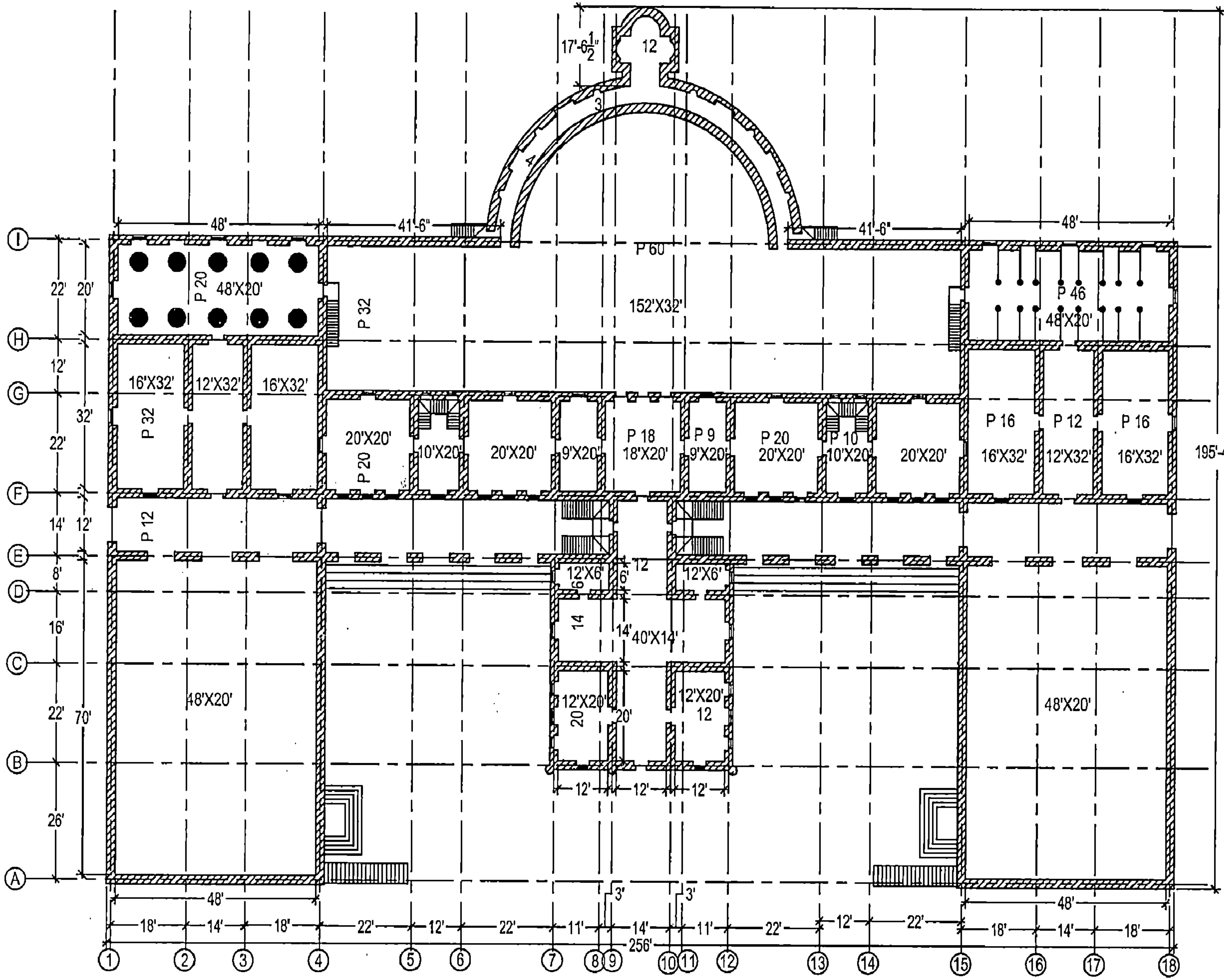


Figure 4.67 Plan Of Eletto di Aquileia daniele & Marc Antonio de Barbari at Masera Redrawn From Plate 034, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

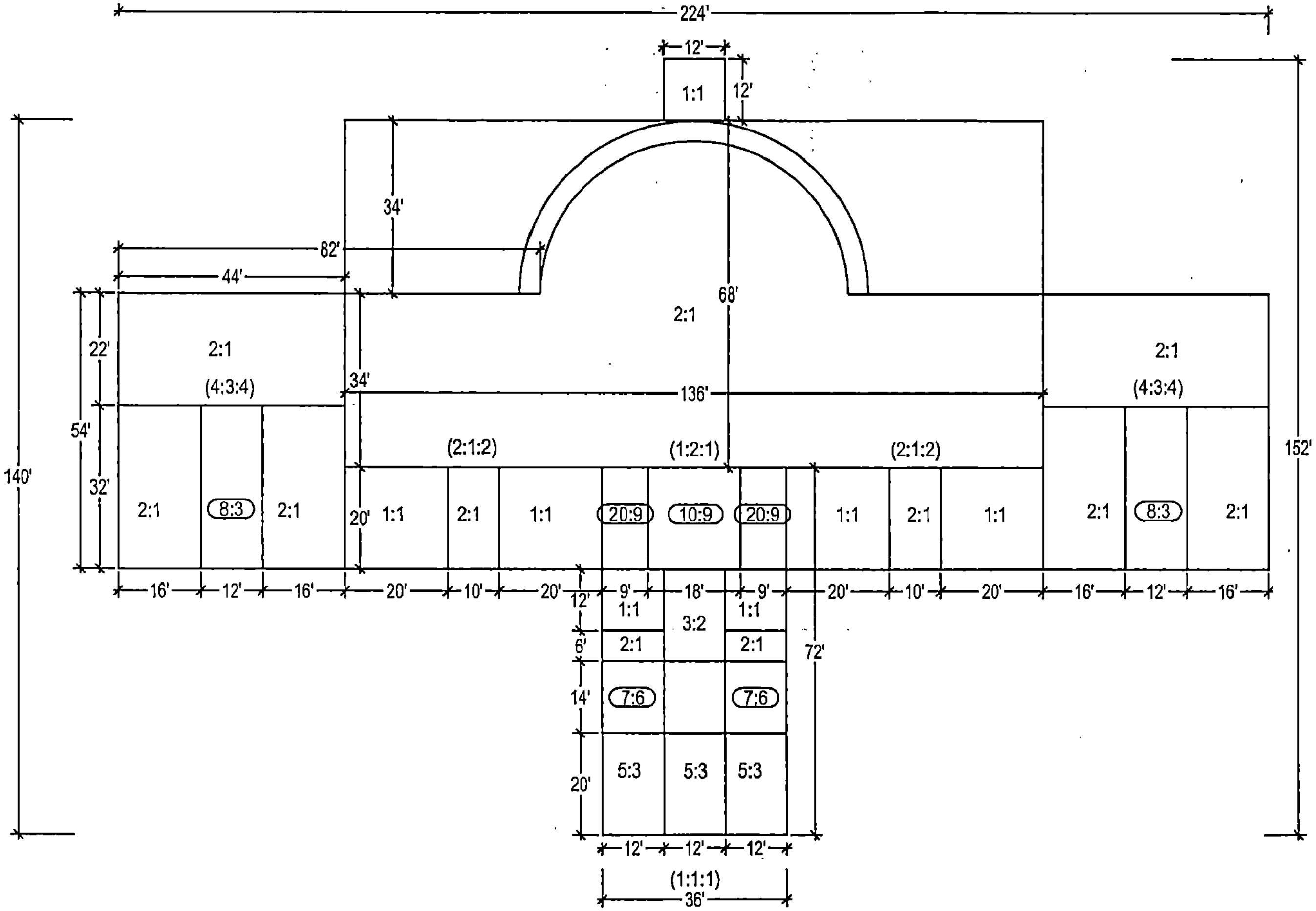


Figure 4.68 Schematic Analysis Eletto di Aquileia daniele & Marc Antonio de Barbari at Masera, Plate 034, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

PLATE 34, VILLA ELETTLO DE AQUILEIA AND MARC' ANTONIO DE BARBARI AT MASER

We can infer the following from schematic line diagram analysis:

- The main building whole with scaled measure of auxiliary wing from plate is close to 224'x 149' which is 3:2.
- The central planning of main structure is symmetrical along central axis with five triples as 16':12':16', 20':10':20', 9':18':9', 20':10':20', 16':12':16' which is 4:3:4, 2:1:2, 1:2:1, 2:1:2 and 4:3:4.
- The main structure is 72' X 36' which is 2:1 and the garden at the back is 136' X 68' which too is 2:1
- Main room sizes and ratios observed are 12'X6', 12'X12', 20'X12', 20'X10', 20'X20', 32'X16' and 44'X22' which could be interpreted as 2:1, 1:1, 5:3, 2:1, 1:1, 2:1 and 2:1
- Non standard room ratios like 10:9, 10:4.5, 8:3 and 7:6 are identified.

  10:9 could be interpreted as ratio formed from division of basic ratio 5:3 / 3:2 = 10:9 (a:b / c:d = bc:ad).

  10:4.5 could be understood as 10:5, which is 2:1

  8:3 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

  7:6 could be understood as square and one sixth.

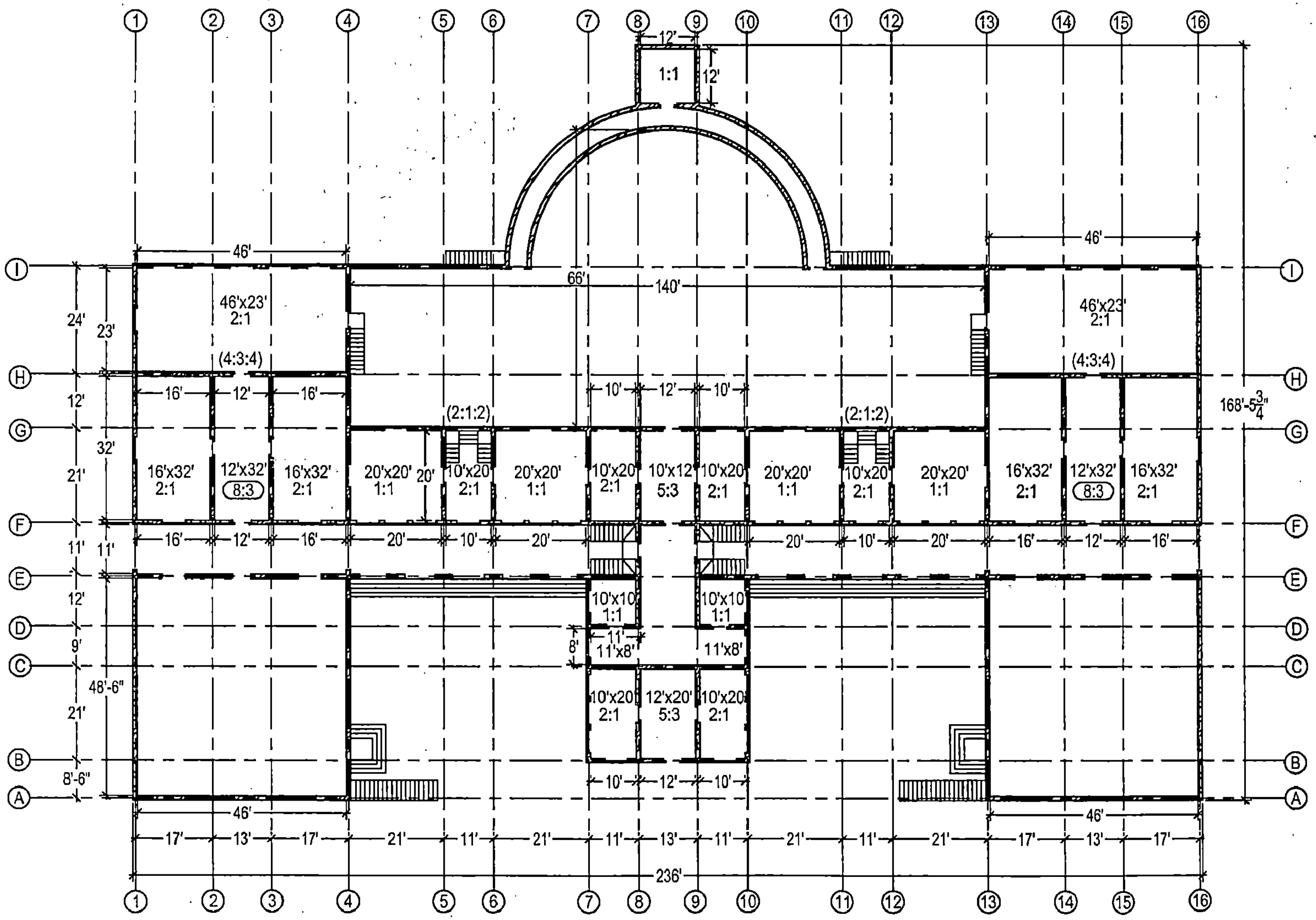
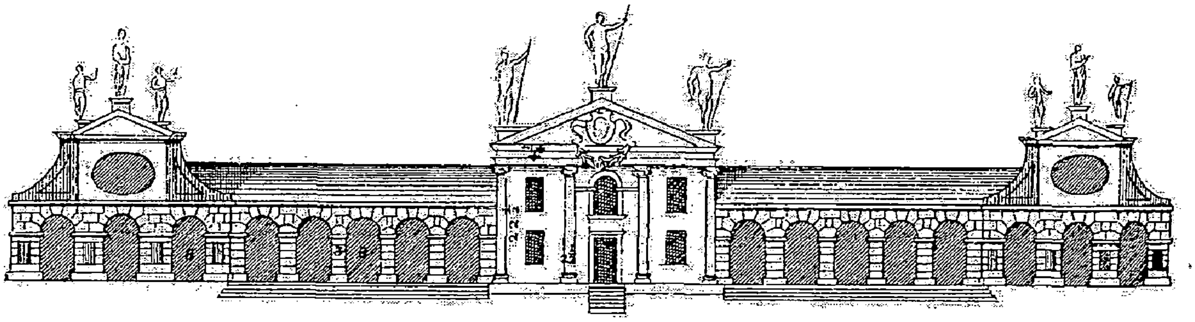
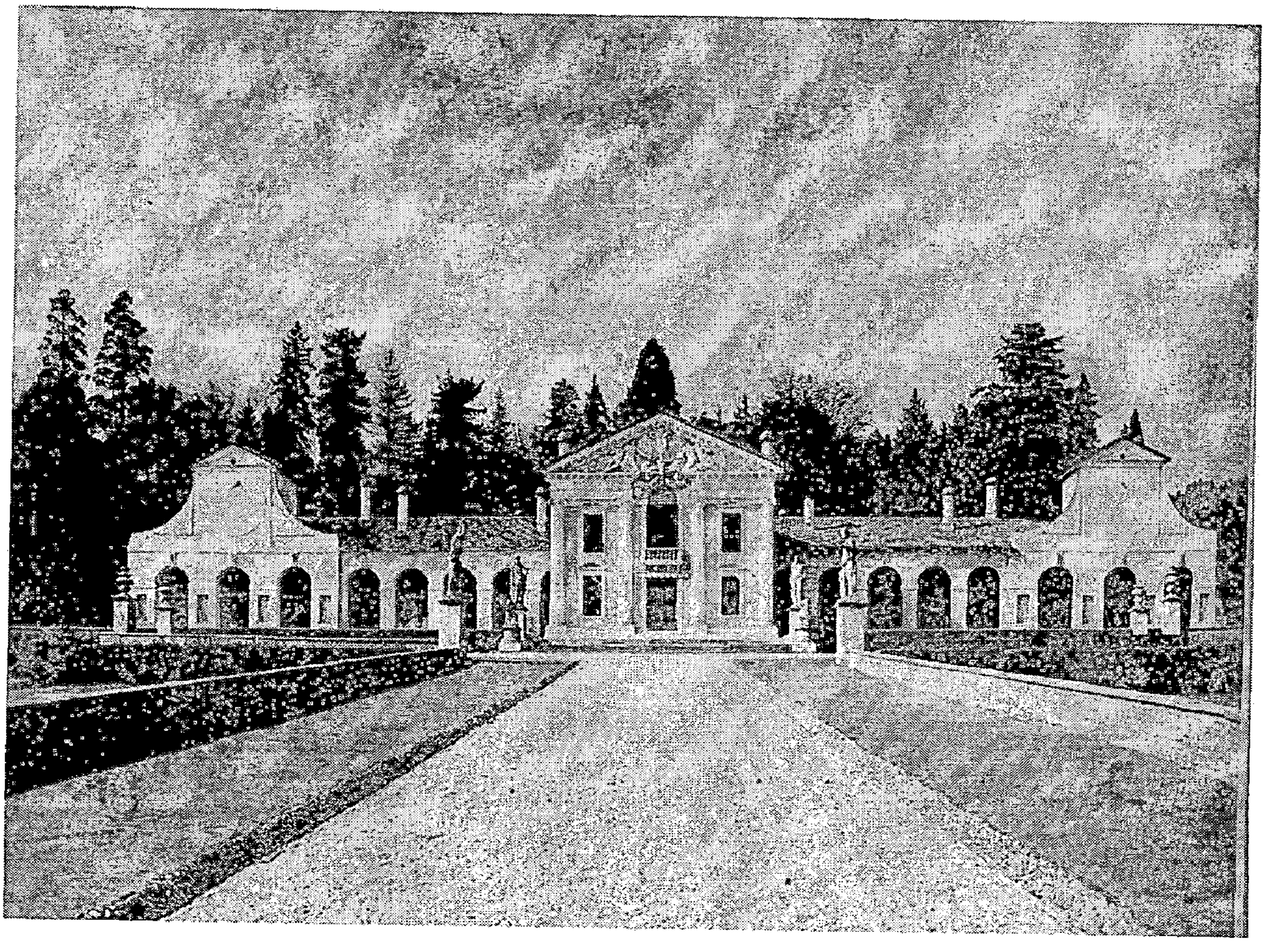


Figure 4.69 Plan of Eletto di Aquileia daniele & Marc Antonio de Barbari at Masera, developed on the basis of schematic analysis

Scale 1" = 36'



Source: Plate 34 Villa Elettlo De Aquileia and Marc' Antonio De Barbari at Maser in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 60
Figure 4.70 Elevation & View of Villa Elettlo De Aquileia And Marc' Antonio De Barbari

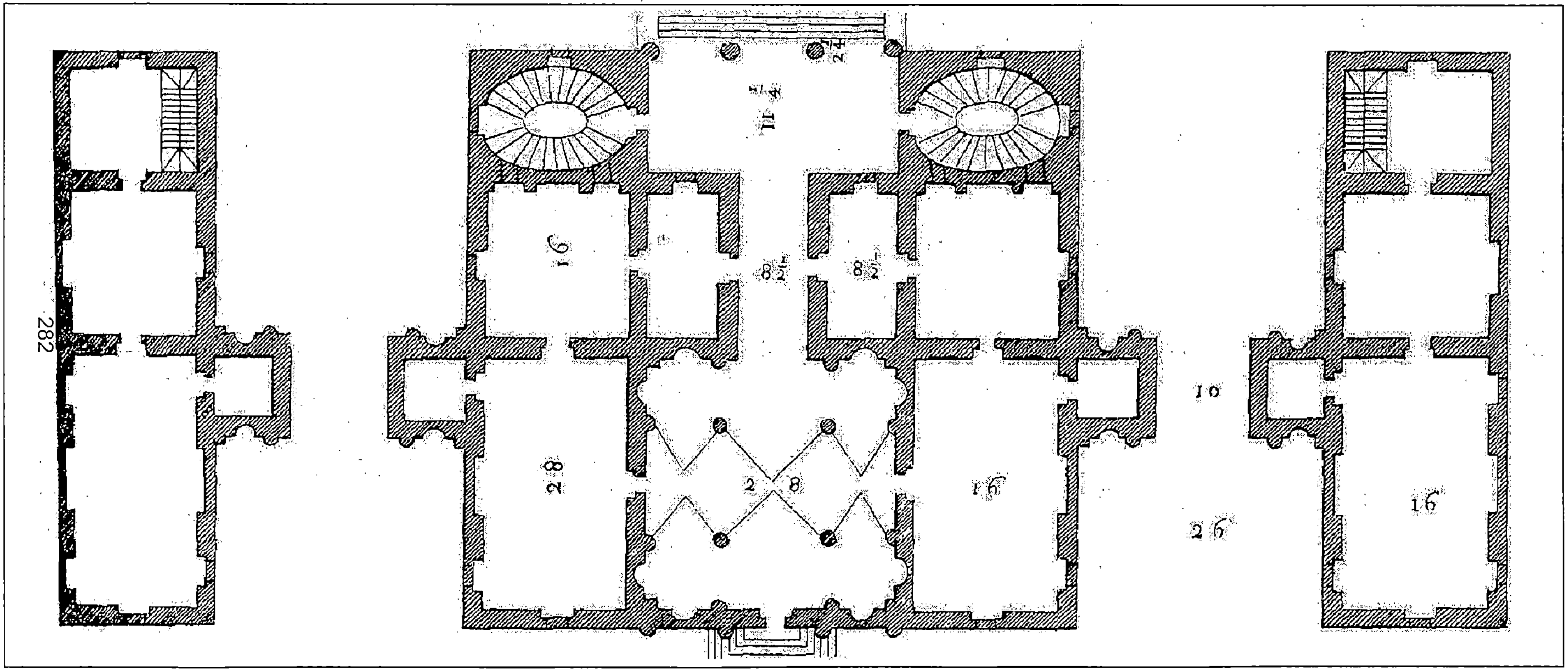


Figure 4.71 Plan Of Francesco Pisani at Montagnana Scanned From Plate 035,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

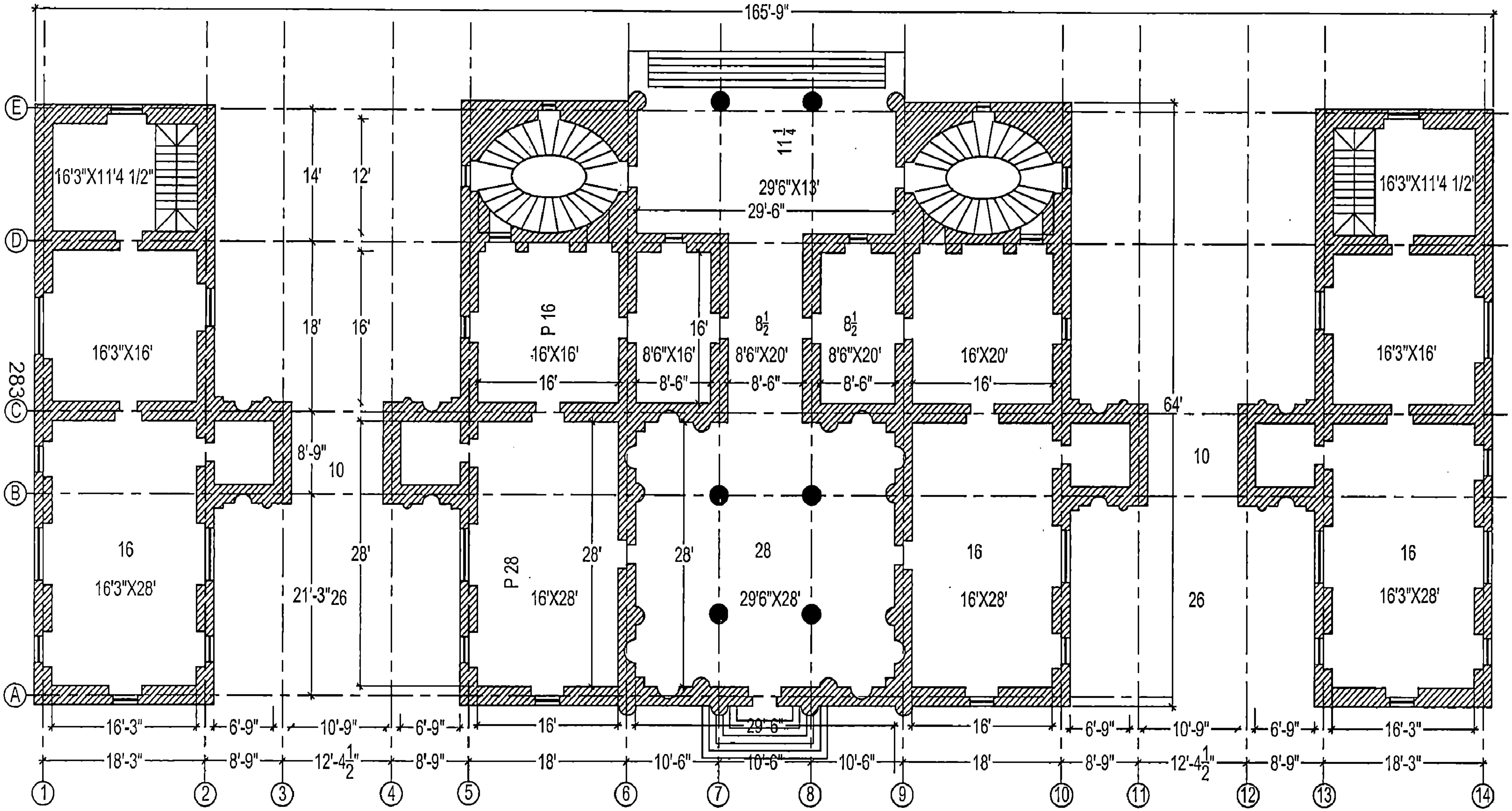


Figure 4.72 Plan Of Francesco Pisani at Montagnana Redrawn From Plate 035, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

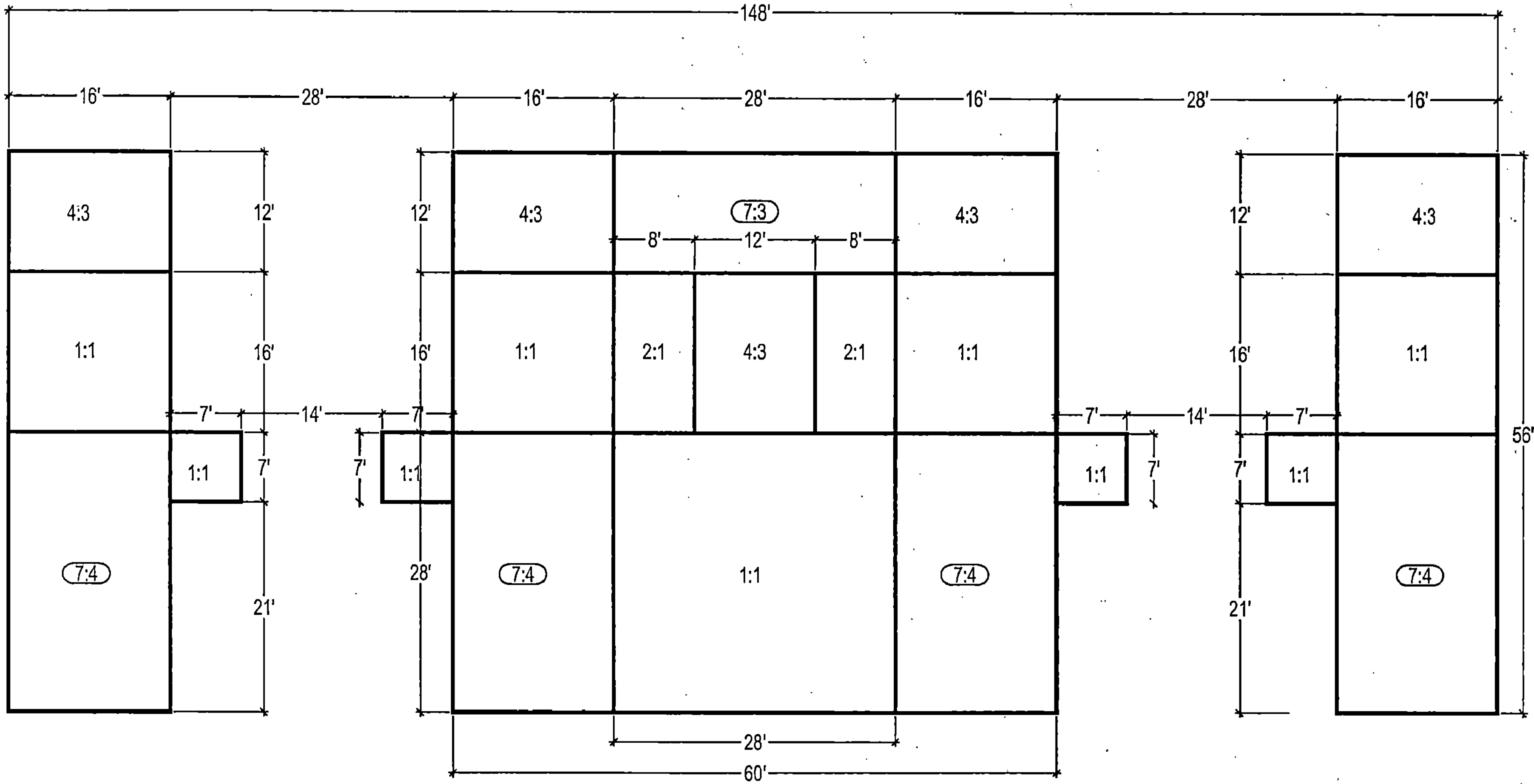


Figure 4.73 Schematic Analysis Francesco Pisani at Montagnana, Plate 035,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 35, VILLA FRANCESCO PISANI AT MONTAGNANA

We can infer the following from schematic line diagram analysis:

- The main building whole with auxiliary wings is 148'x 56' which is 37:14.
- The 148' front is symmetrically divided in to 16':28':16':28':16':28':16' which is 4:7:4:7:4:7:4. 56' side could be seen divided as 28':16':12' which 7:4:3 (where 7:4 is square and three quarters and 4:3 is square and a third) or broadly as 28':28' which is 1:1.
- The main structure is 60'x 56' which is 15:14.
- The 60' front could be seen subdivided as 16':28':16' which is 4:7:4. The 56' side could be seen subdivided as 28':16':12' which 7:4:3.
- Main room sizes and ratios observed are 16'X8', 16'X12', 16'X16' and 28'X28' which could be interpreted as 2:1, 4:3, 1:1 and 1:1
- Non standard room ratios like 7:4 and 7:3 are identified.

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

  7:3 could be interpreted as rational convergent of square root five. It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 7:5 = 7:3 (a:b x c:d = ac:bd)

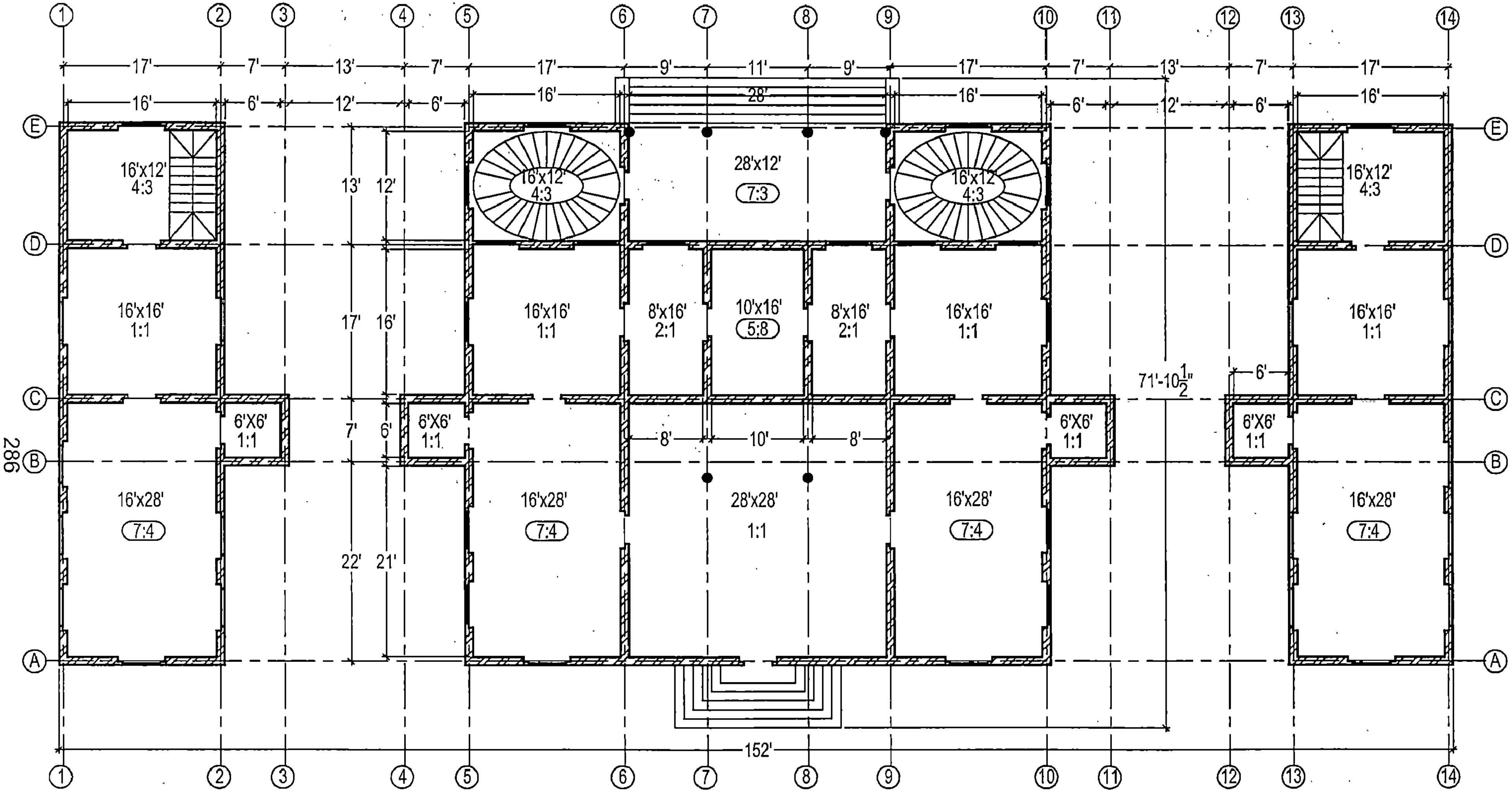
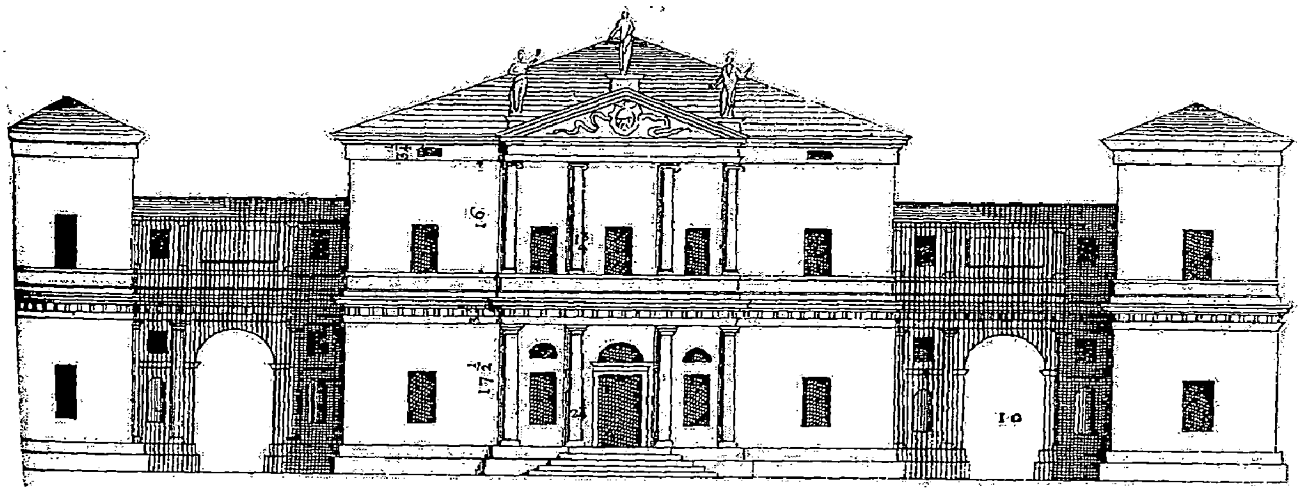


Figure 4.74 Plan of Francesco Pisani at Montagnana, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 35 Villa Francesco Pisani at Montagnana in elevation

Source: Constant Caroline, 'The Palladio Guide', pg. 66
Figure 4.75 Elevation & View of Villa Francesco Pisani

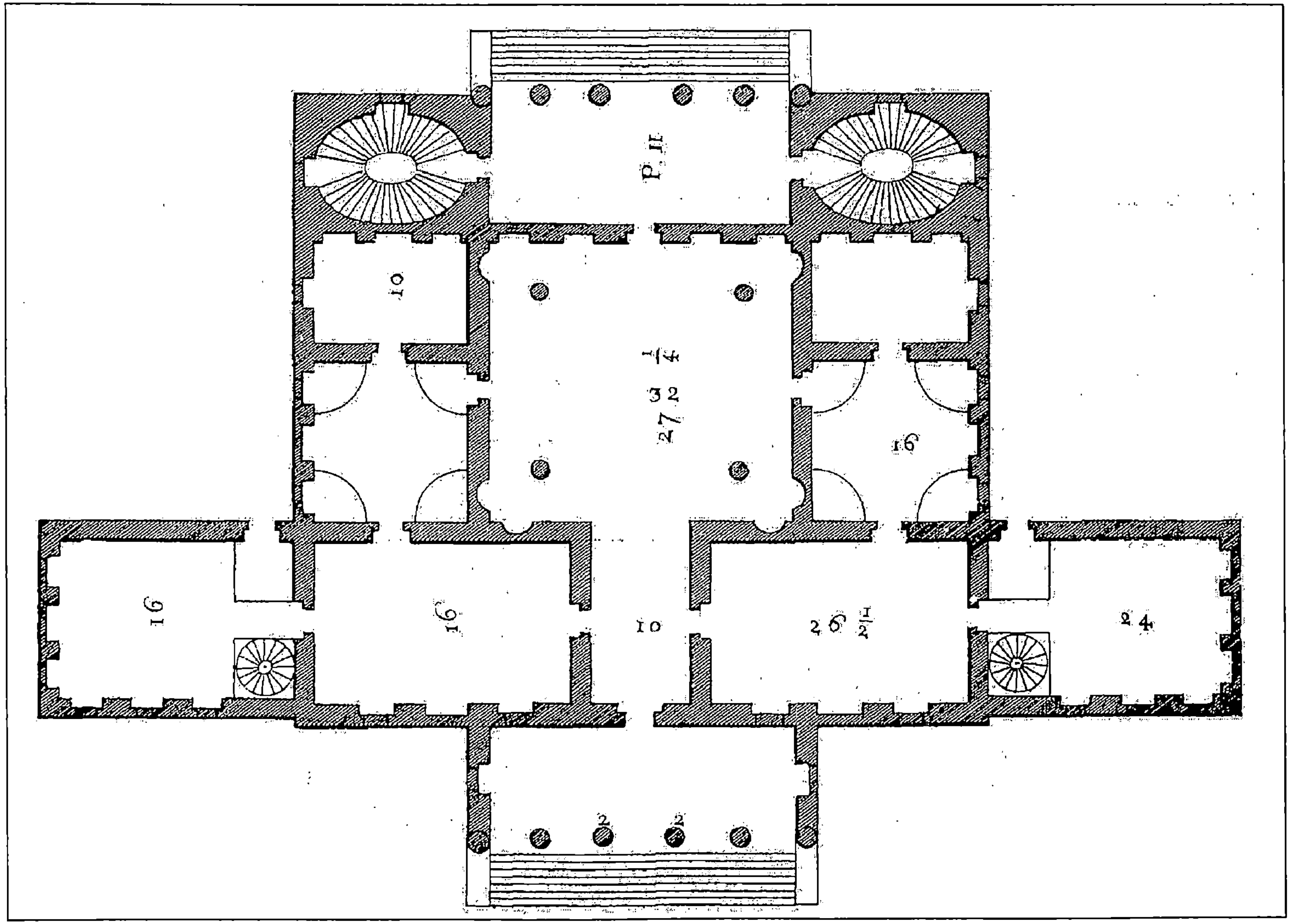


Figure 4.76 Plan Of Giorgio Cornaro at Piombino Scanned From Plate 036,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

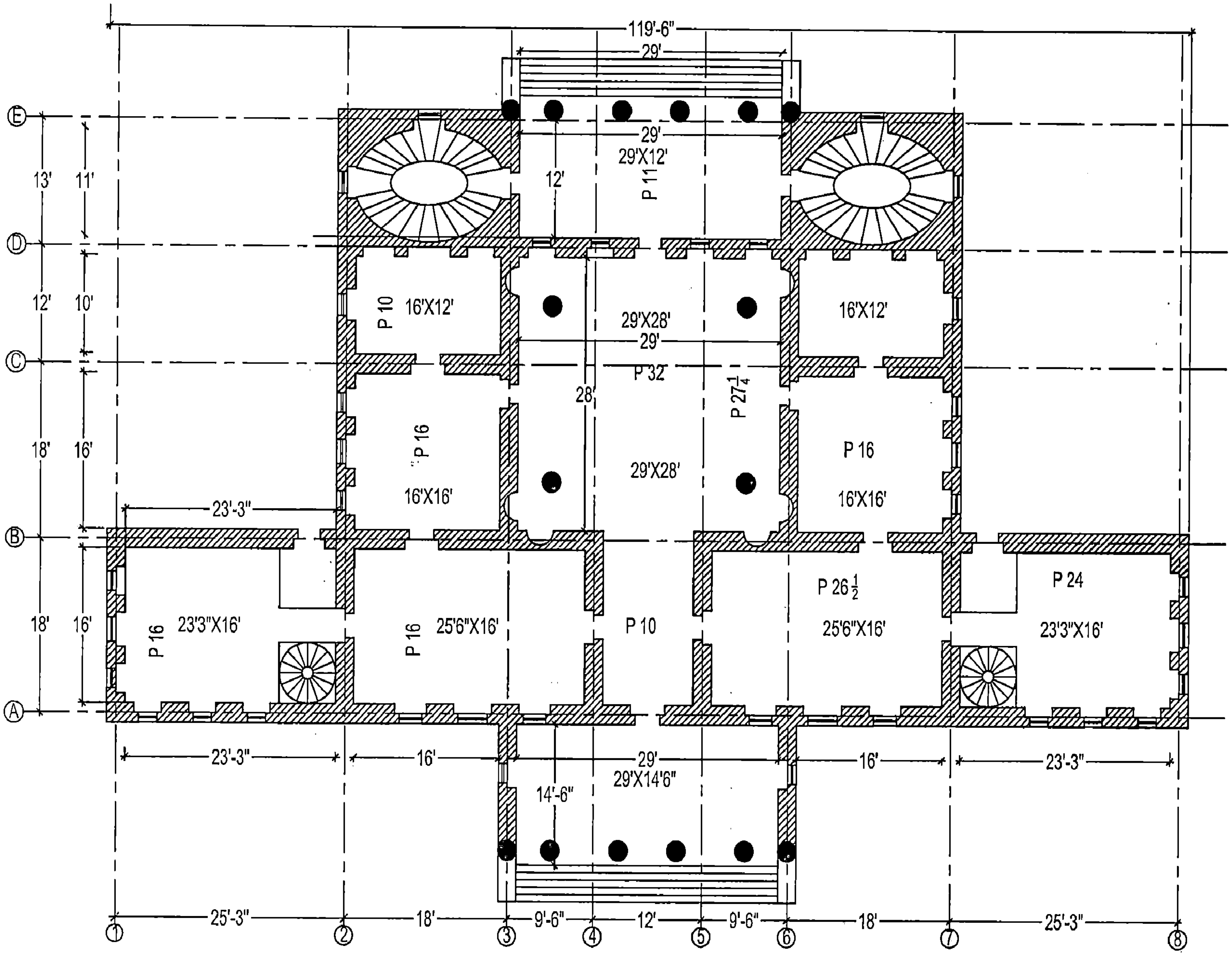


Figure 4.77 Plan Of Giorgio Cornaro at Piombino Redrawn From Plate 036, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

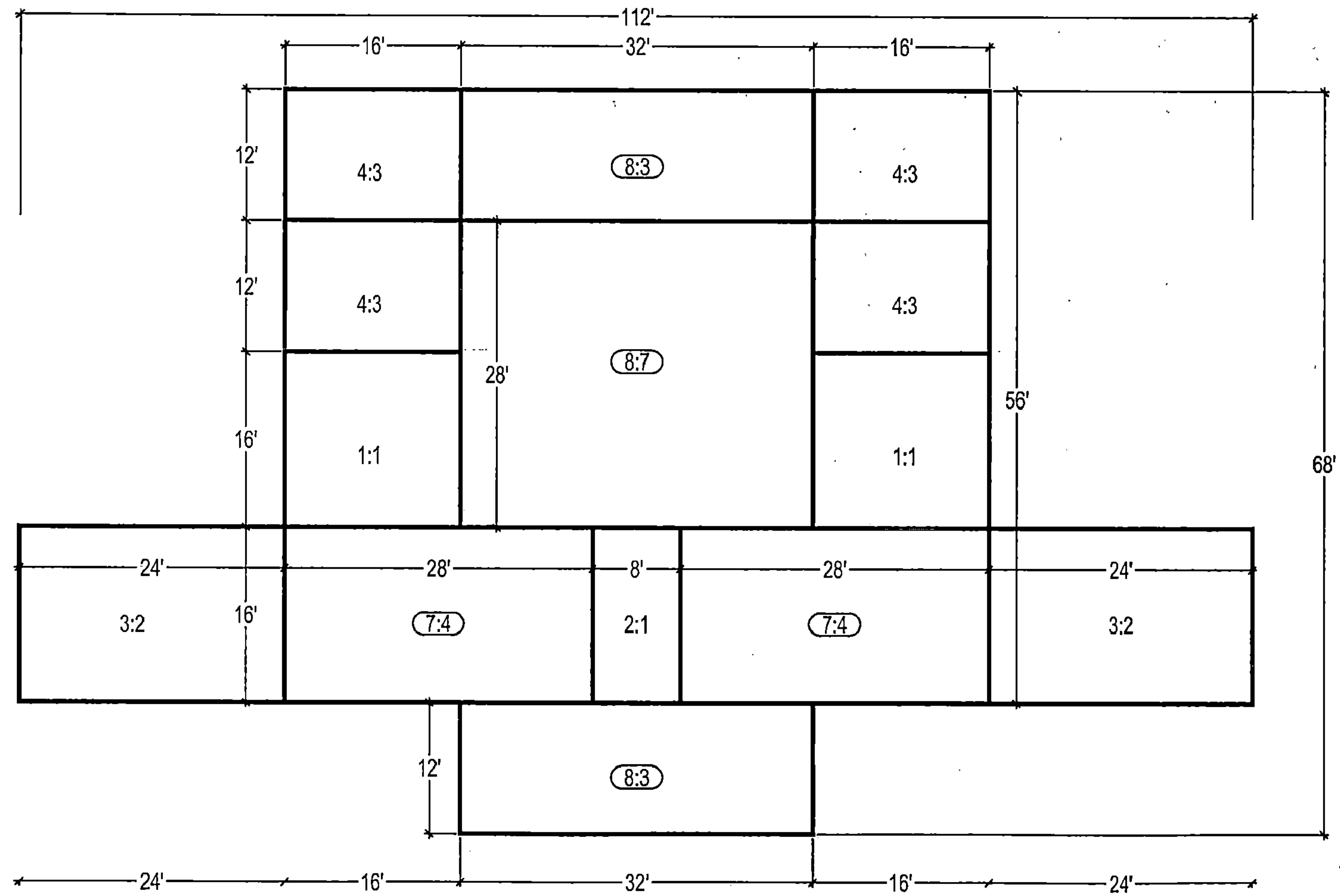


Figure 4.78 Schematic Analysis Giorgio Cornaro at Piombino, Plate 036, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 36, VILLA GIORGIO CORNARO AT PIOMBINO

We can infer the following from schematic line diagram analysis:

- The main building whole with auxiliary wings (and without loggia) is 112'x 56' which is 2:1.
- The 112' front is symmetrically divided in to 24':28':8':28':24' which is 6:7:2:7:6. 56' side could be seen divided as 16':16':12':12' which 4:4:3:3. 64' side could be seen divided as 16':32':16' which 1:2:1.
- The main structure is 64'x 56' which is 8:7. The core of main structure is 32'x38' which too is 8:7.
- Main room sizes and ratios observed are 16'X12', 16'X16' and 24'X16' which could be interpreted as 4:3, 1:1 and 3:2.
- Non standard room ratios like 8:7, 8:3, and 7:4 are identified.

  8:7 could be understood as square and one seventh.

  8:3 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

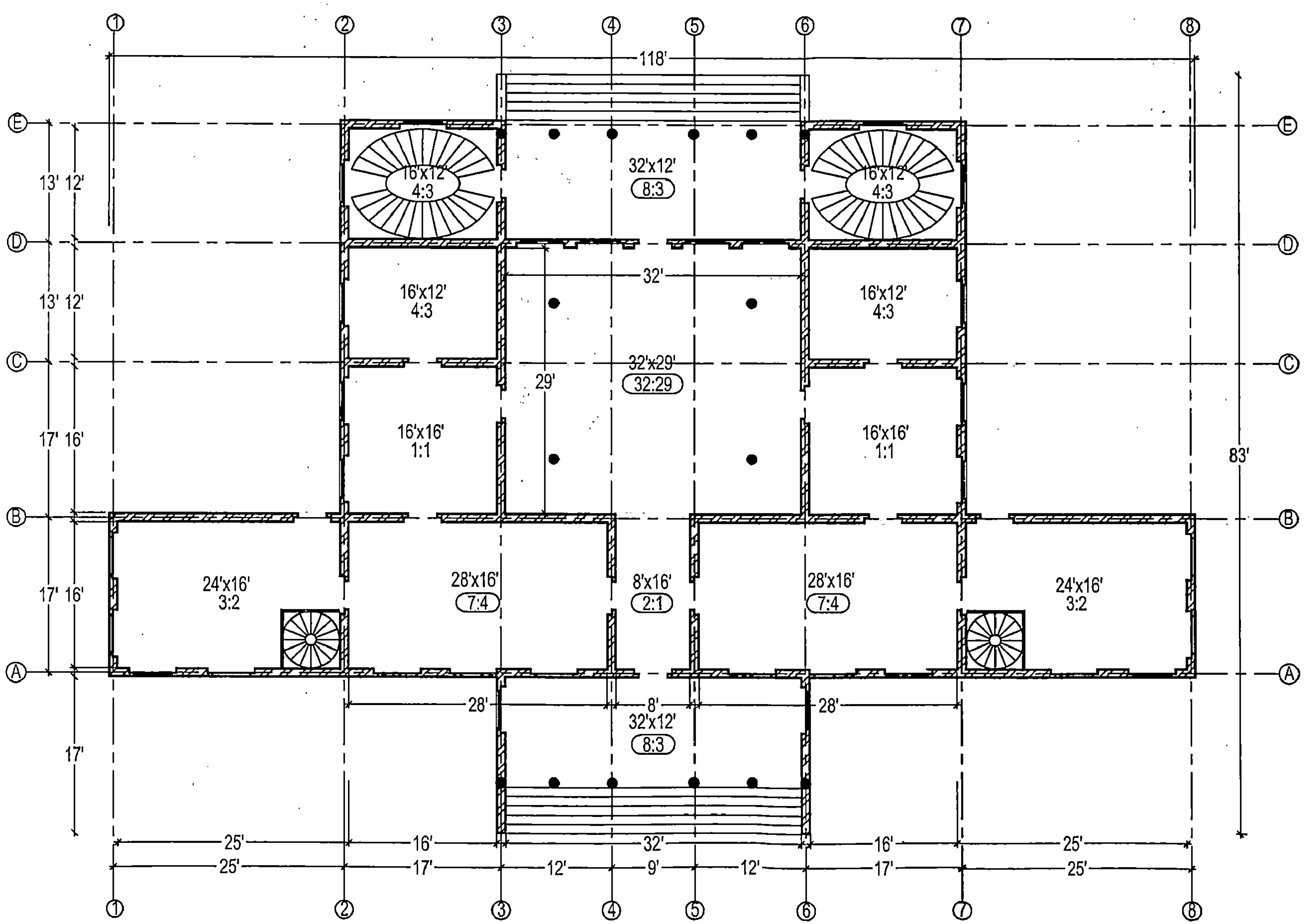
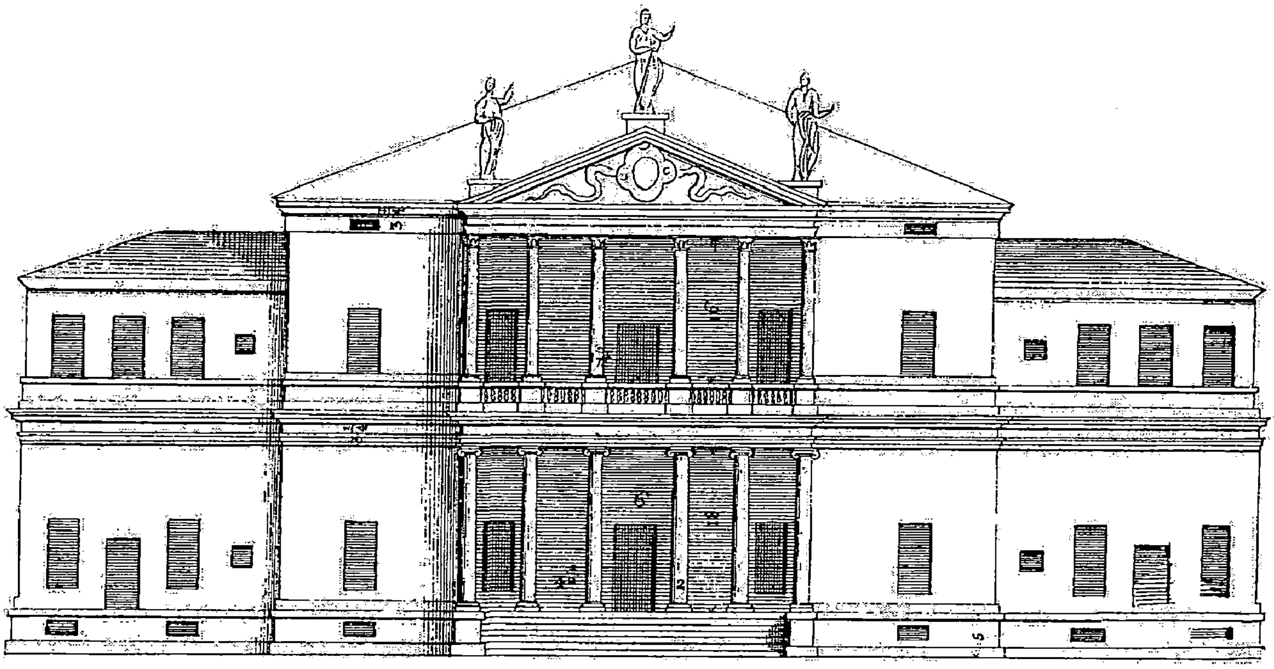
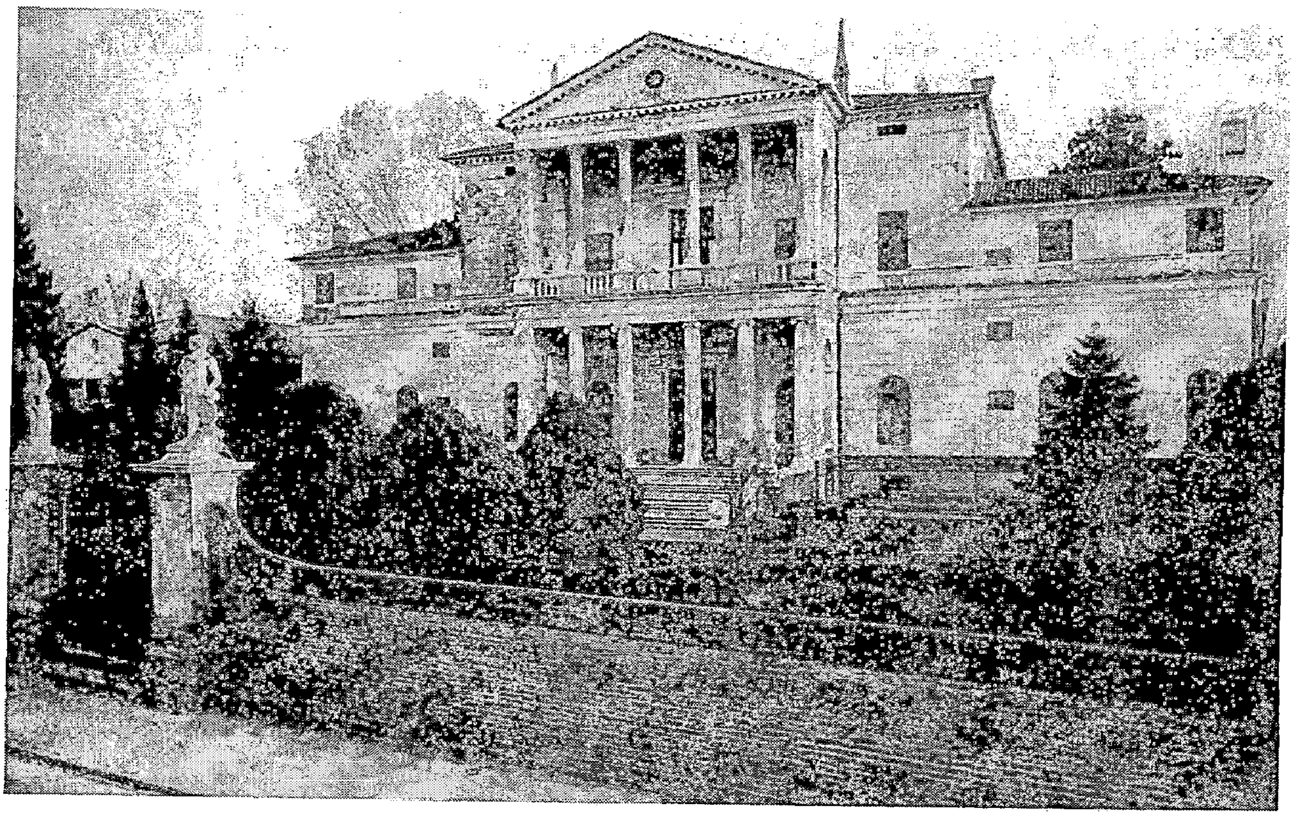


Figure 4.79 Plan of Giorgio Cornaro at Piombino, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 36 Villa Giorgio Cornaro at Piombino in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 63
Figure 4.80 Elevation & View of Villa Giorgio Cornaro

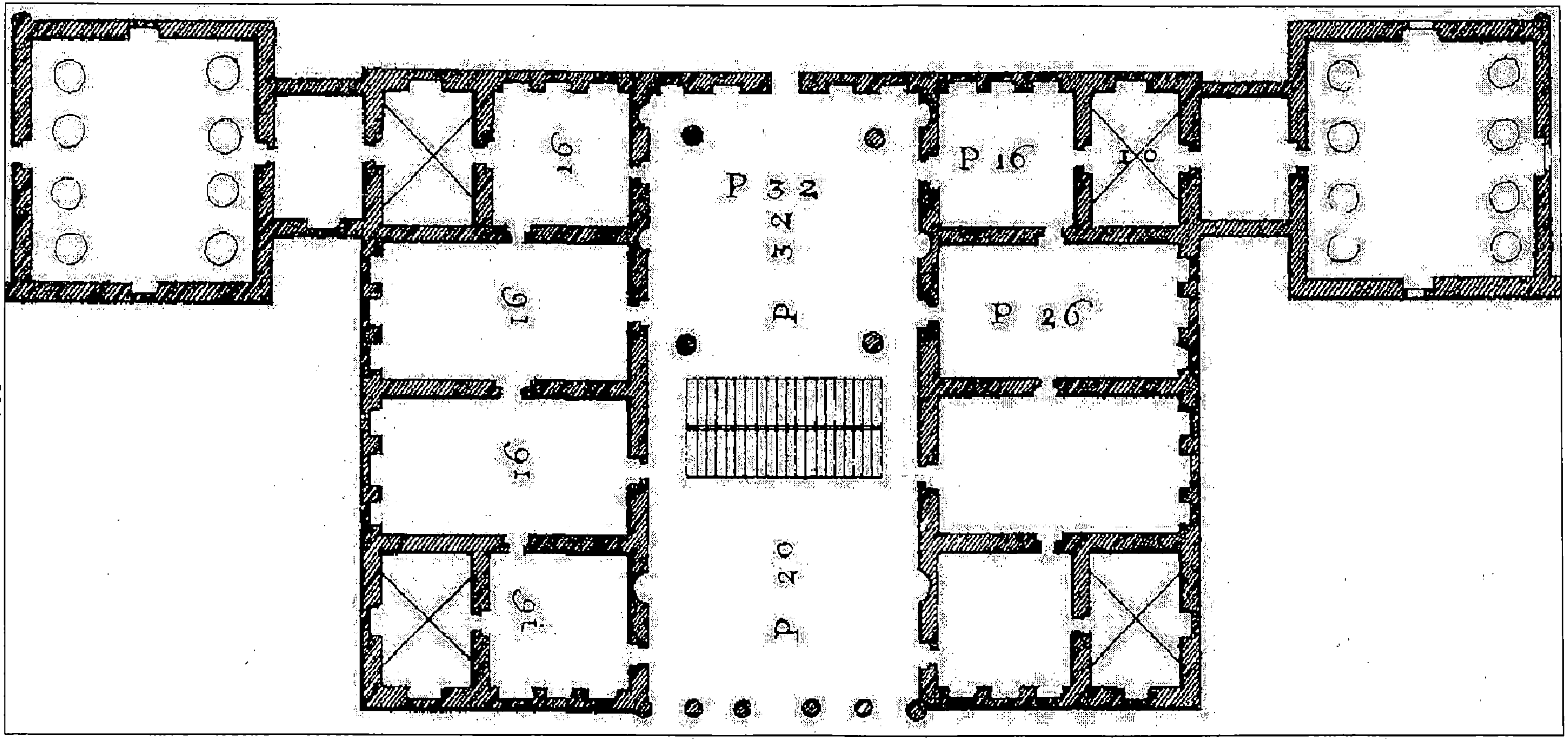


Figure 4.81 Plan Of Leonardo Mocenico at Marocco Scanned From Plate 037, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

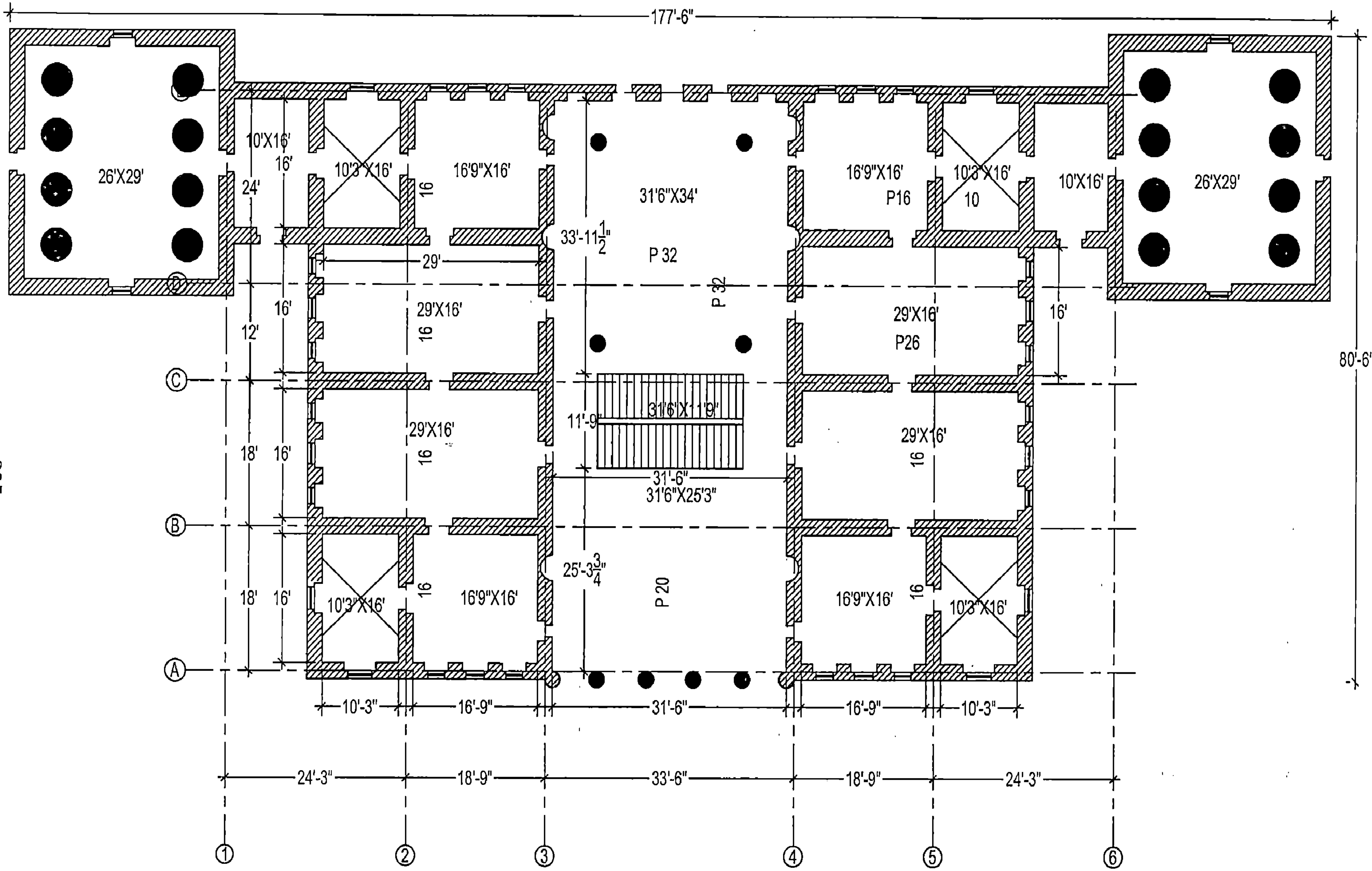


Figure 4.82 Plan Of Leonardo Mocenico at Marocco Redrawn From Plate 037, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

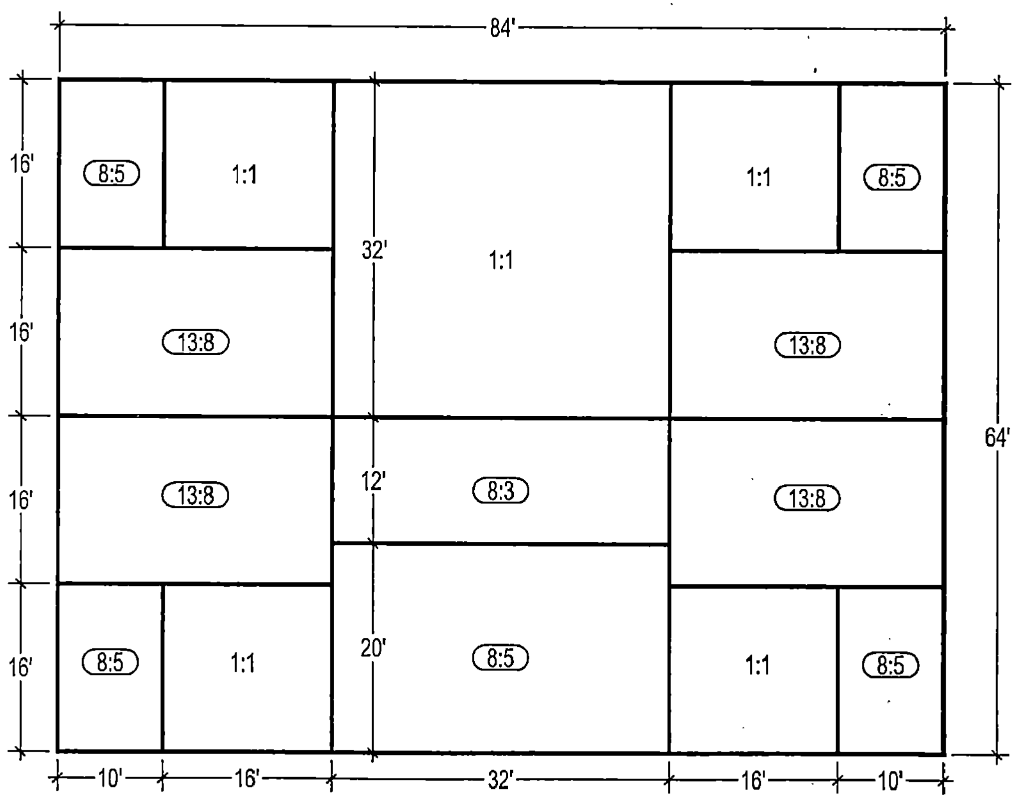


Figure 4.83 Schematic Analysis Leonardo Mocenico at Marocco, Plate 037,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 37, VILLA LEONARDO MOCENICO AT MAROCCO

We can infer the following from schematic line diagram analysis:

- The main building whole without auxiliary wings is 84'x 64' which is 21:16.
- The 84' front is symmetrically divided in to 10':16':32':16':10' which is 5:8:16:8:5. 64' side could be seen divided as 16':16':16':16' which 1:1:1:1.
- Main room sizes and ratios observed are 16'X16'and 32'X32' which could be interpreted as 1:1and 1:1.
- Non standard room ratios like 13:8, 8:5 and 8:3 are identified.

  13:8 could be understood as square and five eighths

  8:5 could be understood as square and three fifths. It is minor sixth as musical note.

  8:3 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

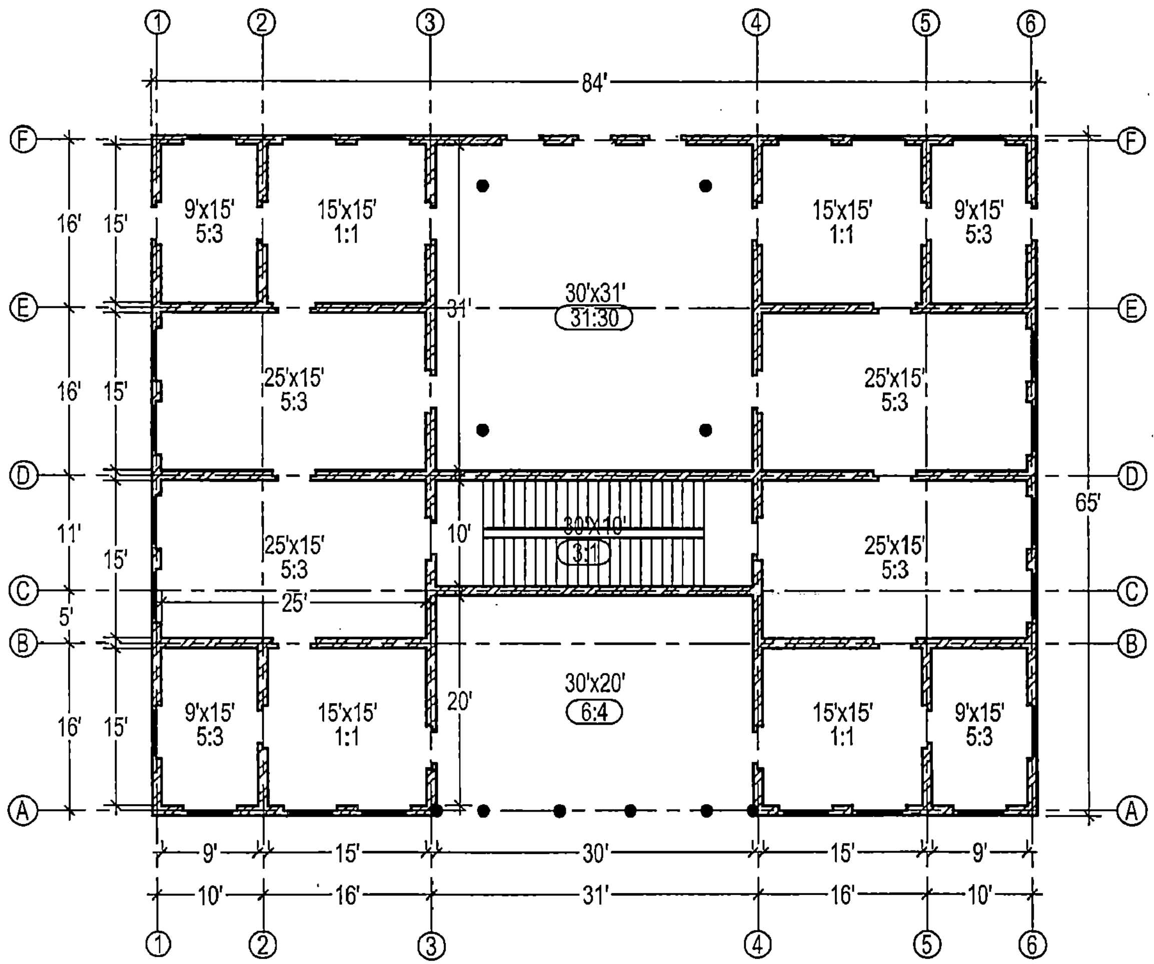
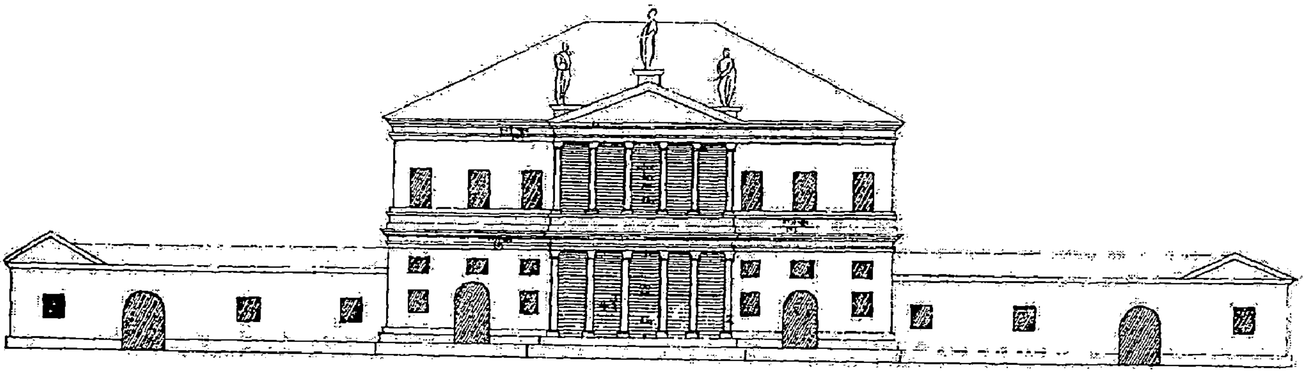


Figure 4.84 Plan of Leonardo Mocenico at Marocco, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 37 Villa Leonardo Mocenico at Marocco in elevation

Figure 4.85 Elevation of Villa Leonardo Mocenico at Marocco

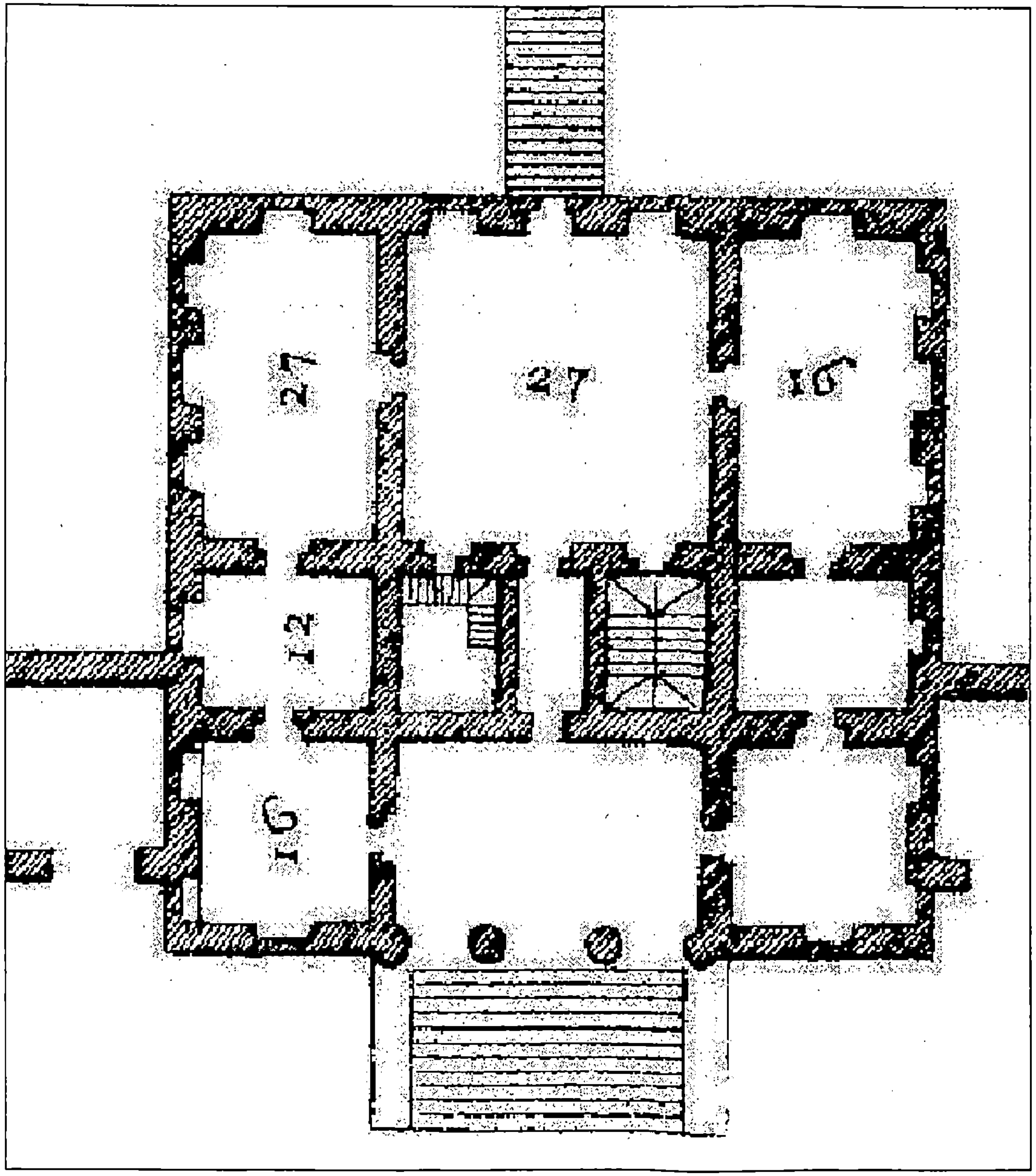


Figure 4.86 Plan Of Leonardo Emo at Fanzolo Scanned From Plate 038,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

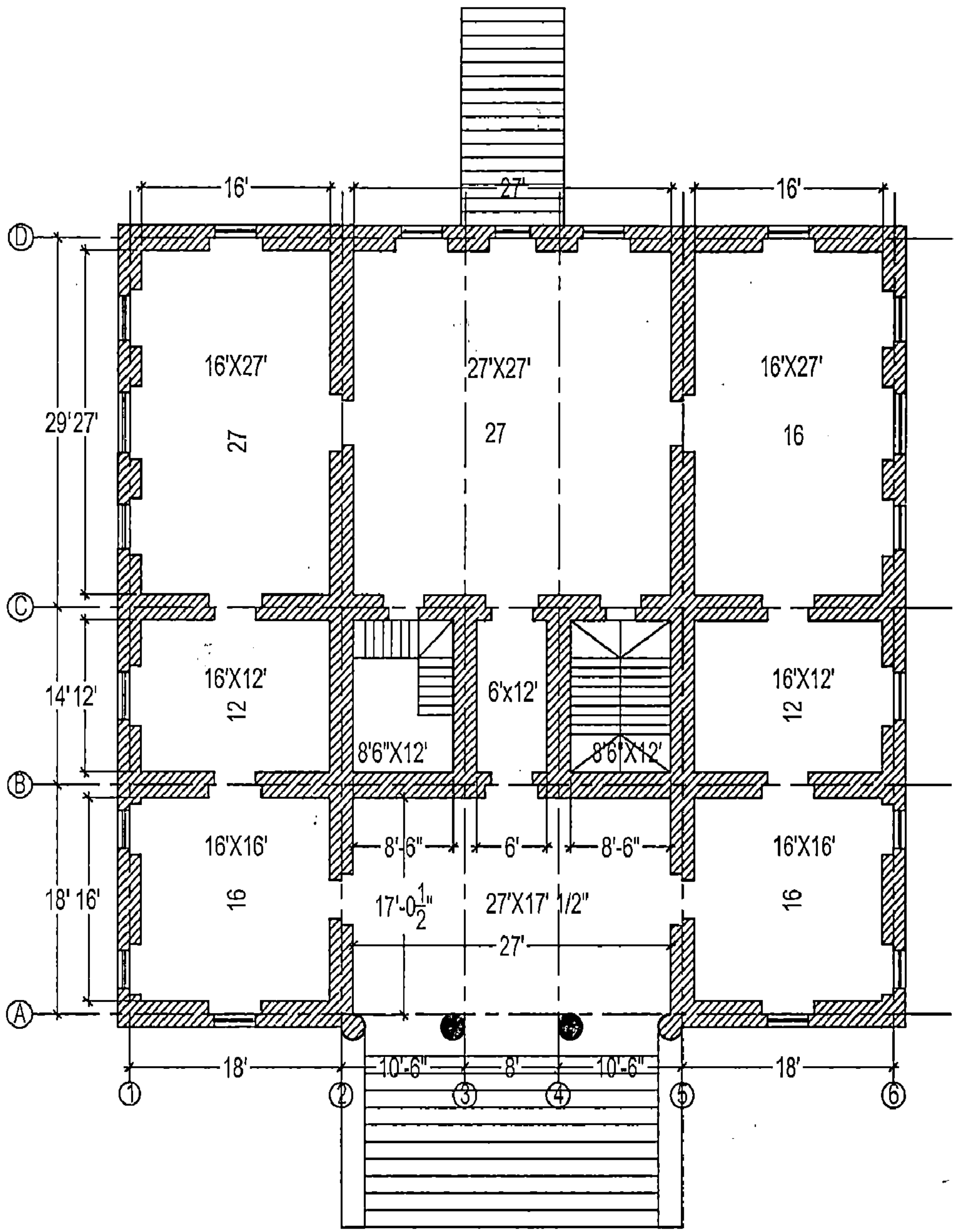


Figure 4.87 Plan Of Leonardo Emo at Fanzolo Redrawn From Plate 038, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

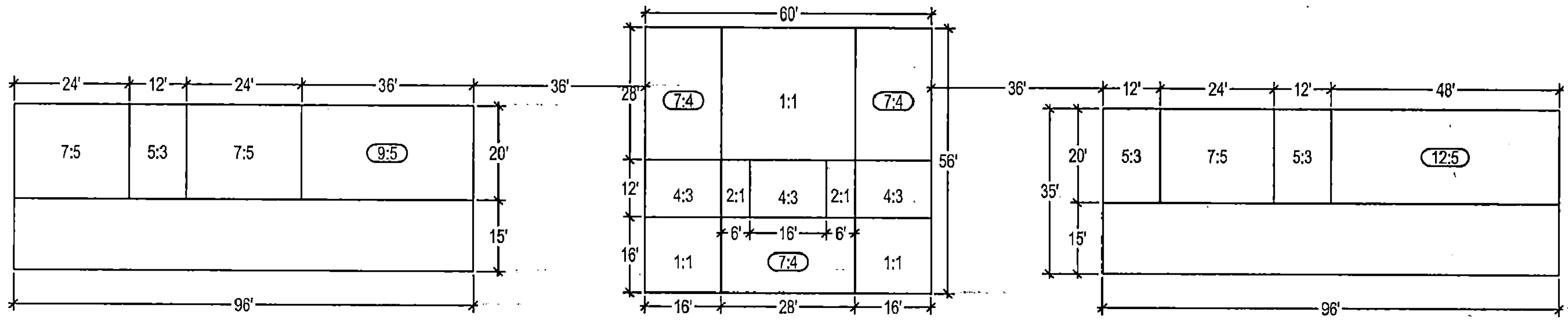


Figure 4.88 Schematic Analysis Leonardo Emo at Fanzolo, Plate 038, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

PLATE 38, VILLA LEONARDO EMO (OR ERNO) AT FANZOLO

We can infer the following from schematic line diagram analysis:

- The main building whole without auxiliary wings is 60'x 56' which is 15:14 and close to 1:1.
- The 60' front is symmetrically divided in to 16':28':16':28' which is 4:7:4:7. 56' side could be seen divided as 16':12':28' which 4:3:7.
- Auxiliary wing on right is seen divided into 12':24':12':48' which is 1:2:1:4 (1:2:4 is geometric proportion) with room sizes of 20'x12', 24'x20'and 48'x20' which is 5:3, 7:5 and 12:5.
- Auxiliary wing on left is inferred divided into 24':12':24':36' which is 2:1:2:3 (1:2:3 is arithmetic proportion) with room sizes of 24'x20', 20'x12'and 36'x20' which is 7:5, 5:3 and 9:5.
- Room width of auxiliary rooms and its corridor are related as 20':15' which is 4:3. Main room sizes and ratios observed are 6'X12', 12'X16', 16'X16' and 28'X28' which could be interpreted as 2:1,4:3, 1:1 and 1:1.
- Non standard room ratios like 7:4 is identified. 7:4 could be interpreted as rational convergent of square root three.

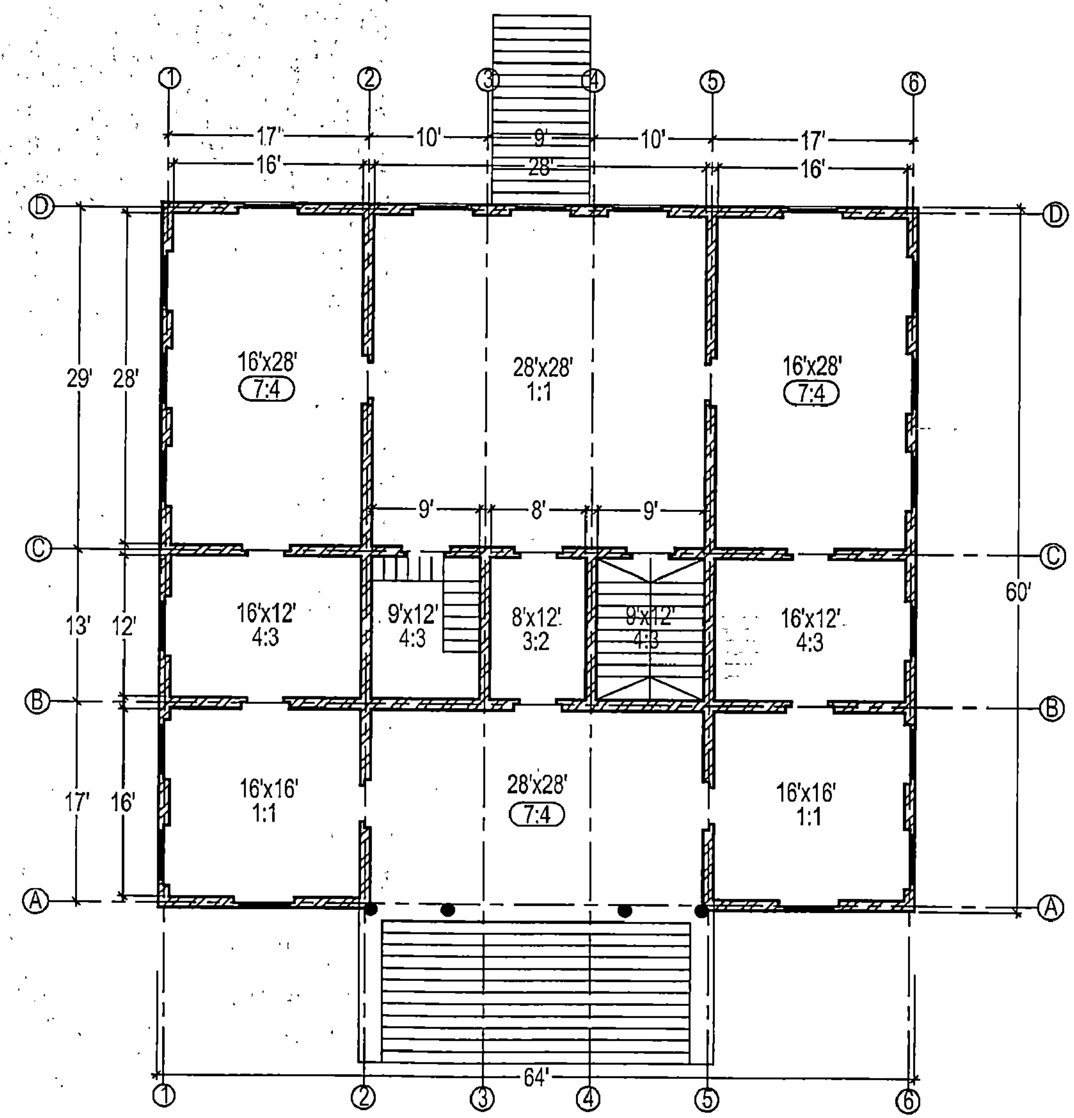
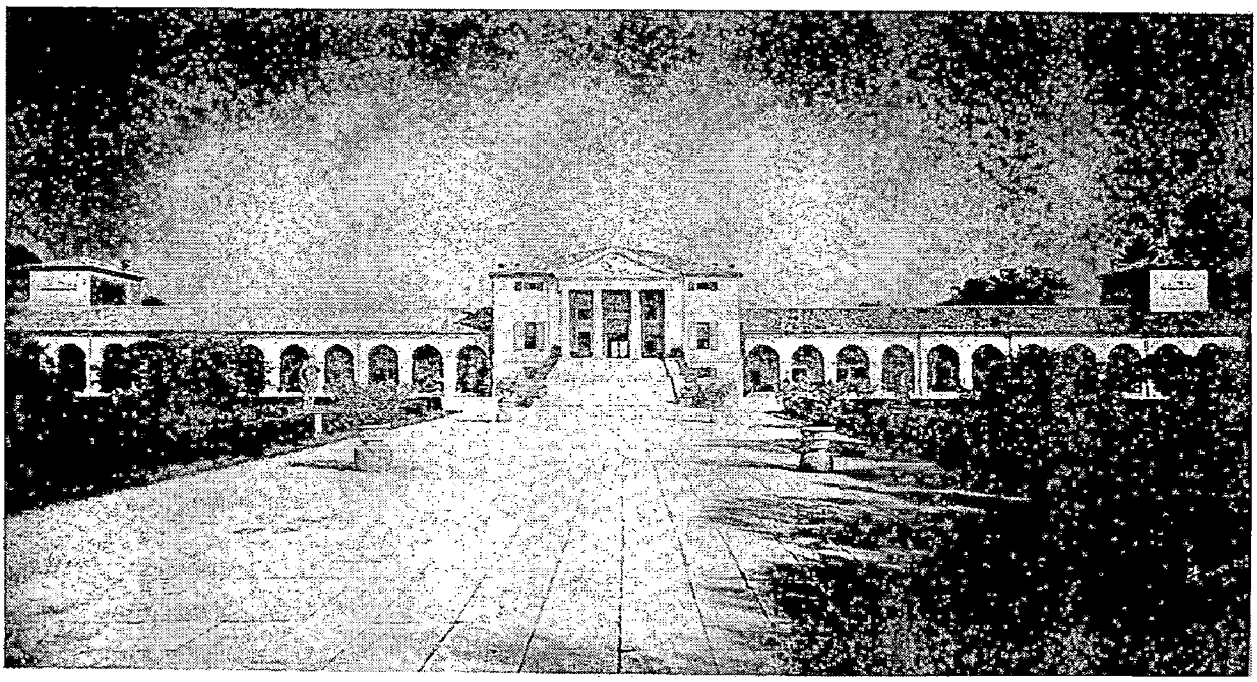


Figure 4.89 Plan of Leonardo Emo at Fanzolo, developed on the basis of schematic analysis

Scale 1" = 16'

Source: Plate 38 Villa Leonardo Emo (or Erno) at Fanzolo in elevation



Source: 'The Palladio Guide', pg. 90
Figure 4.90 Elevation & View of Constant Caroline, Villa Leonardo Emo

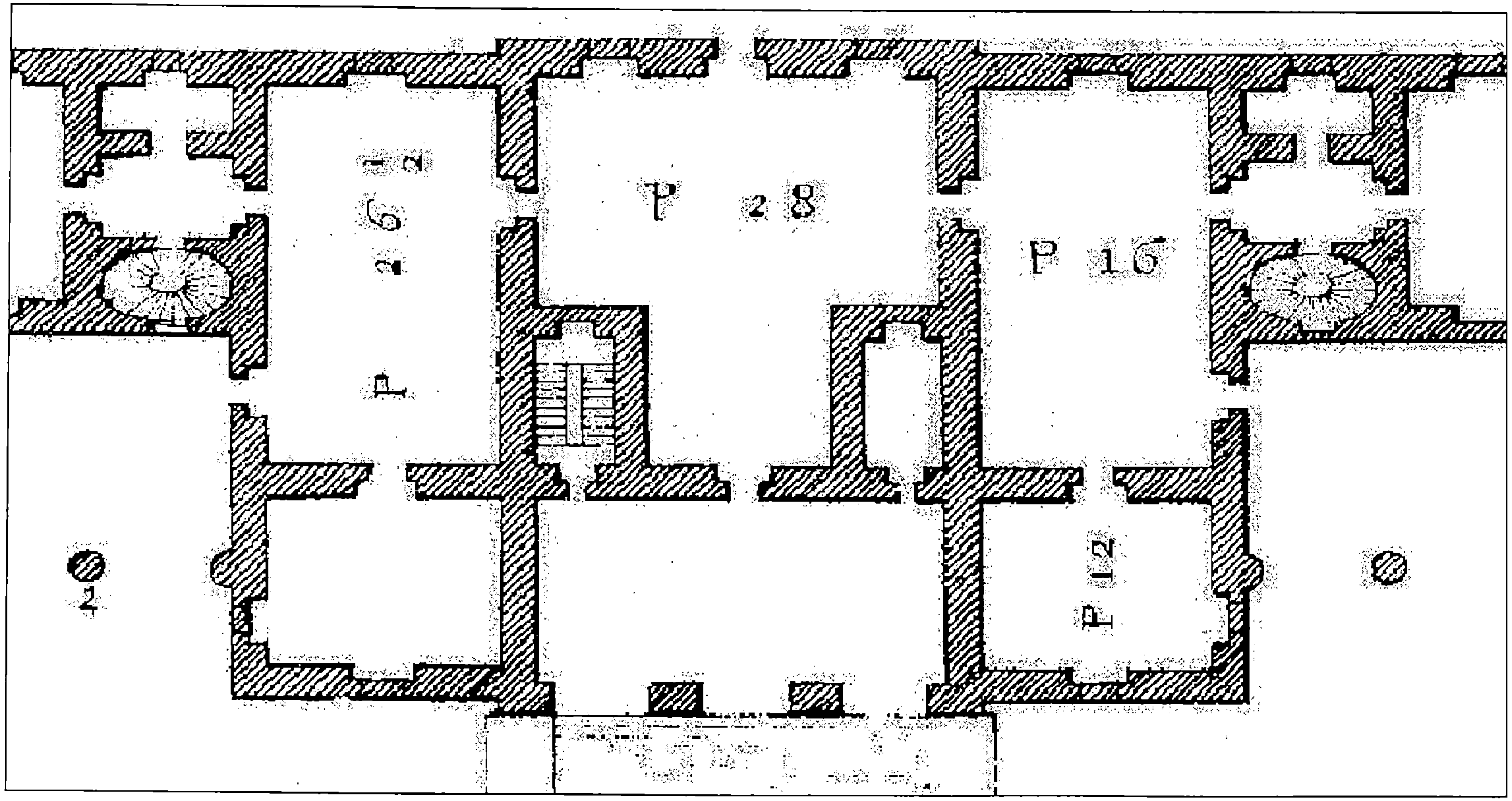


Figure 4.91 Plan Of Biaggio Sarraceno at Finale Scanned From Plate 039, 'I Quattro Libri Dell' Architecttura', Book-2

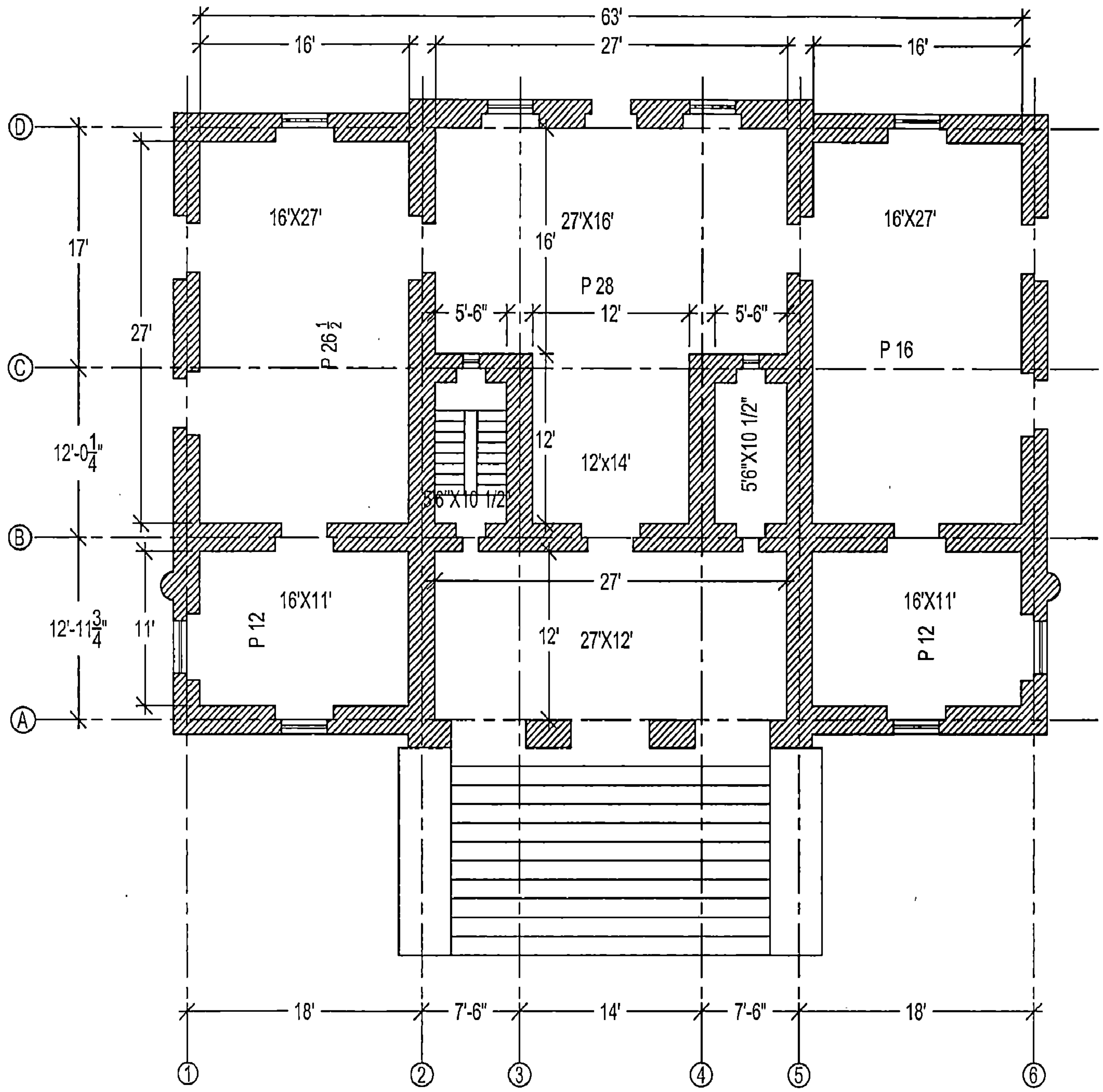


Figure 4.92 Plan Of Biaggio Sarraceno at Finale Redrawn From Plate 039, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 12'

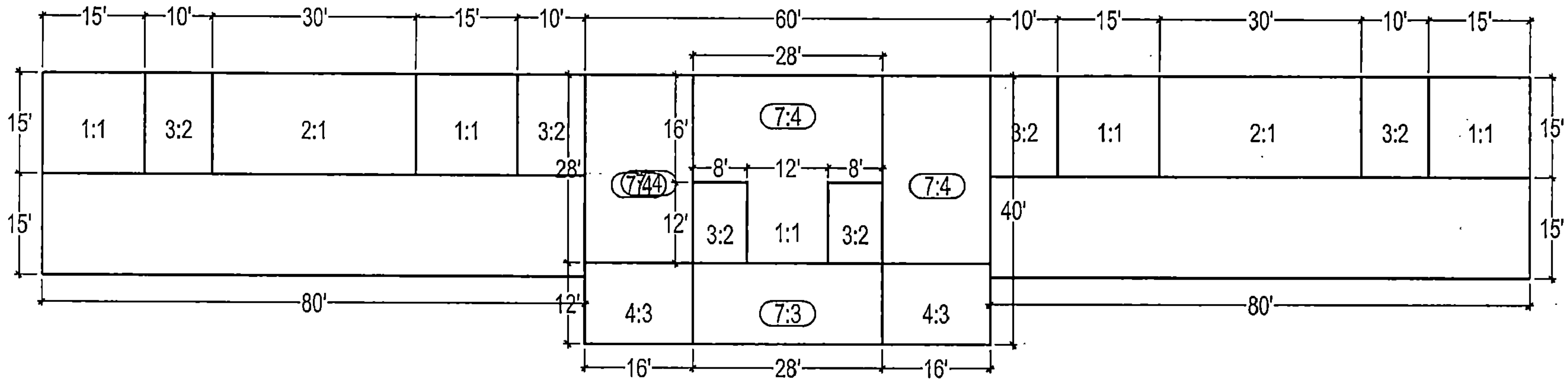


Figure 4.93 Schematic Analysis Biaggio Sarraceno at Finale, Plate 039,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

PLATE 39, VILLA BIAGIO SARRACENO AT FINALE

We can infer the following from schematic line diagram analysis:

- The main building whole without auxiliary wings is 60'x 40' which is 3:2.
- The 60' front is symmetrically divided in to 16':28':16' which is 4:7:4. 56' side could be seen divided as 12':28' which 3:7.
- Auxiliary wing on either side of main structure is seen with room sizes of 15'x10', 15'x15'and 30'x15' which is 3:2, 1:1 and 2:1.
- Room width of auxiliary rooms and its corridor are related as 15':15' which is 1:1
- Main room sizes and ratios observed are 12'X8', 16'X12'and 28'X14' which could be interpreted as 3:2, 4:3 and 2:1.
- Non standard room ratios like 7:4 and 7:3 are identified.

  7:4 could be interpreted as rational convergent of square root three.

  7:3 could be interpreted as rational convergent of square root five. It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 7:5 = 7:3 (a:b x c:d = ac:bd)

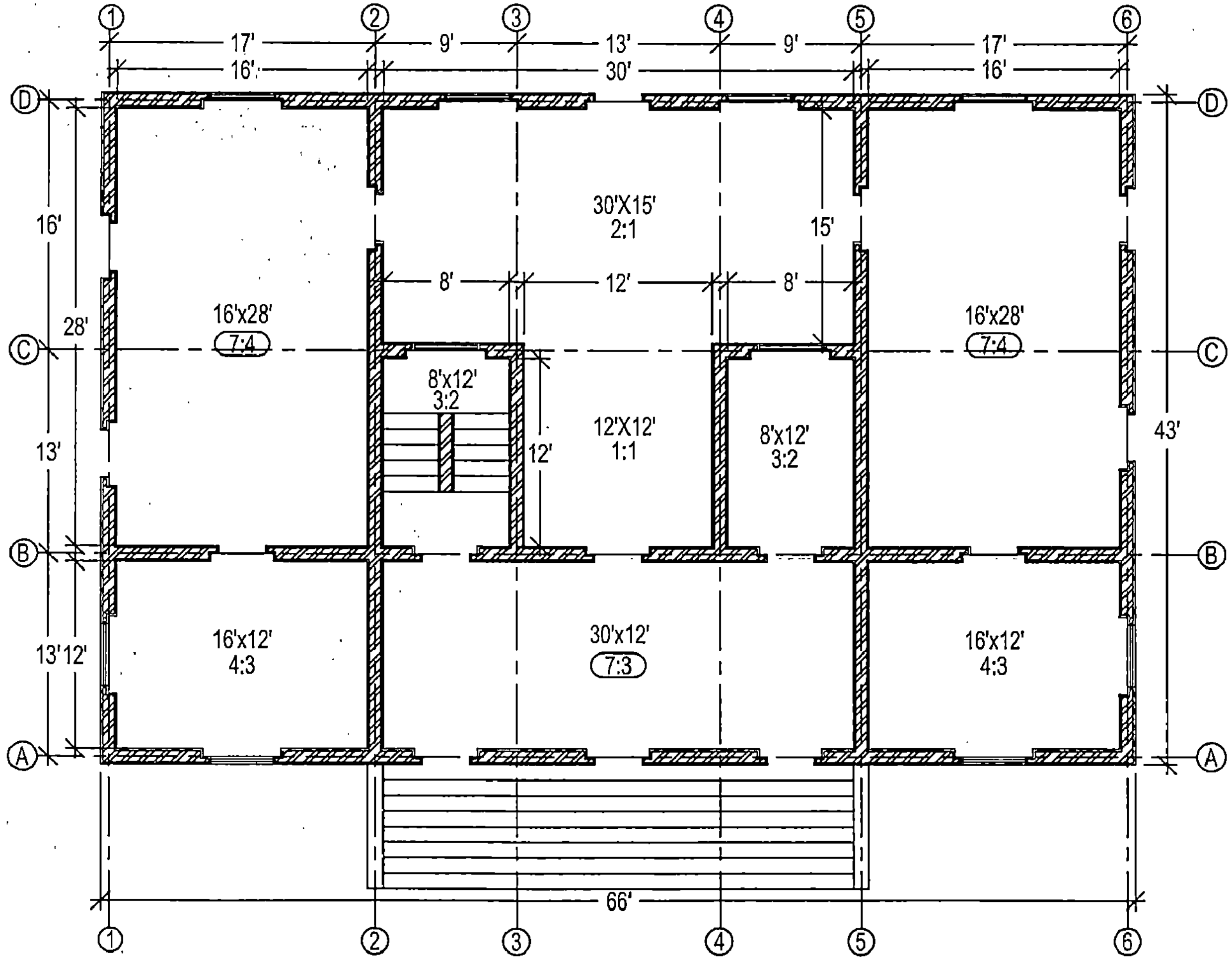
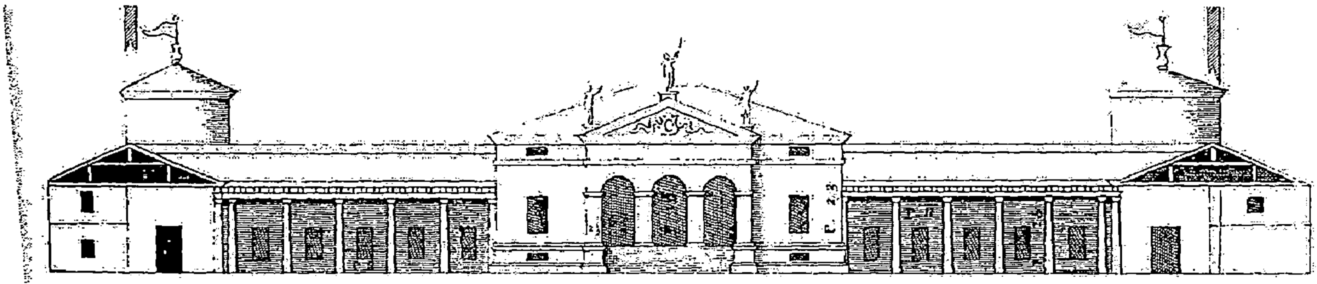
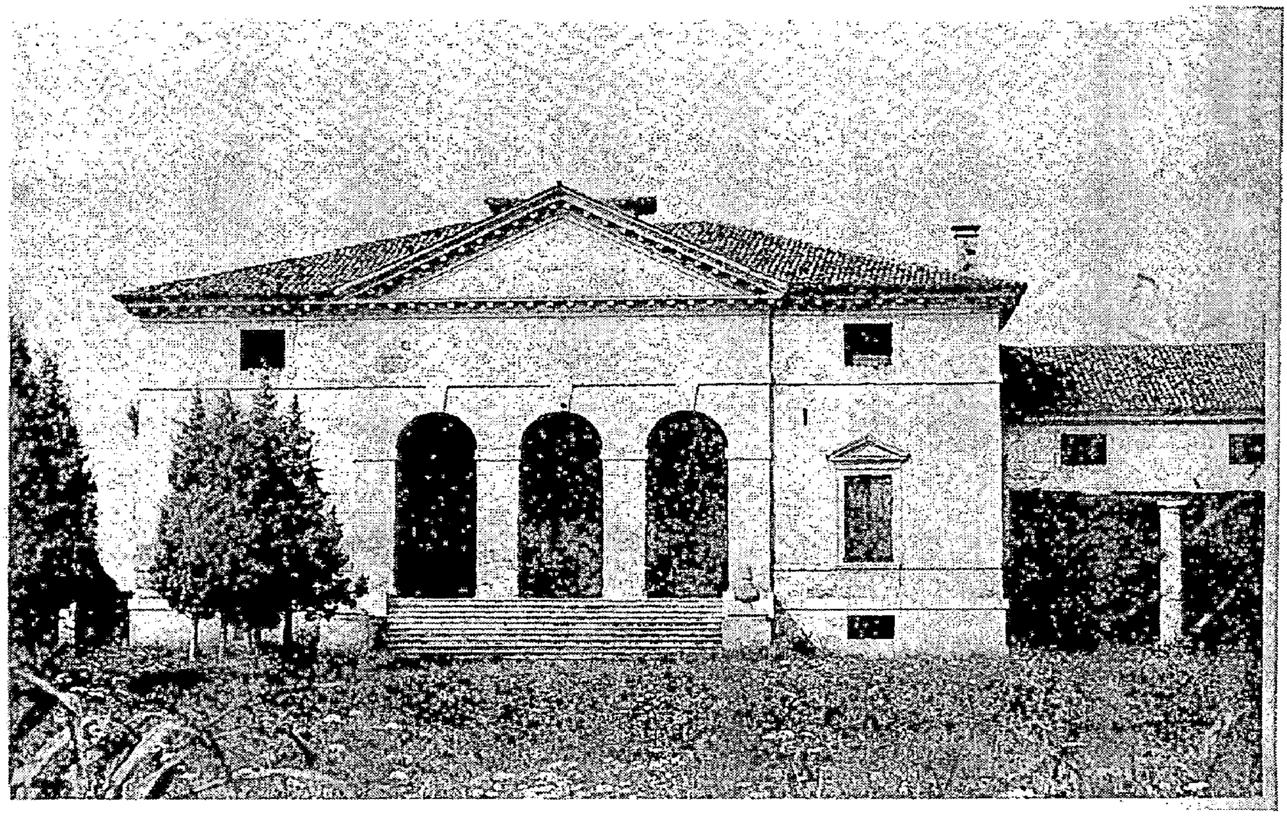


Figure 4.94 Plan of Biaggio Sarraceno at Finale, developed on the basis of schematic analysis

Scale 1" = 12'



Source: Plate 39 Villa Biagio Sarraceno at Finale in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 38
Figure 4.95 Elevation & View of Villa Biagio Sarraceno

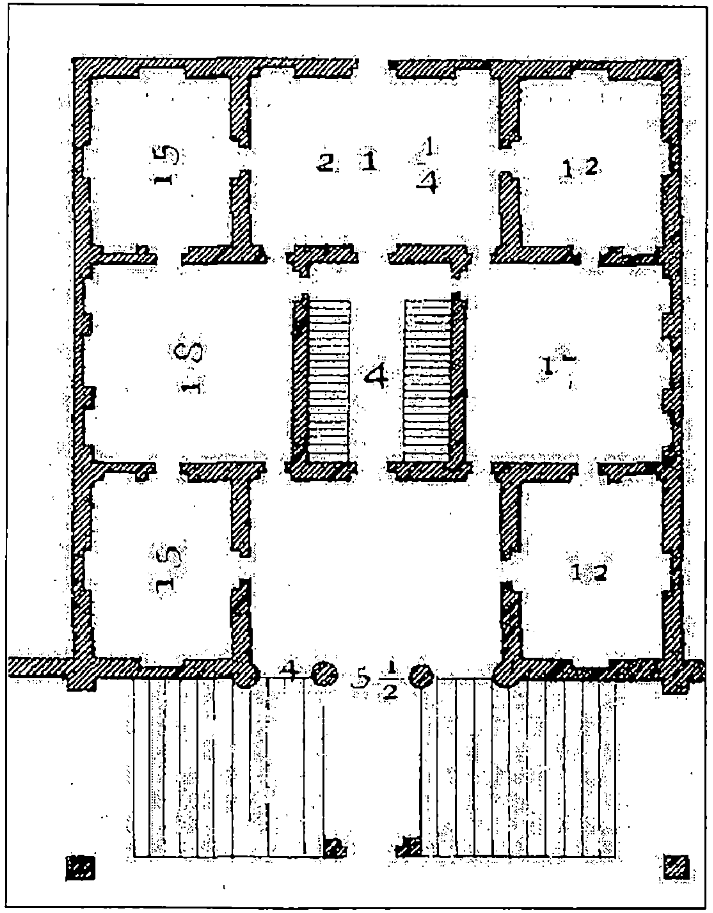


Figure 4.96 Plan Of Girolamo Ragona at Ghizzole Scanned From Plate 040,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

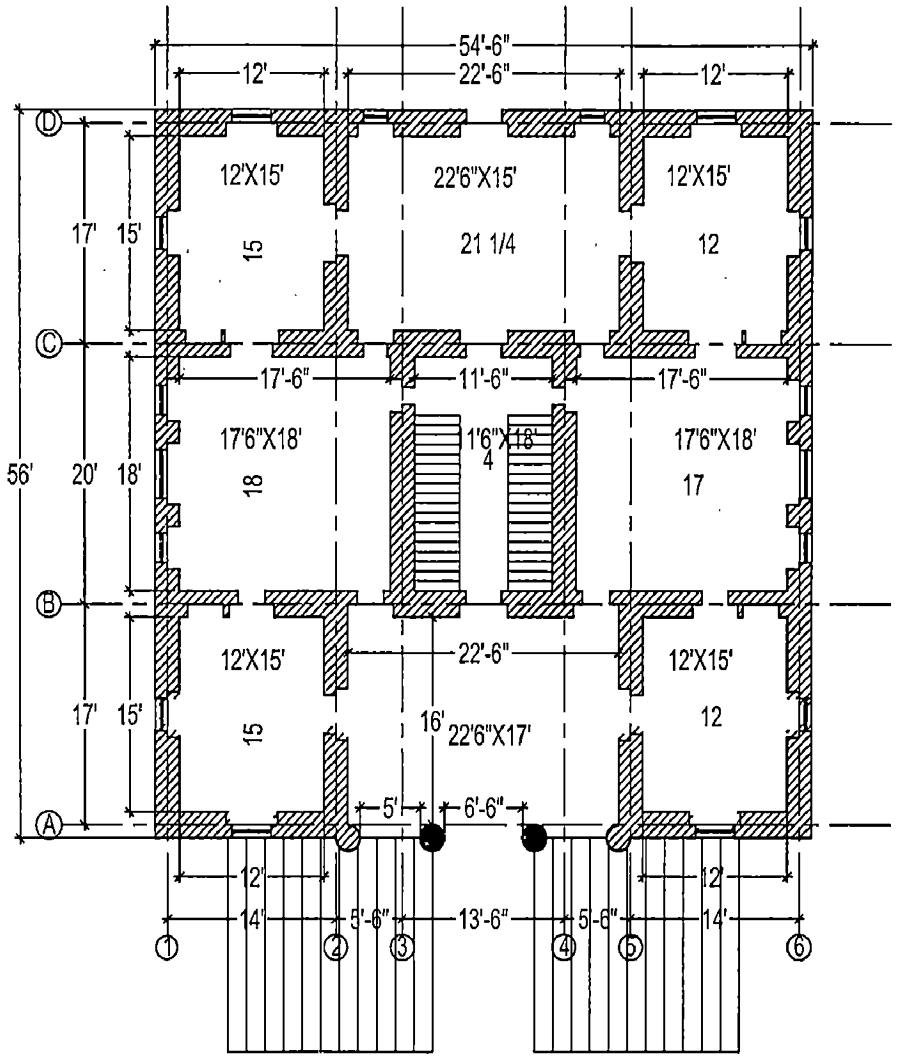


Figure 4.97 Plan Of Girolamo Ragona at Ghizzole Redrawn From Plate 040, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

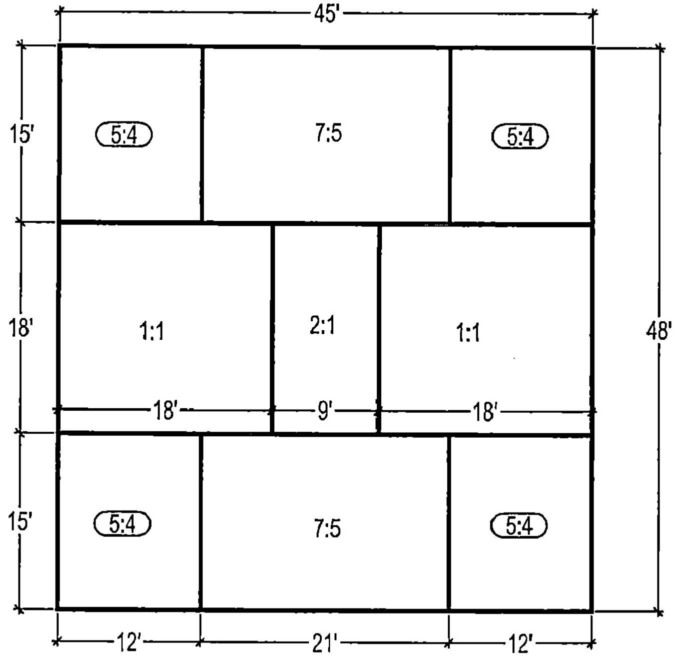


Figure 4.98 Schematic Analysis Girolamo Ragona at Ghizzole, Plate 040,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 40, VILLA GIORALMO RAGONA AT GHIZZOLE

We can infer the following from schematic line diagram analysis:

- The main building whole without auxiliary wings is 48'x 45' which is 16:15 and close to 1:1.
- The 45' front is symmetrically divided in to 12':21':12' which is 4:7:4. 4' side could be seen divided as 15':18':15' which 5:6:5.
- Main room sizes and ratios observed are 18'X9', 18'X18'and 21'X15' which could be interpreted as 2:1, 1:1 and 7:5.
- Non standard room ratio like 5:4 (which is square and one quarter) is identified.

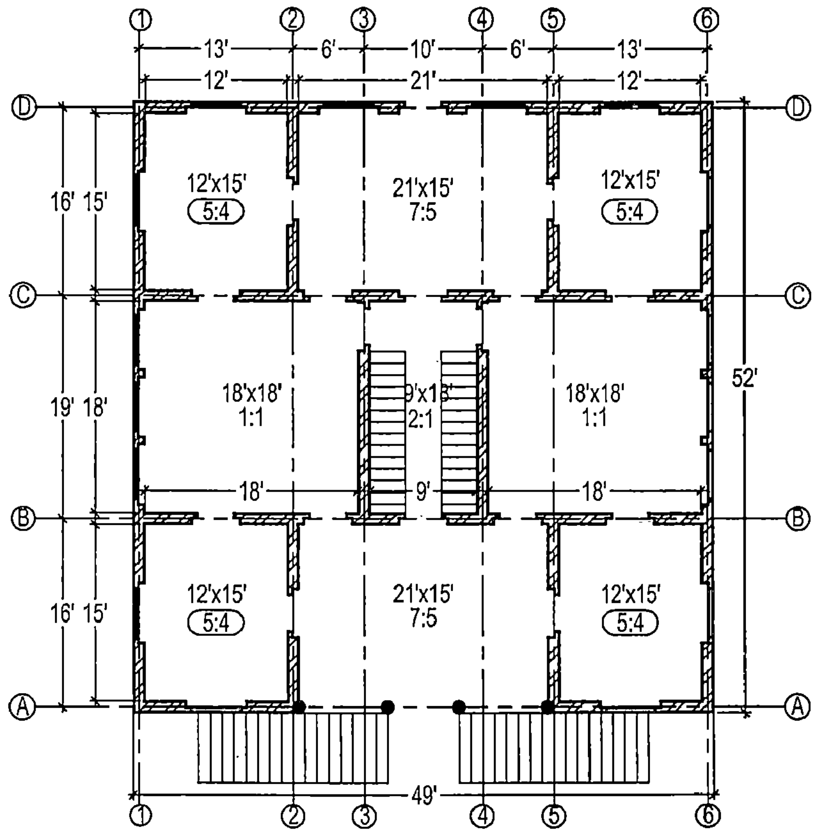
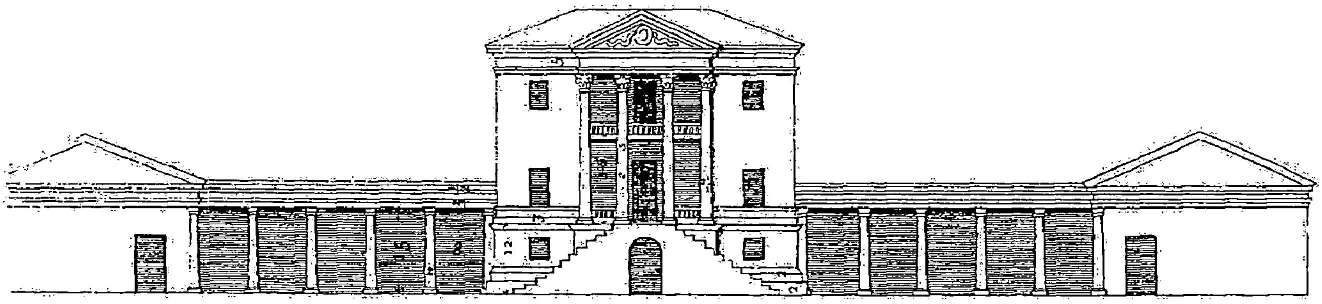


Figure 4.99 Plan of Girolamo Ragona at Ghizzole, Redrawn as per Analysis

Scale 1" = 16'



Source: Plate 40 Villa Gioralmo Ragona at Ghizzole in elevation

Figure 4.100 Elevation of Villa Gioralmo Ragona at Ghizzole

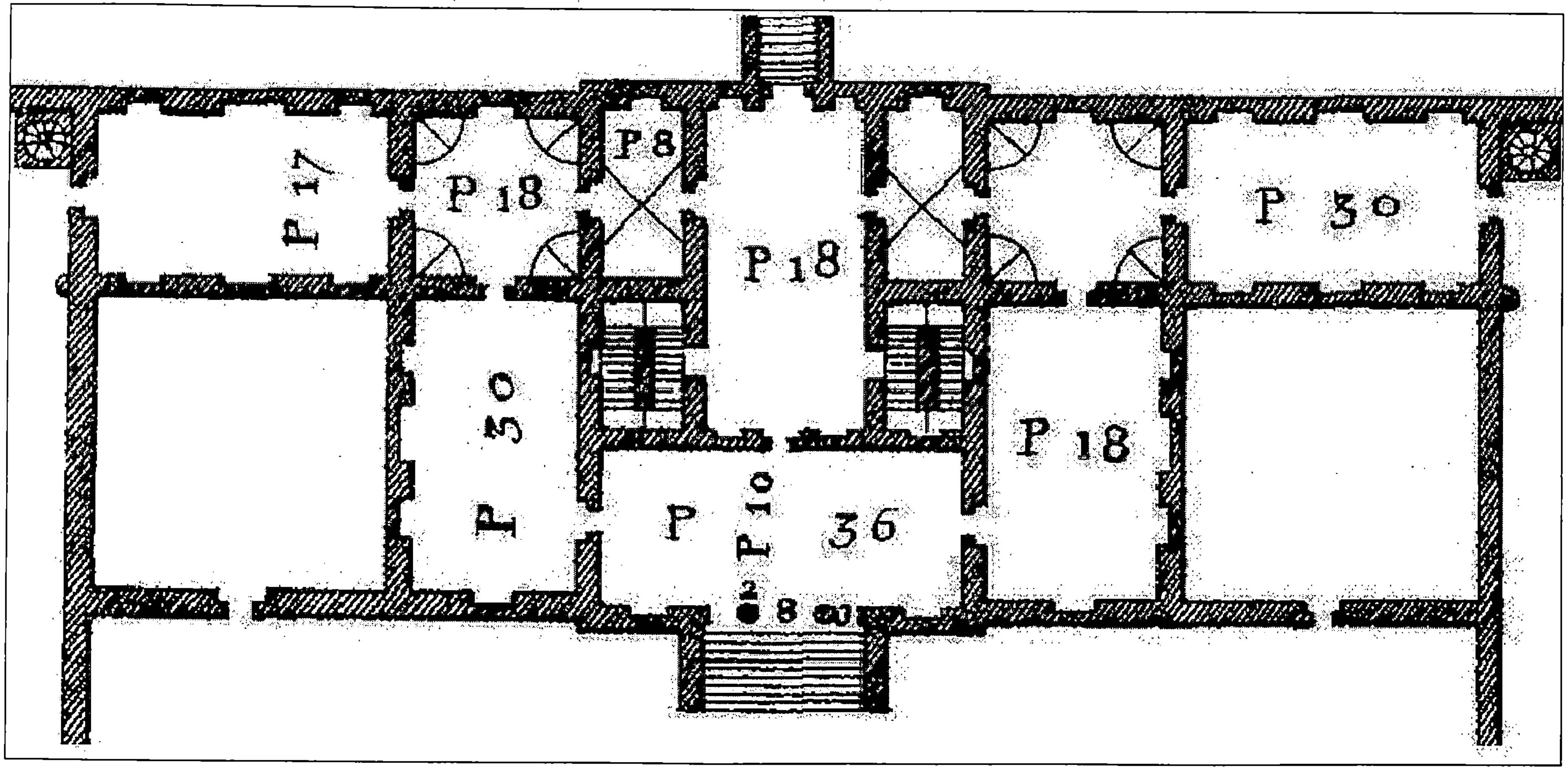


Figure 4.101 Plan Of Pogliana at Pogliana Maggiore Scanned From Plate 041, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

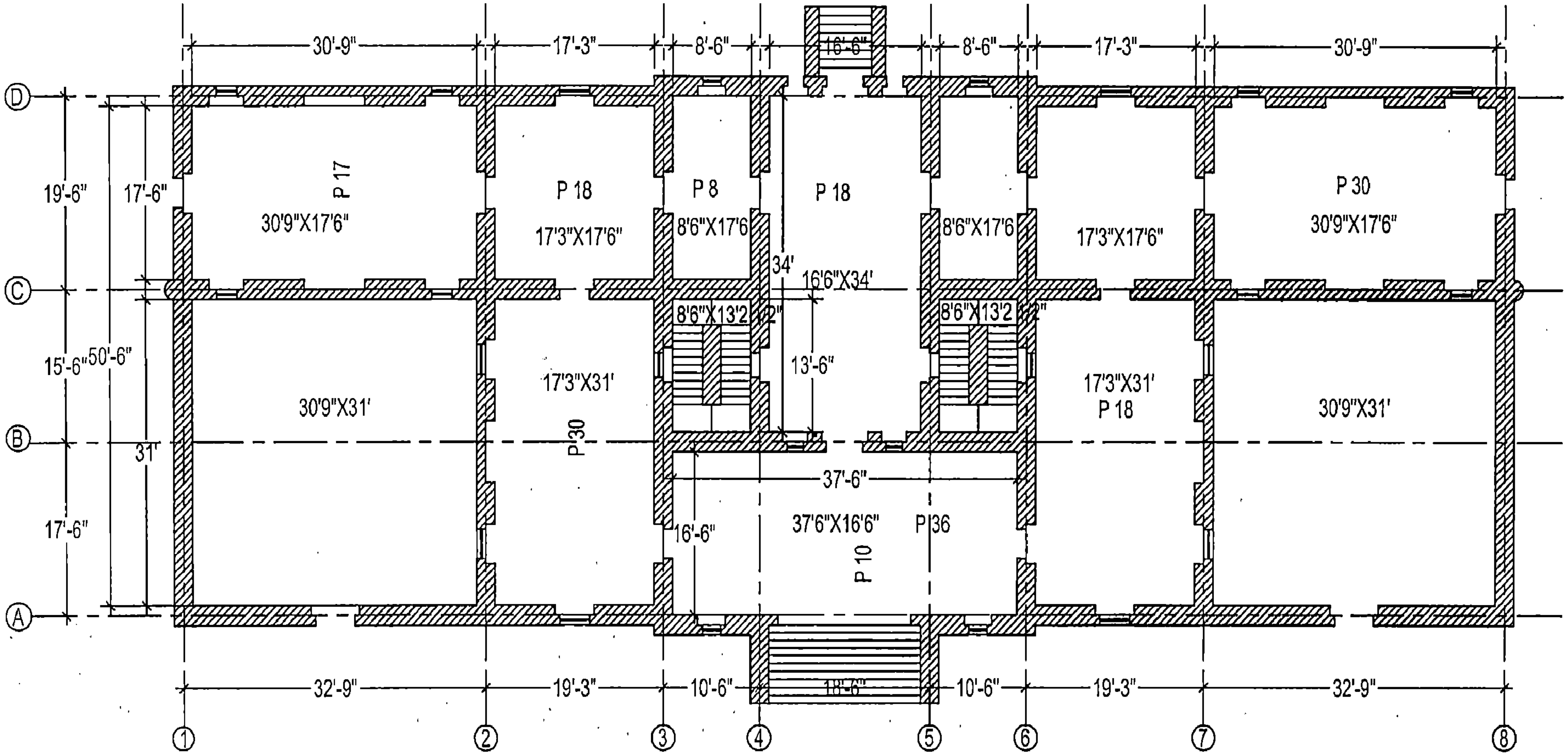


Figure 4.102 Plan Of Pogliana at Pogliana Maggiore Redrawn From Plate 041, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

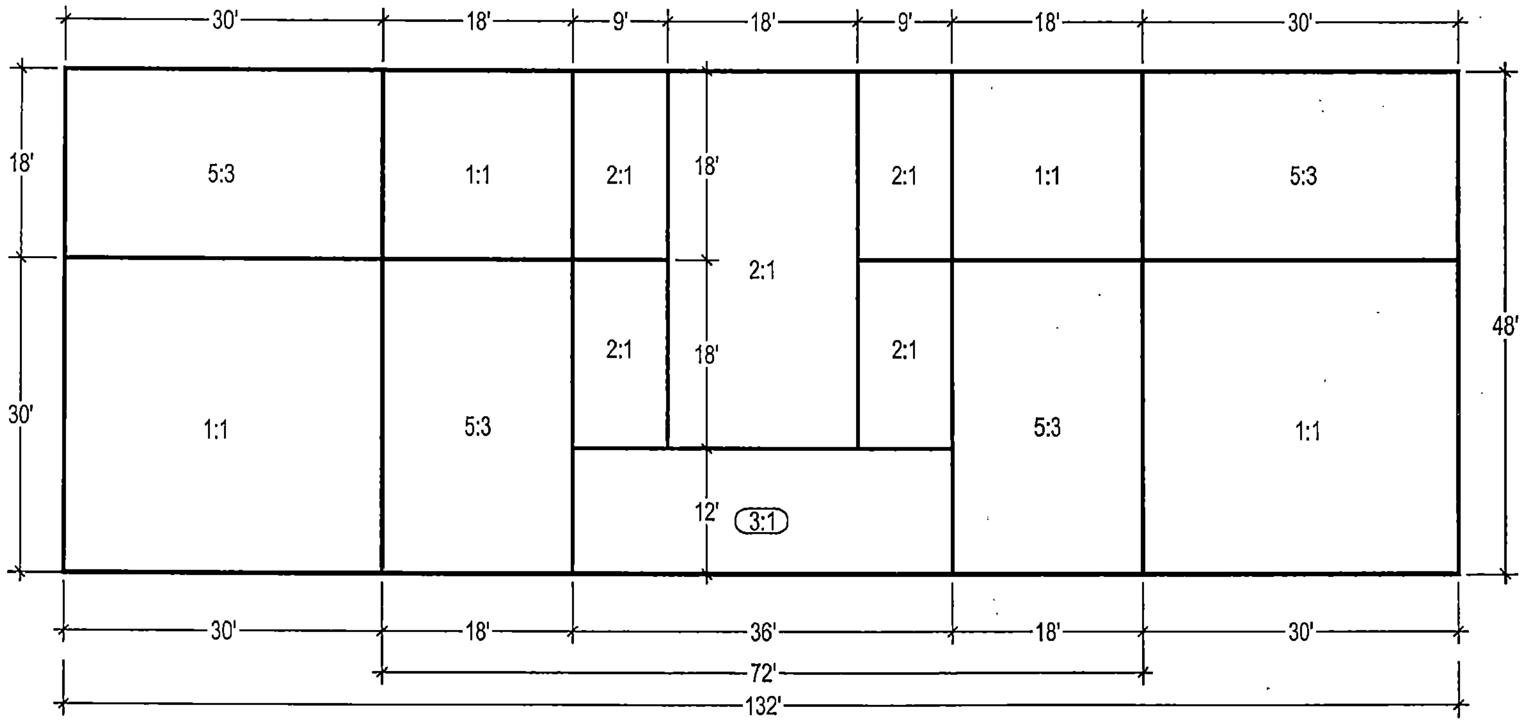


Figure 4.103 Schematic Analysis Pogliana at Pogliana Maggiore, Plate 041, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 41, VILLA CAVALIER POGLIANA (OR POIANA) AT POGLIANA

We can infer the following from schematic line diagram analysis:

- The main building whole with auxiliary wings (and without loggia) is 132'x 48' which is 33:12, very close to rational convergent of root 8, 34:12
- The main building whole without auxiliary wings is 72'x 48' which is 3:2.
- The 72' front is symmetrically divided in to 18':36':18' which is 1:2:1. Its back could be seen divided as 18':9':18':9'18' which 2:1:2:1:2. 48' side is seen divided as 18':18':12' which is 3:3:2.
- Main room sizes and ratios observed are 18'X9', 18'X18', 36'X 18'and 30'X18' which could be interpreted as 2:1, 1:1, 2:1 and 5:3.
- Non standard room ratios like 3:1 is identified which could be referred to Alberti's theory of long room ratios.

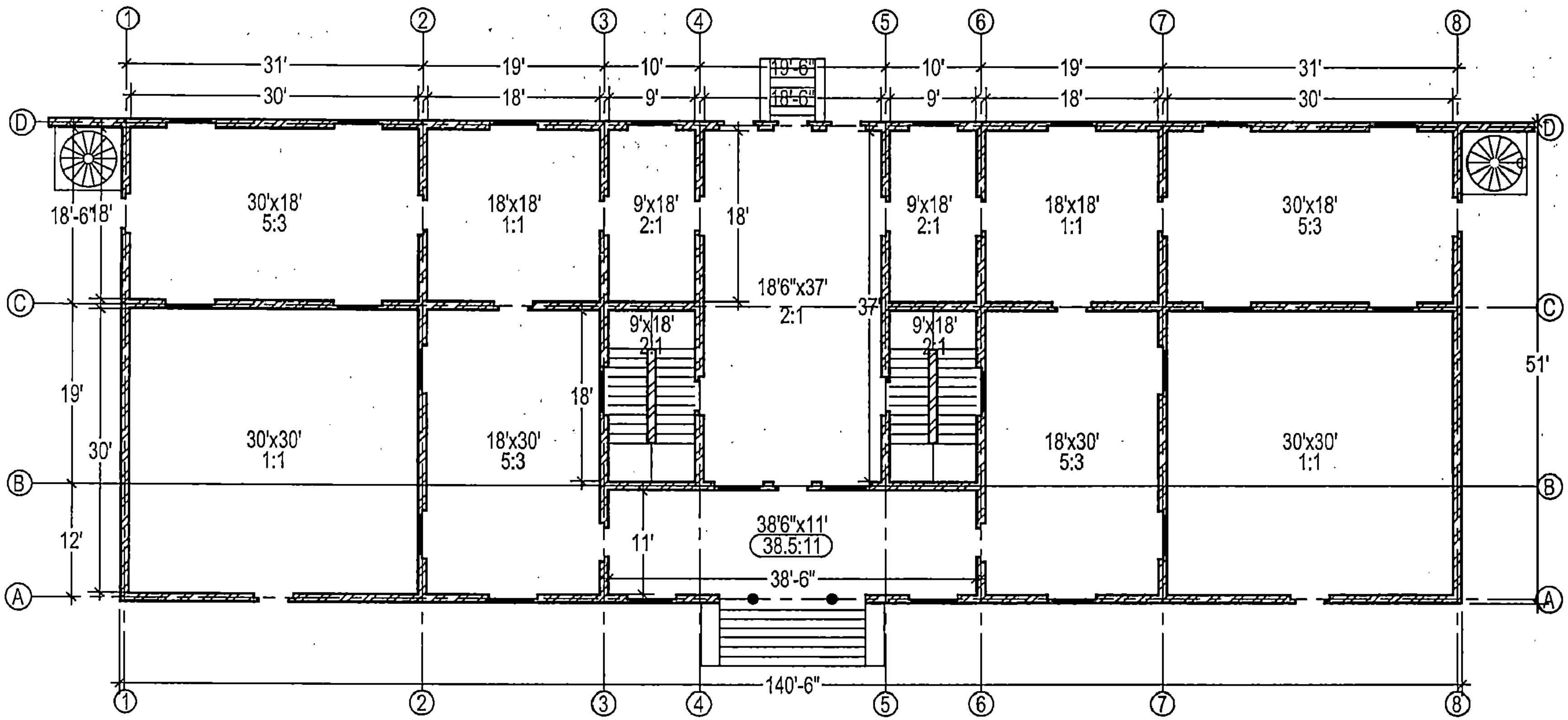
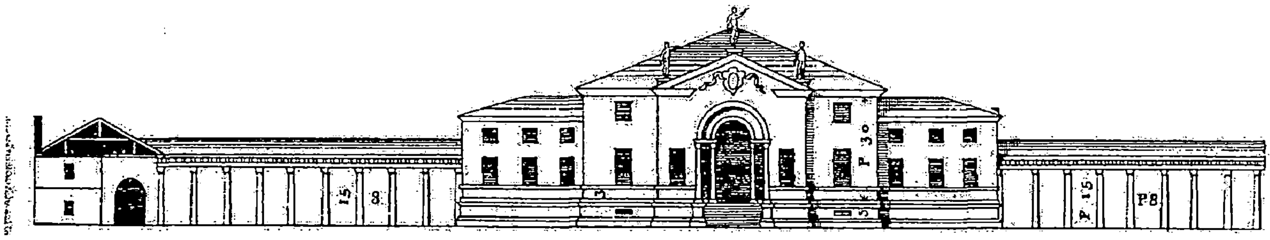
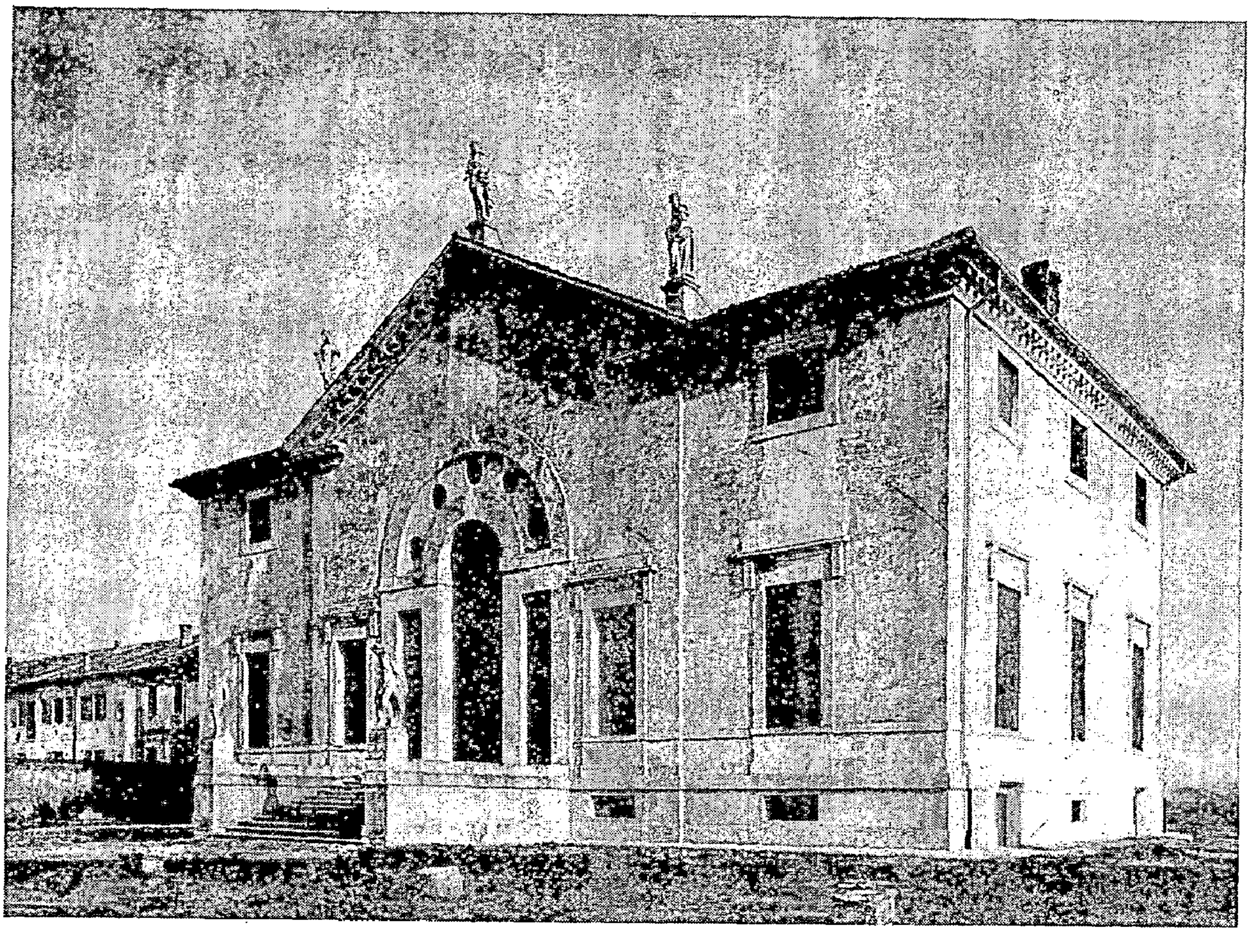


Figure 1.104 Plan of Pogliana at Pogliana Maggiore, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 41 Villa Cavalier Pogliana (or Poiana) at Pogliana in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 57
Figure 4.405 Elevation & View of Villa Cavalier Pogliana

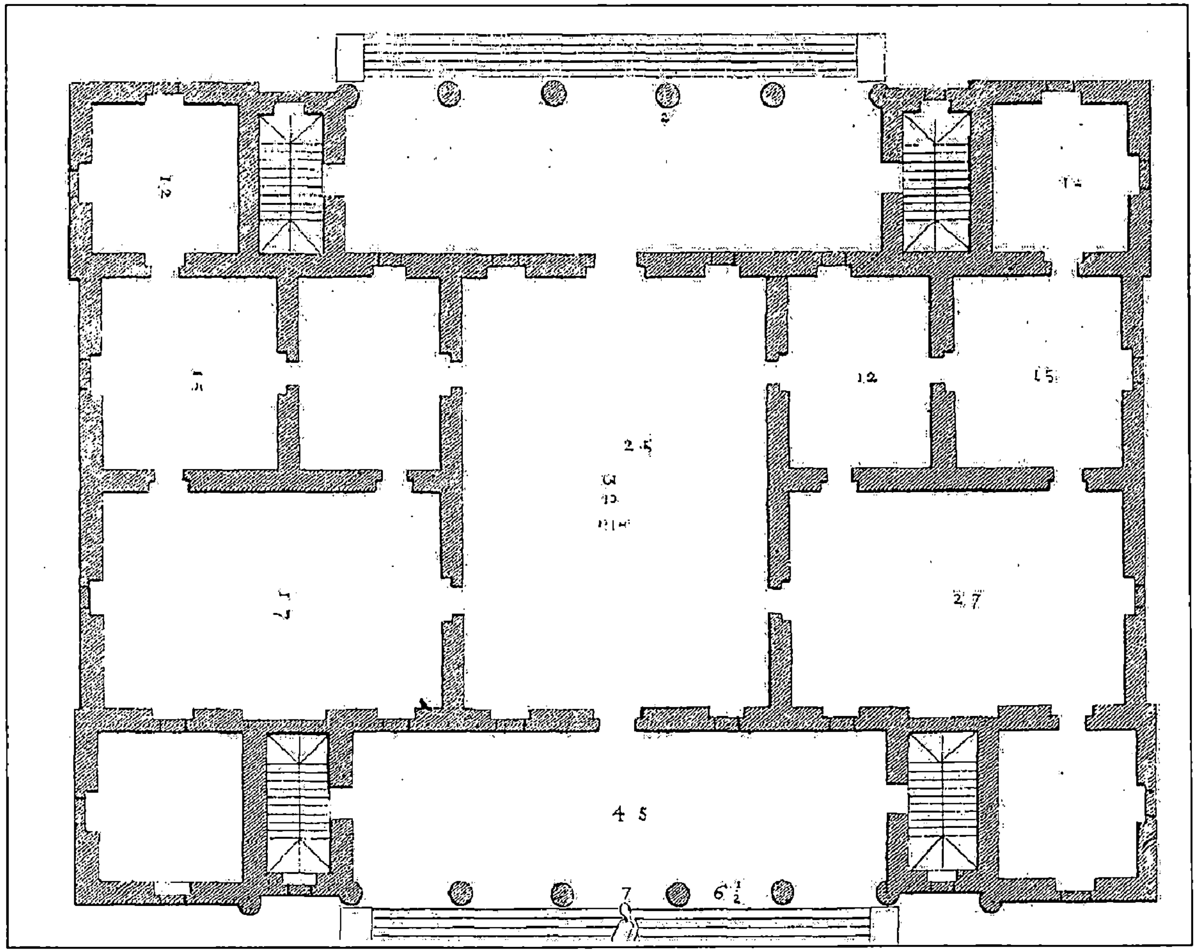


Figure 4.106 Plan Of Gio Francesco Valmarana at Lisiera Scanned From Plate 042,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

Scale 1" = 16'

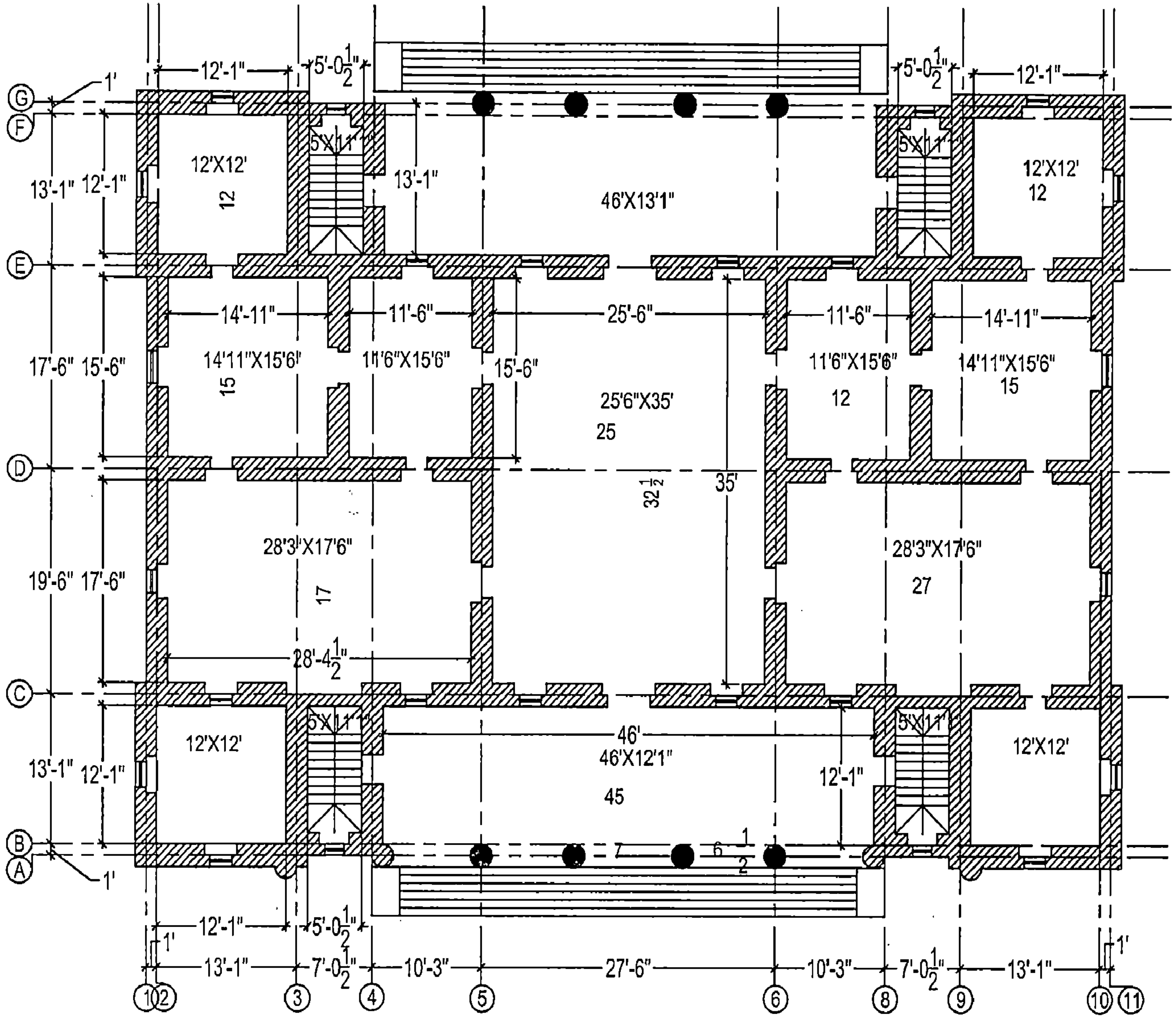


Figure 4.107 Plan Of Gio Francesco Valmarana at Lisiera Redrawn From Plate 042, 'I Quattro Libri Dell' Architettura', Book-2

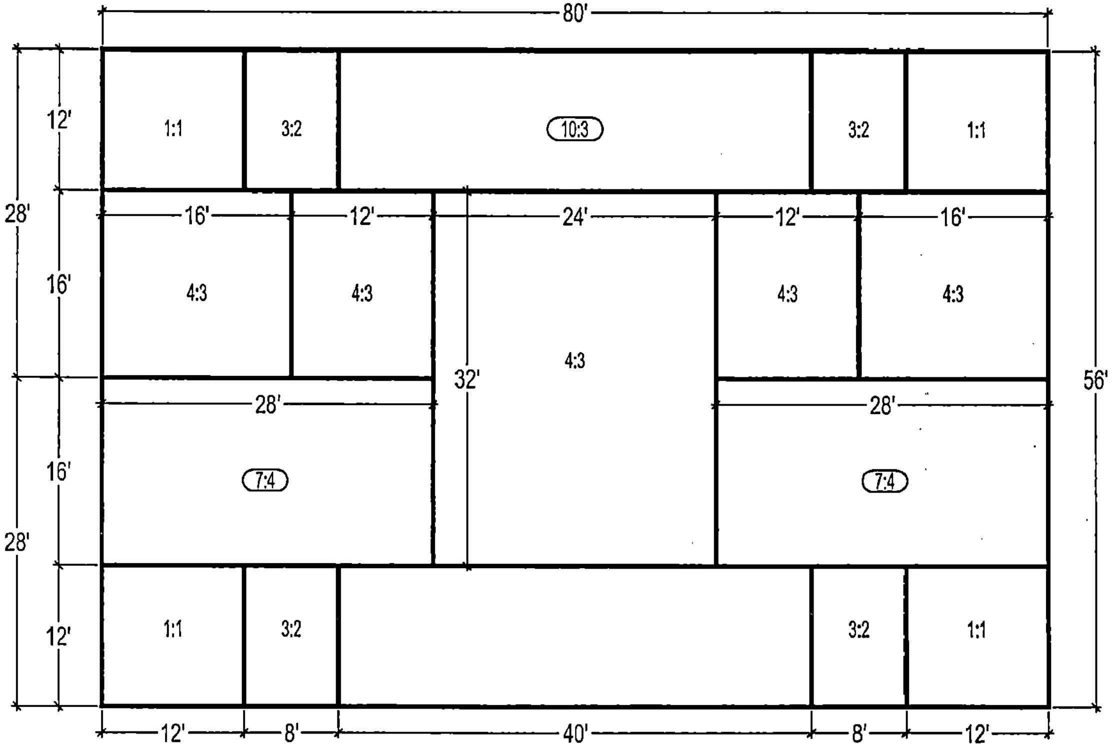


Figure 4.108 Schematic Analysis Gio Francesco Valmarana at Lisiera, Plate 042, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 42, VILLA FRANCESCO VALMARANA AT LISIERA

We can infer the following from schematic line diagram analysis:

- The main building whole is 80'x 56' which is 10:7.
- The 80' front is symmetrically divided in to 12':8':40':8':12' which is 3:4:10:4:3. 56' side is seen divided as 12':16':16':12' which is 3:4:4:3.
- Main room sizes and ratios observed are 12'X8', 12'X12', 16'X12', 16'X 16'and 32'X24' which could be interpreted as 3:2, 1:1, 4:3, 1:1 and 4:3.
- Non standard room ratio like 10:3 and 7:4 are identified. 10:3 could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 2:1 = 10:3 (a:b x c:d = ac:bd). 7:4 could be interpreted as square and three quarters

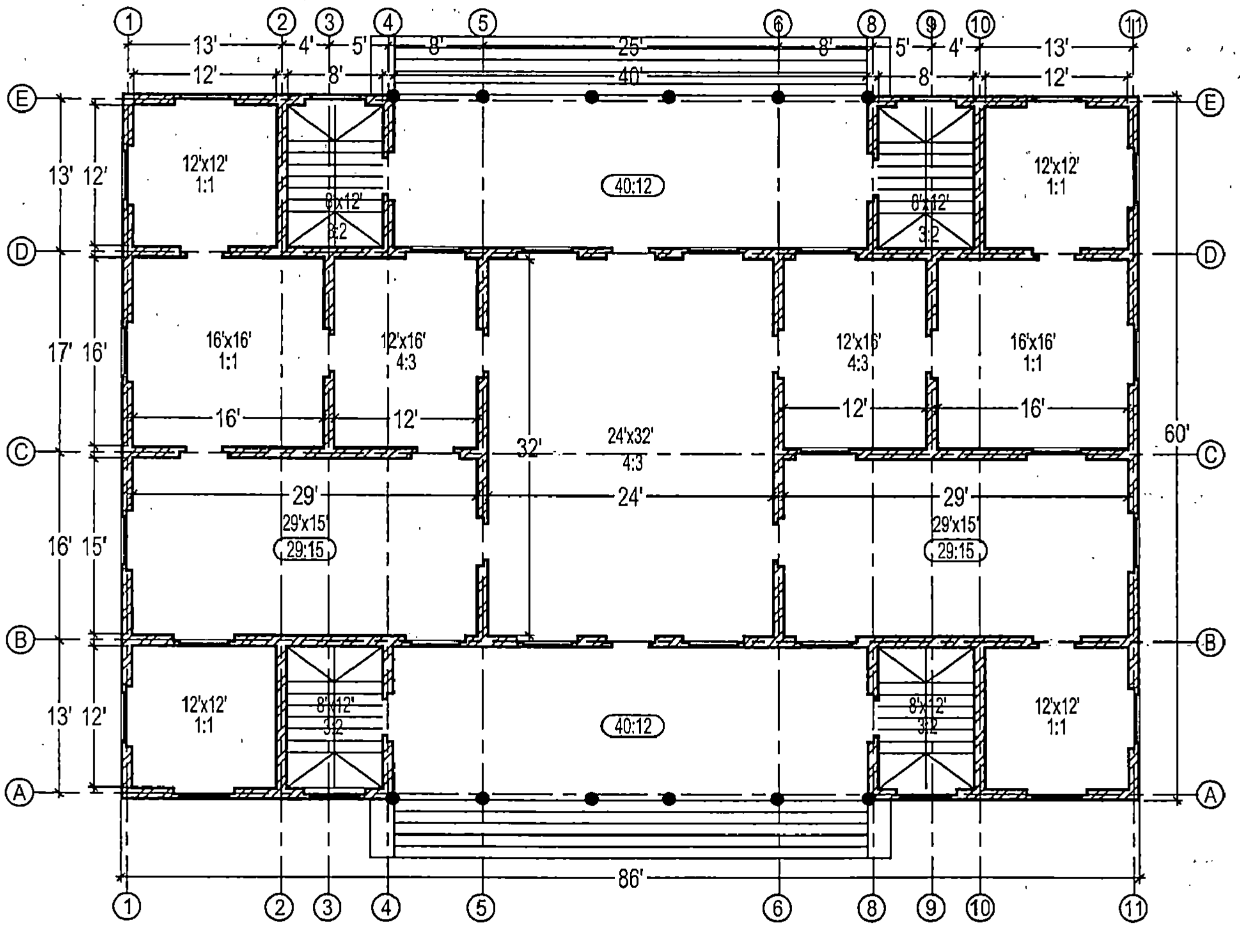
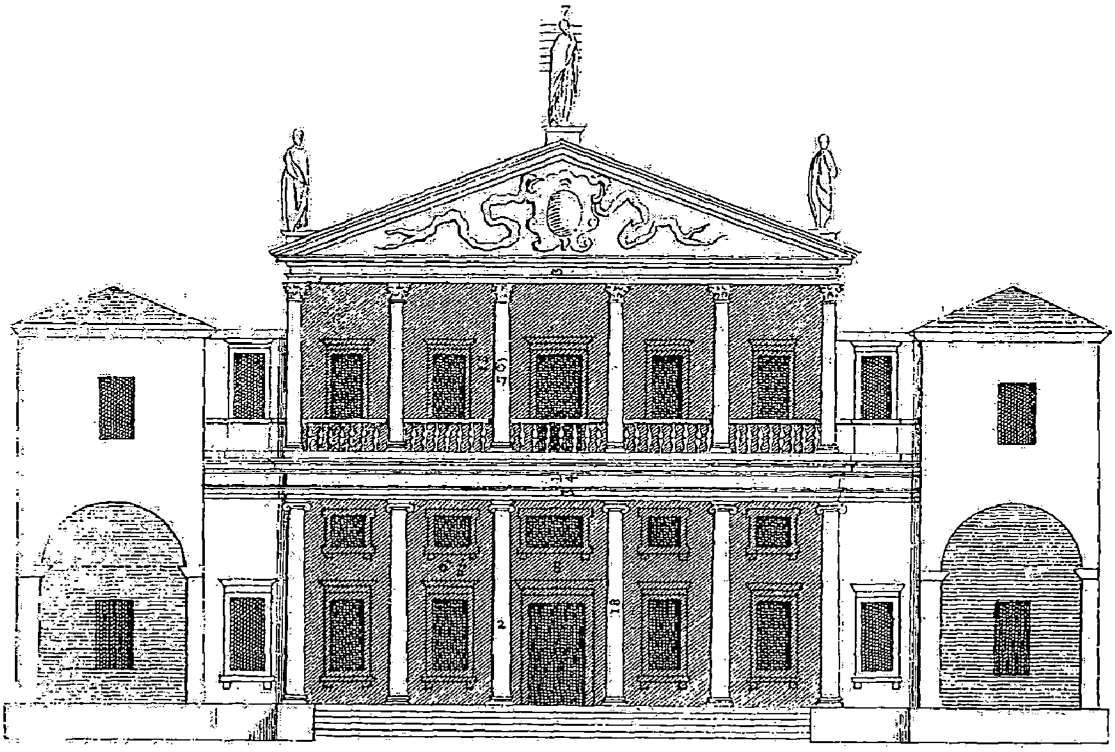
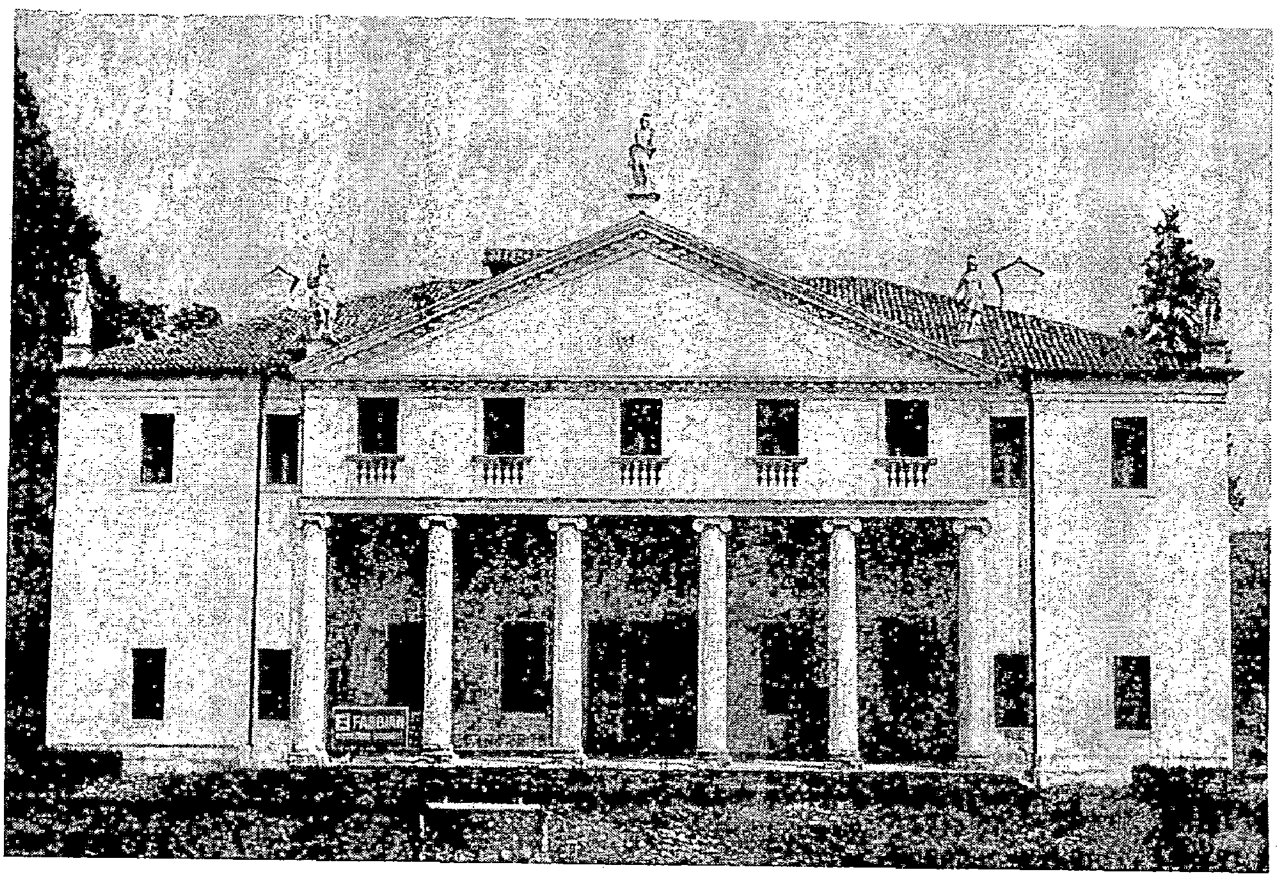


Figure 4.109 Plan of Gio Francesco Valmarana at Lisiera, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 42 Villa Francesco Valmarana at Lisiera in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 99
Figure 4.110 Elevation & View of Villa Francesco Valmarana

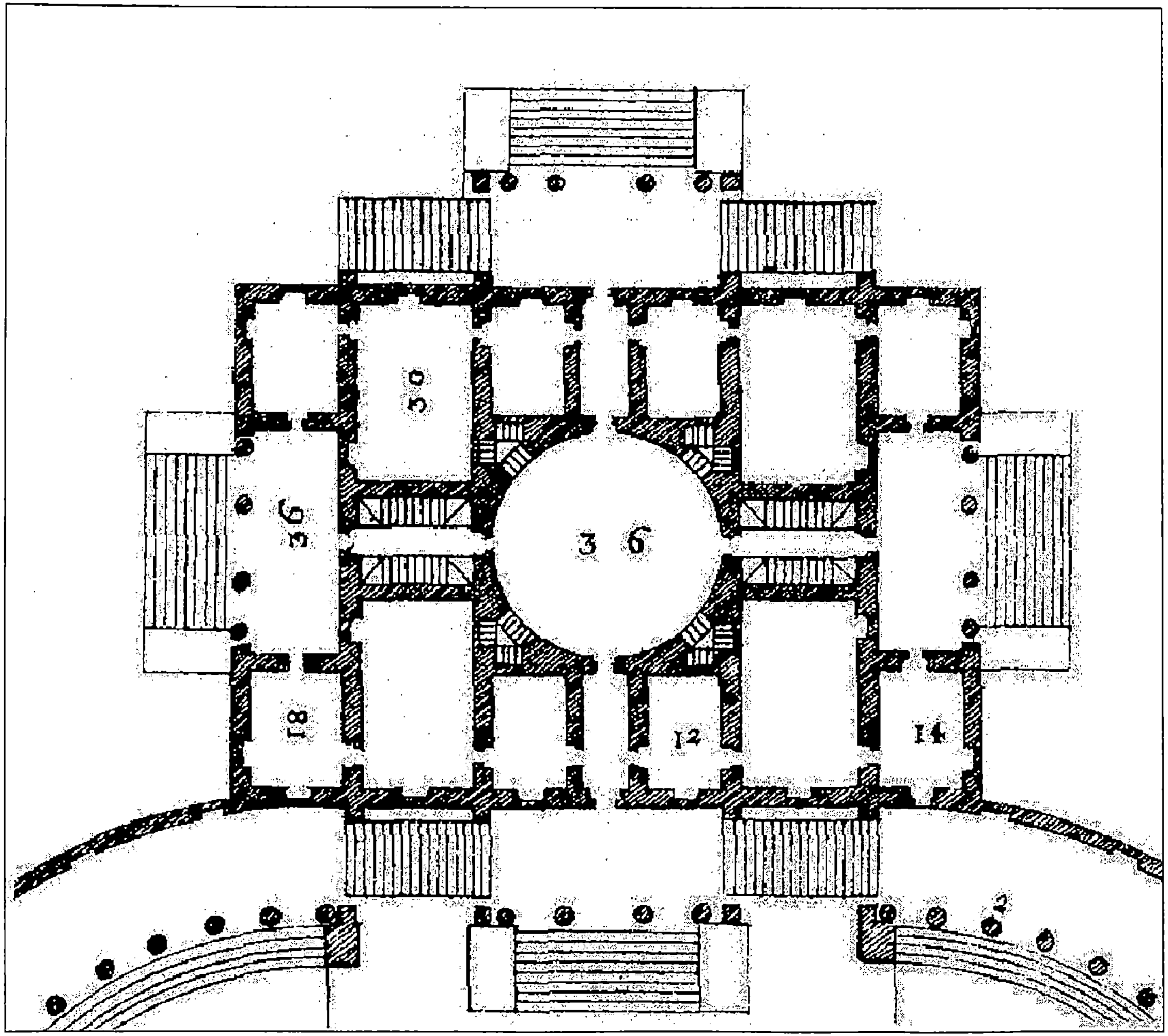


Figure 4.111 Plan Of Francesco & Lodovico Trissini at Meledo Scanned From Plate 043, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

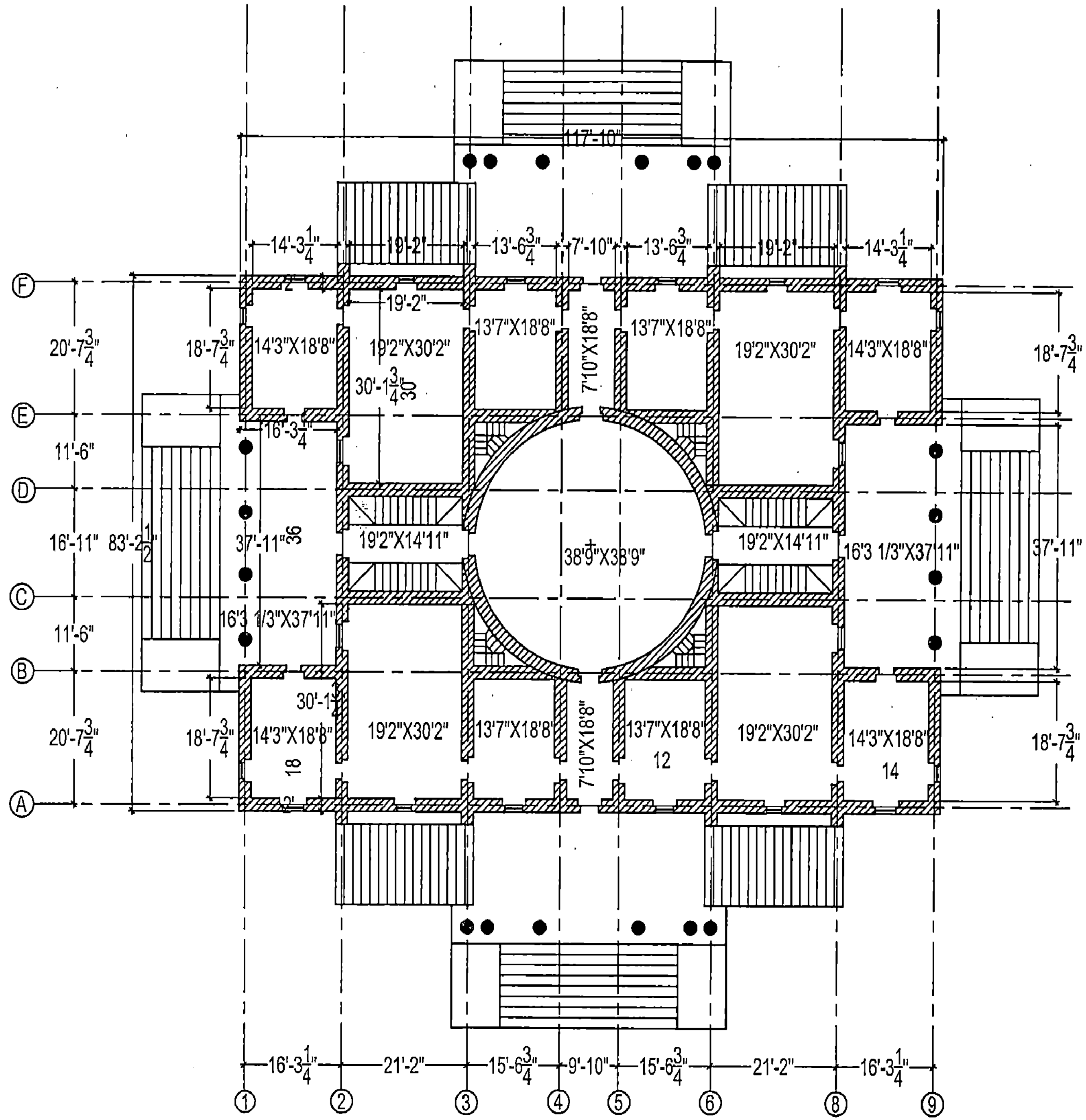


Figure 4.112 Plan Of Francesco & Lodovico Trissini at Meledo Redrawn From Plate 043, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

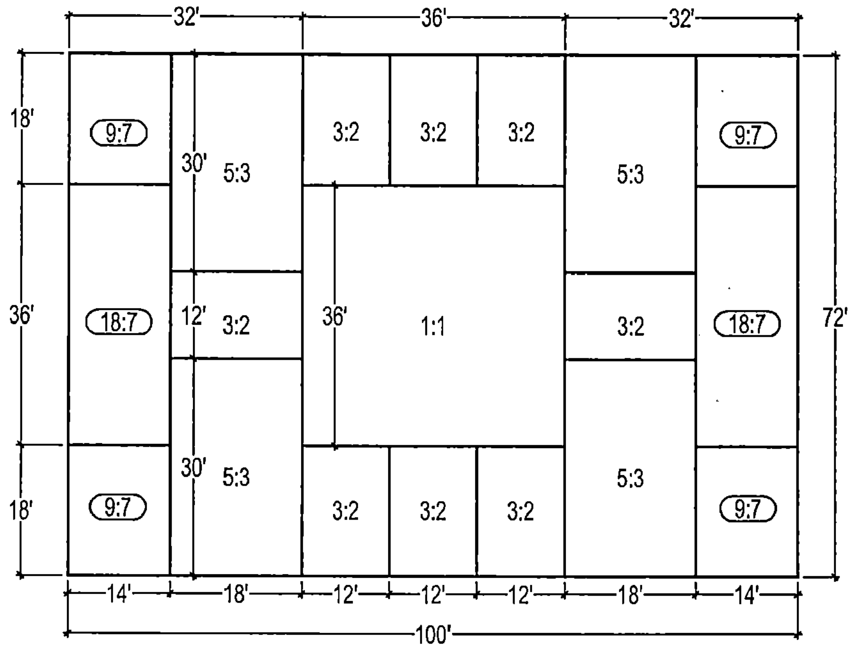


Figure 4.113 Schematic Analysis Francesco & Lodovico Trissini at Meledo, Plate 043, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

PLATE 43, VILLA FRANCESCO AND LODOVICO DE TRISSINI AT MELEDO

We can infer the following from schematic line diagram analysis:

- This is second plate in book two to exhibit use of circle in plan.
- The main building whole including loggias is 72'x 72' which is 1:1.
- The 100' front is symmetrically divided in to 14':18':12':12':12':18':14' which is 7:9:6:6:6:9:7. 72' side (without loggia) is seen divided as 18':36':18' which is 1:2:1.
- Main room sizes and ratios observed are 18'X12', 30'X18'and 36'X36' which could be interpreted as 3:2, 5:3 and 1:1.
- Non standard room ratios like 18:7 and 9:7 are identified.

  18:7 could be understood as square and one seventh. 18:7 is close rational convergent of square root six; which is 17:7.

  9:7 could be understood as square and two sevenths.

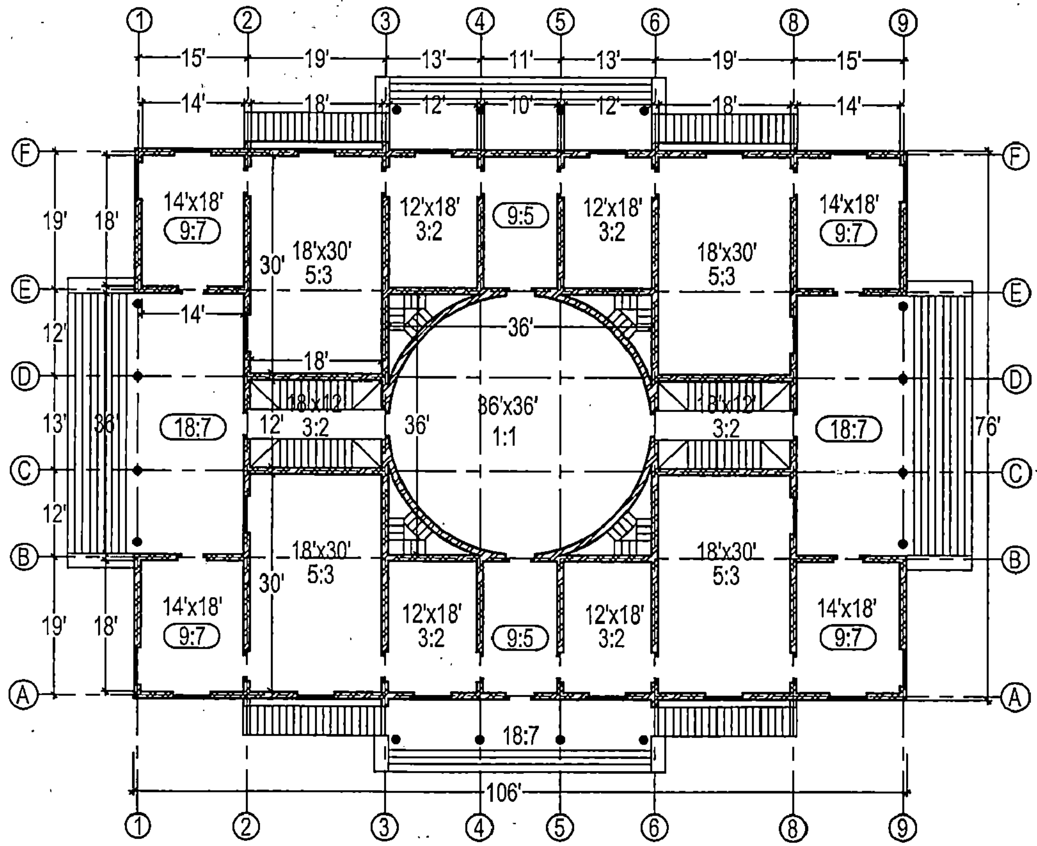
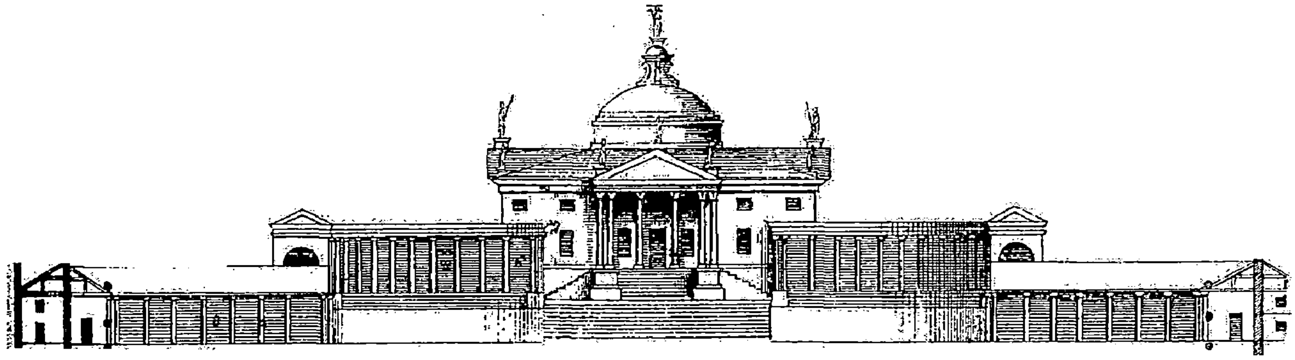
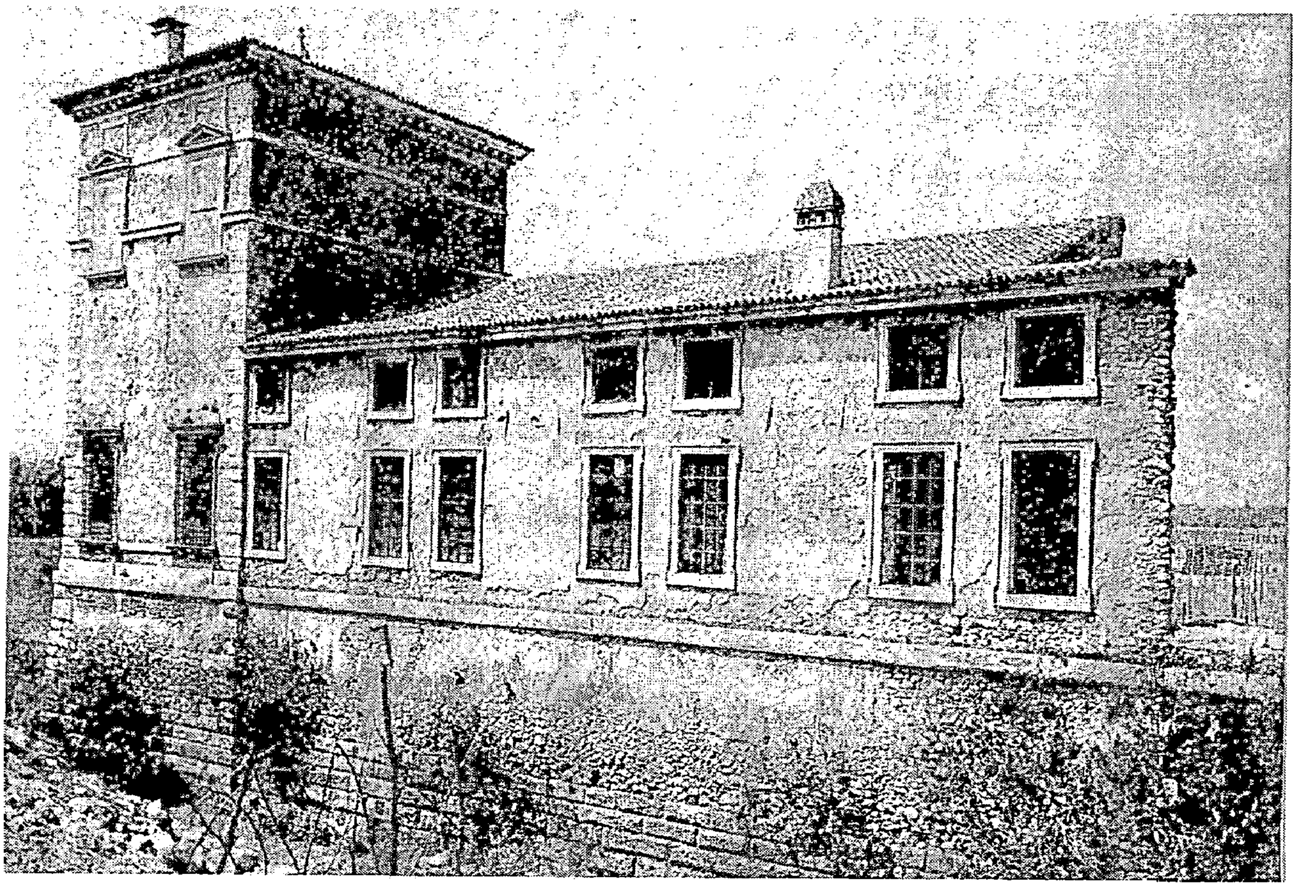


Figure 4.114 Plan of Francesco & Lodovico Trissini at Meledo, developed on the basis of schematic analysis

Scale 1" = 26'



Source: Plate 43 Villa Francesco and Lodovico De Trissini at Meledo elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 88
Figure 4.115 Elevation & View of Villa Francesco And Lodovico De Trissini

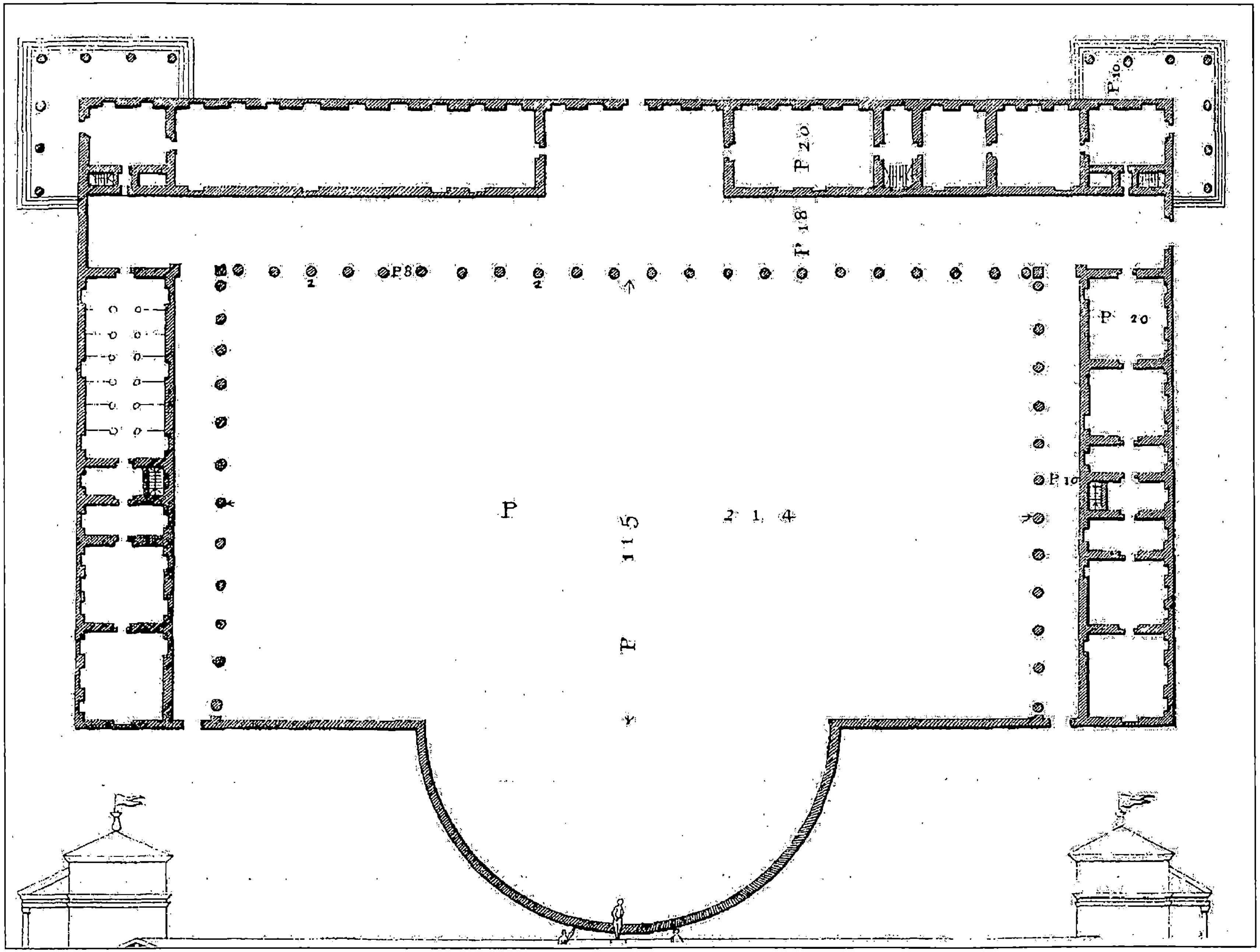


Figure 4.116 Plan Of Mario Repeta at Campiglia Scanned From Plate 044,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

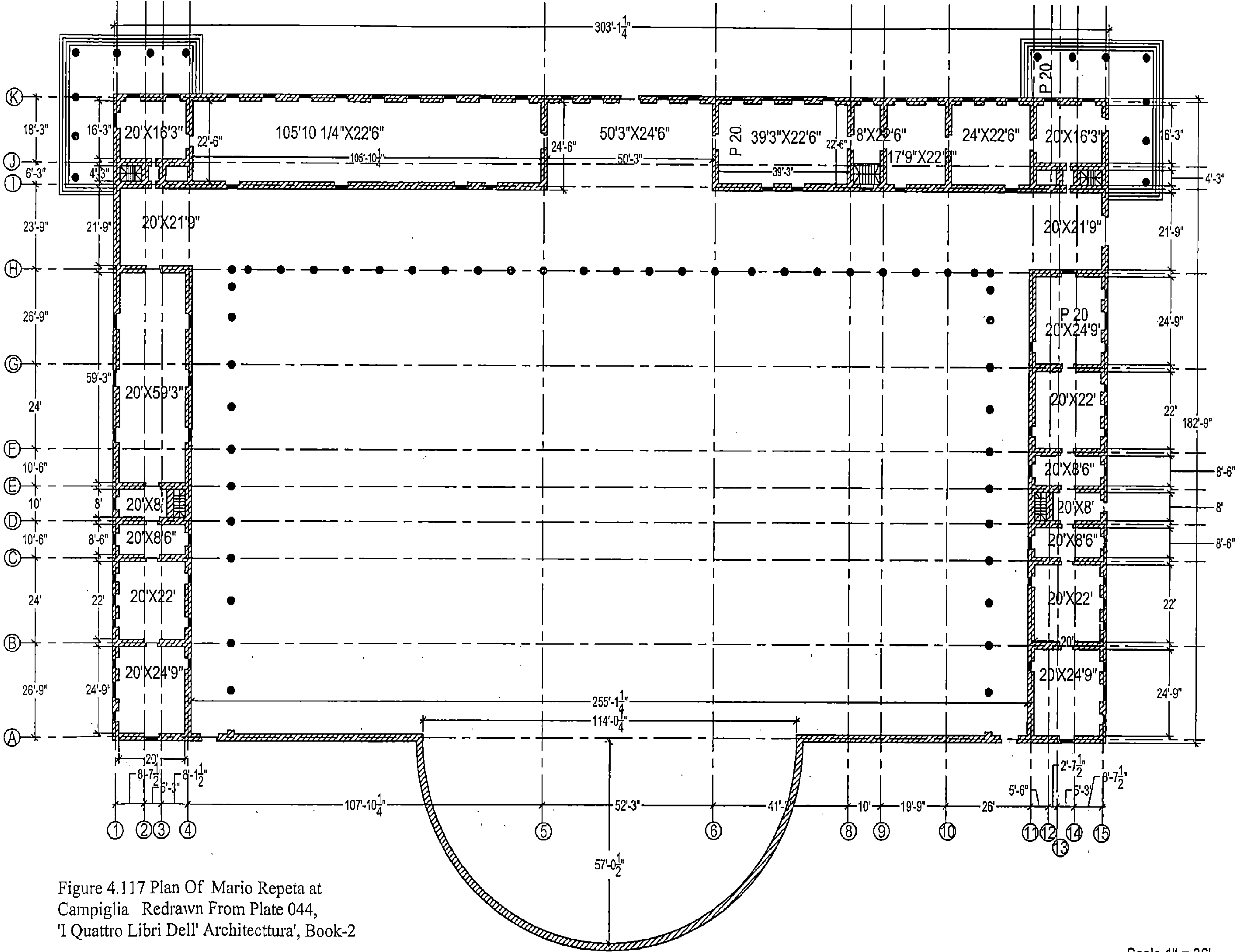


Figure 4.117 Plan Of Mario Repeta at Campiglia Redrawn From Plate 044, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

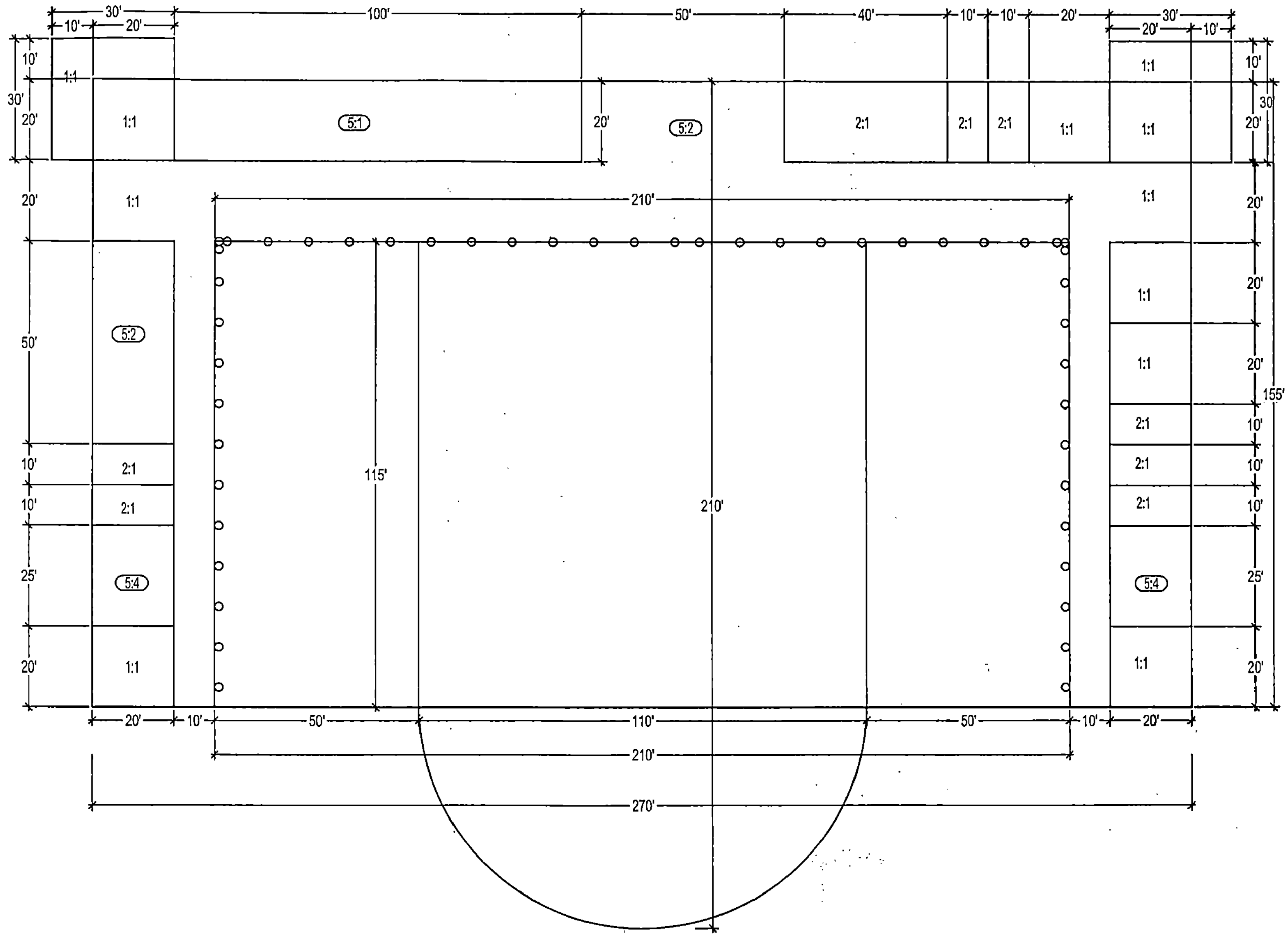


Figure 4.118 Schematic Analysis Mario Repeta at Campiglia, Plate 044,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 36'

PLATE 44, VILLA MARIO REPETA AT CAMPIGLIA

We can infer the following from schematic line diagram analysis:

- The main building whole including loggias is 270'x 155'.
- Main building including loggia to main courtyard is 210':210' which is 1:1.
- The 270' front is asymmetrically divided in to 20':100':50':40':10':10':20':20' which is 2:10:5:4:1:1:2:2. 150' side (without loggia) is seen divided as 20':20':10':10':10':20':20':20':20' which is 2:2:1:1:2:2:2:2. Another auxiliary arm is seen asymmetrically divided as 20':20':10':10':50':20':20' which is 2:2:1:1:5:2:2.
- Room width of auxiliary rooms and its corridor are related as 20':10' which is 2:1
- Main room width and its corridor are related as 20':20' which is 1:1
- Main room sizes and ratios observed are 20'X10', 20'X20'and 40'X20' which could be interpreted as 2:1, 1:1 and 2:1.
- Non standard room ratios like 5:4, 5:2 and 5:1 are identified.

  5:4 could be understood as square and a fourth. It could be understood as square and a fourth. It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)

  5:2 could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
- With such analysis we can see Palladio is using sequential ratios of number 5; like 5:1, 5:2, 5:3 and 5:4 in this plan.

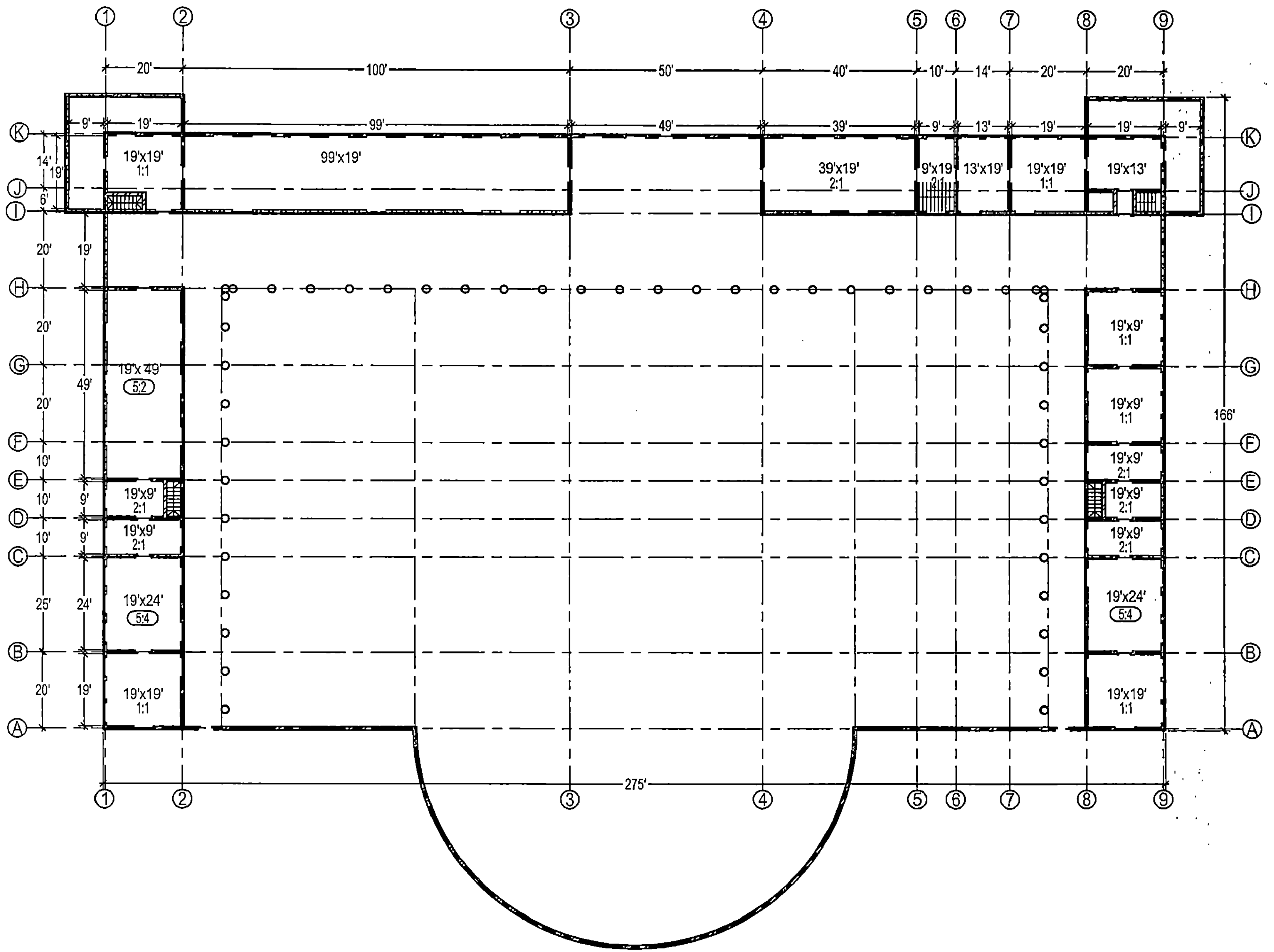
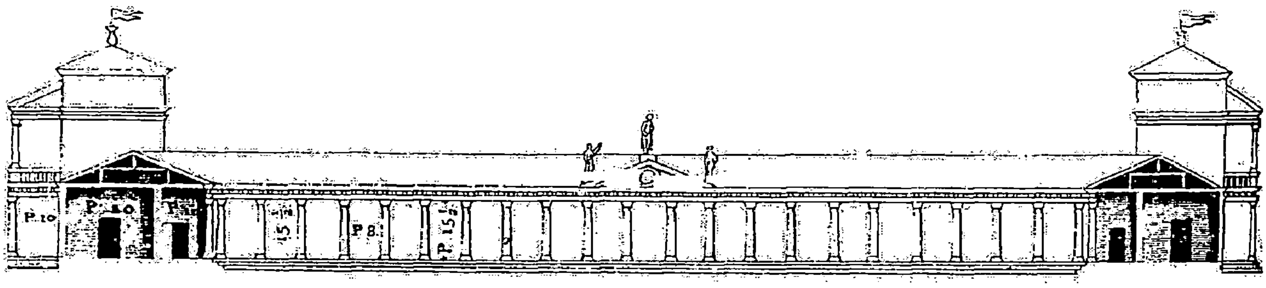


Figure 4.19 Plan of Mario Repeta at Campiglia, developed on the basis of schematic analysis

Scale 1" = 36'



Source: Plate 44 Villa Mario Repeta at Campiglia in elevation

Figure 4.120 Elevation of Villa Mario Repeta at Campiglia

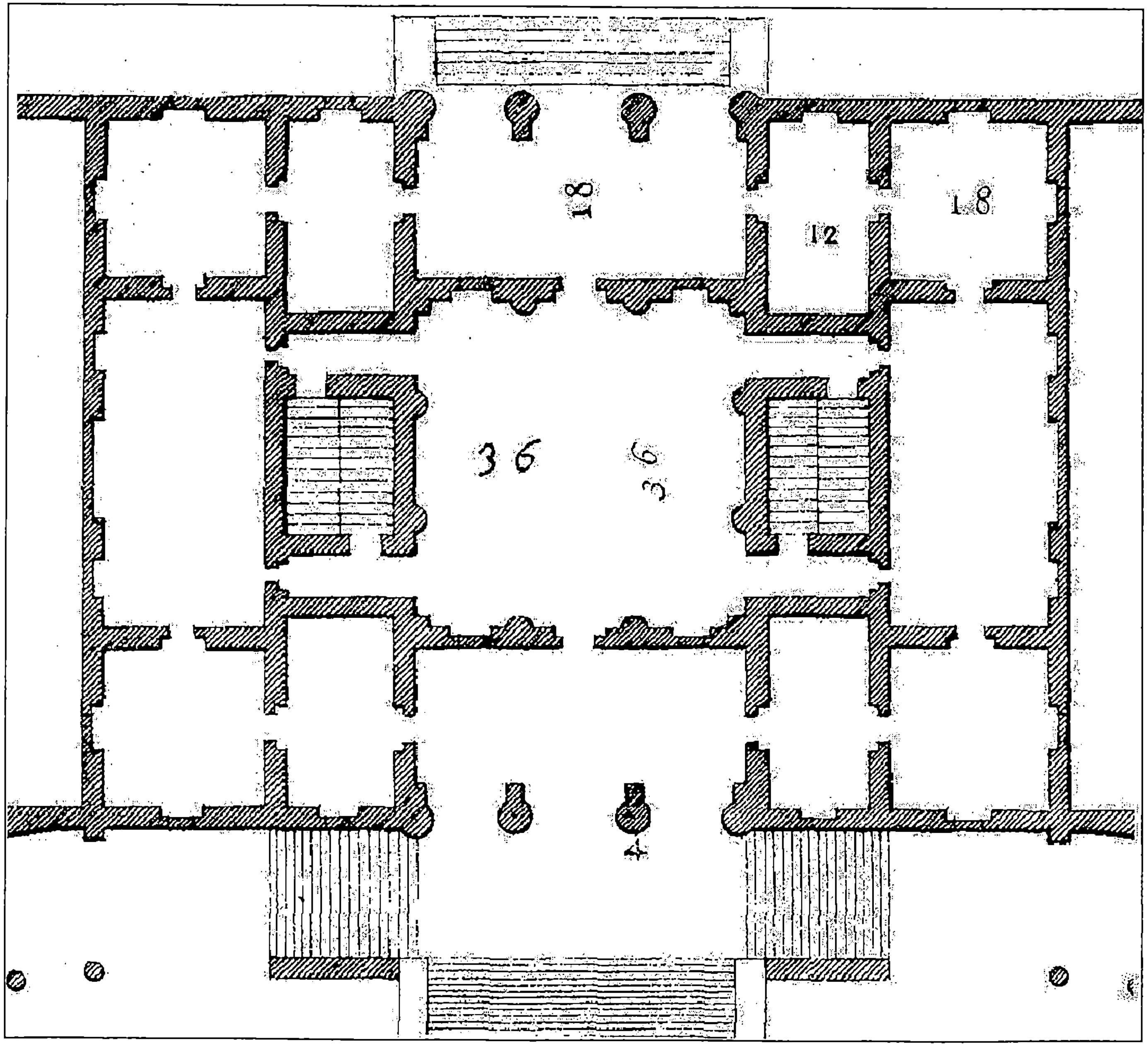


Figure 4.121 Plan Of Odoardo & Theodoro Thieni at Cigogna Scanned From Plate 045,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1"

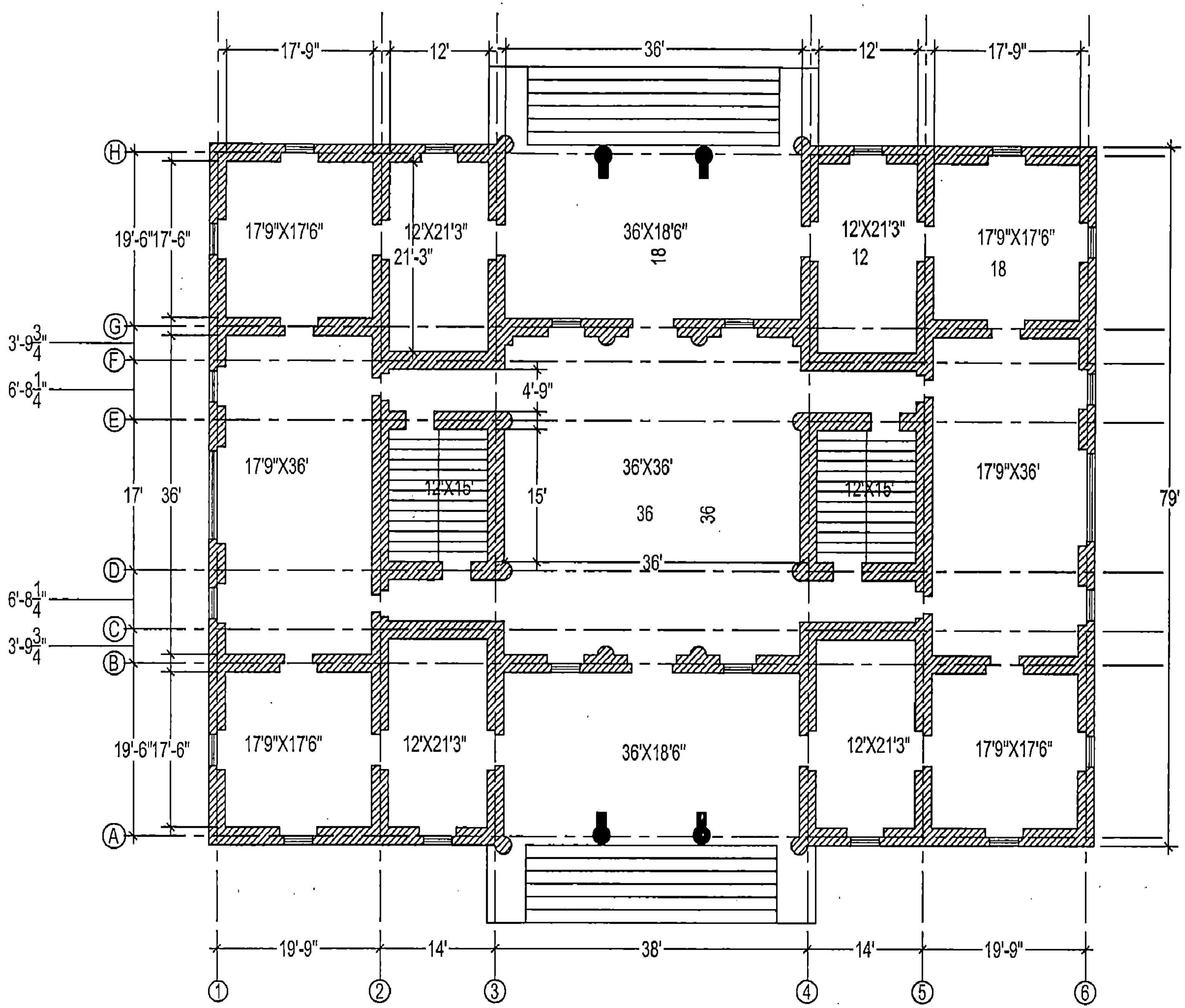


Figure 4.122 Plan Of Odoardo & Theodoro Thieni at Cigogna Redrawn From Plate 045, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

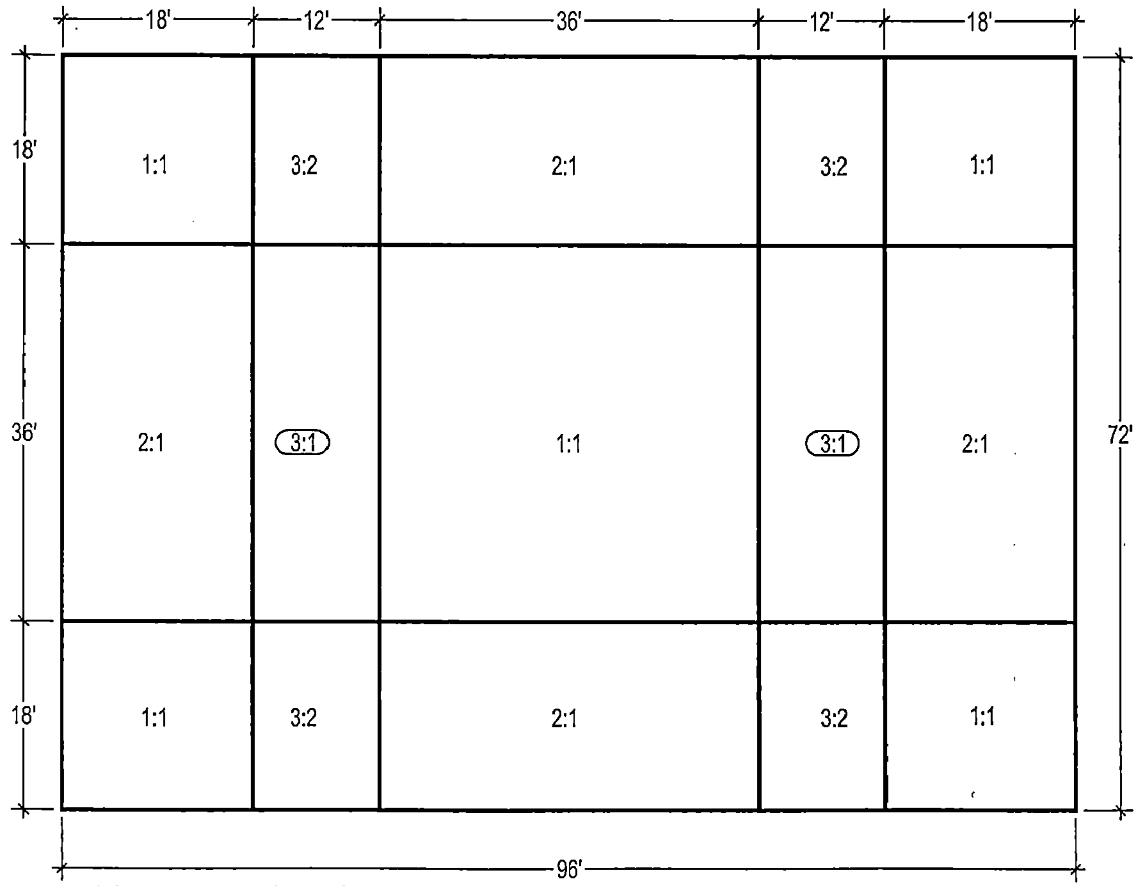


Figure 4.123 Schematic Analysis Odoardo & Theodoro Thieni at Cigogna, Plate 045,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 45, VILLA ODOARDO (OLEARDO) AND THEODORO DE THIENE AT CICOGNA

We can infer the following from schematic line diagram analysis:

- The main building whole is 96'x 72' which is 4:3.
- The 96' front is symmetrically divided in to 18':12':36':12':18' which is 3:2:6:2:3.
- 72' side is seen divided as 18':36':18' which is 1:2:1.
- Main room sizes and ratios observed are 18'X12', 18'X18', 36'X18'and 36'X36' which could be interpreted as 3:2, 1:1, 2:1 and 1:1.
- No non standard room ratios are identified

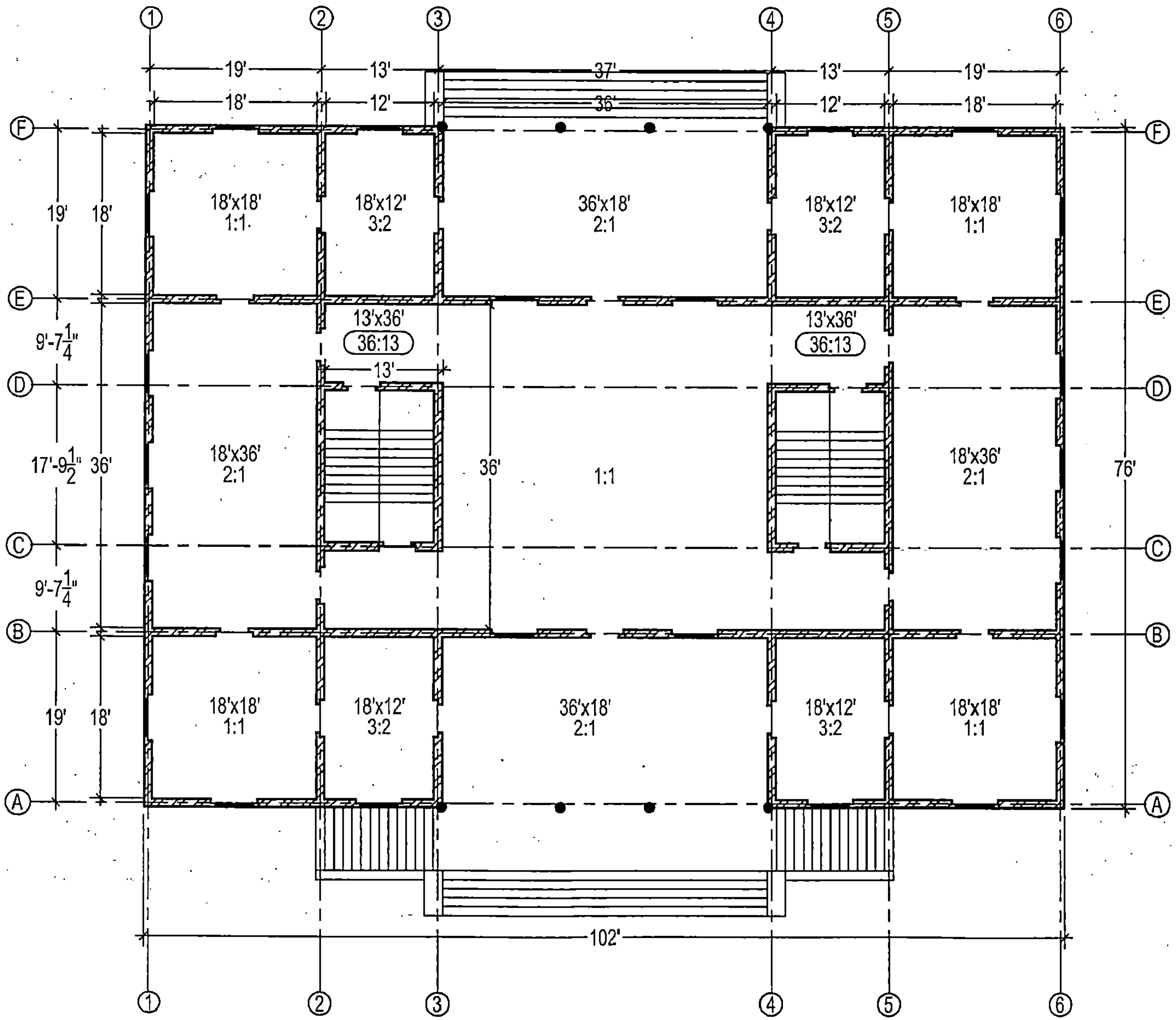
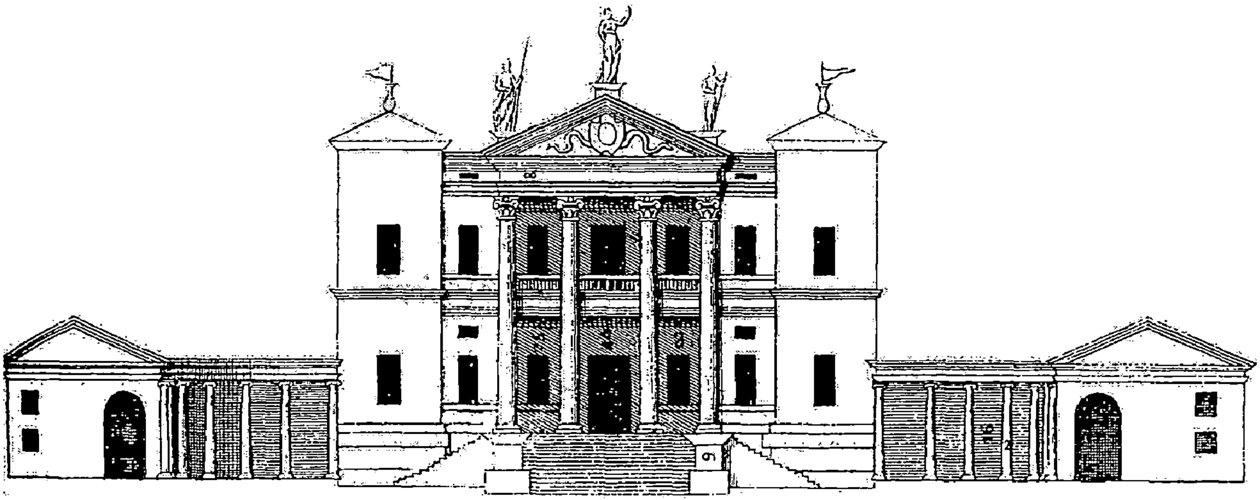
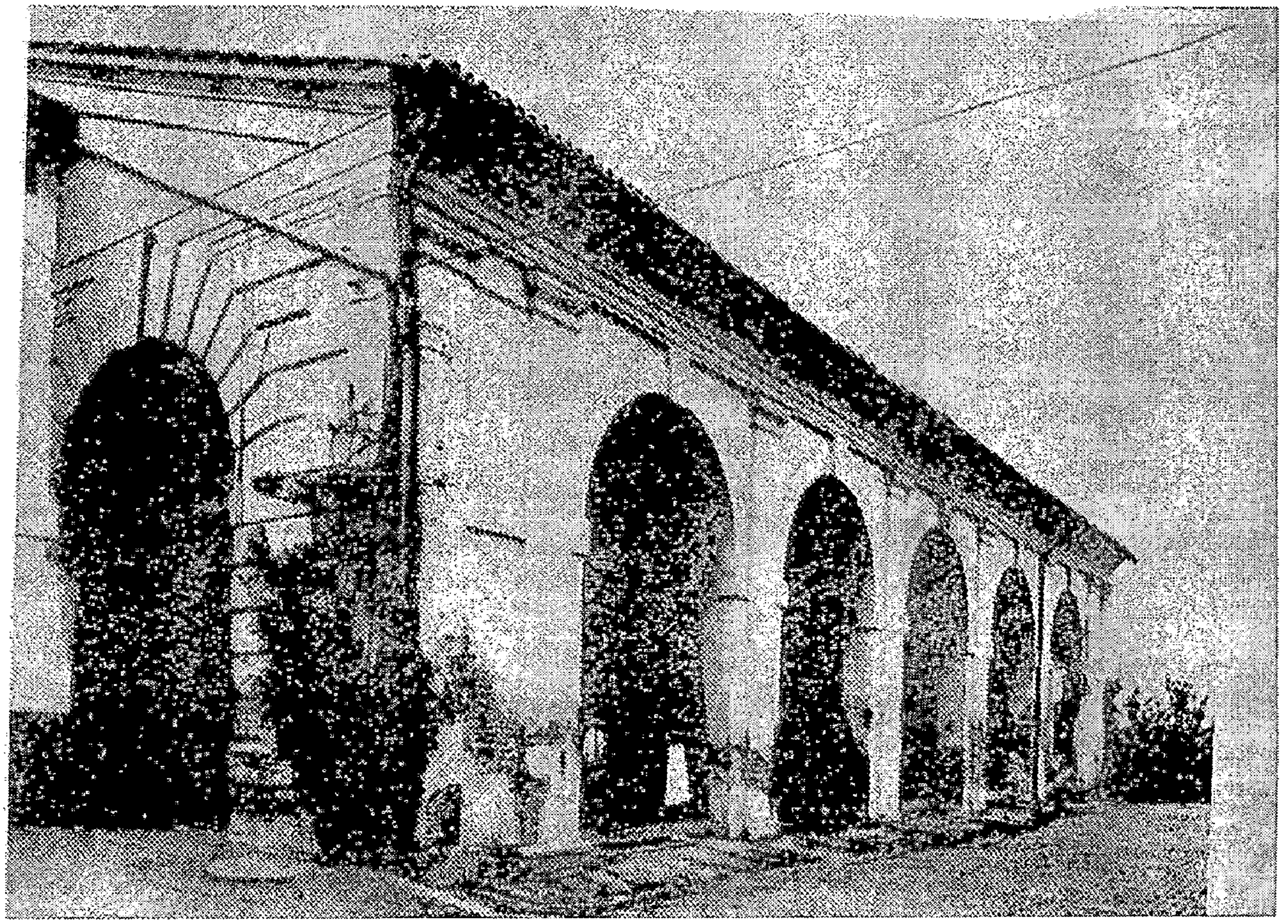


Figure 4.124 Plan of Odoardo & Theodoro Thieni at Cigogna, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 45 Villa Odoardo (Oleardo) and Theodoro De Thiene at Cicogna



Source: Constant Caroline, 'The Palladio Guide', pg. 76
Figure 4.125 Elevation & View of Villa Odoardo

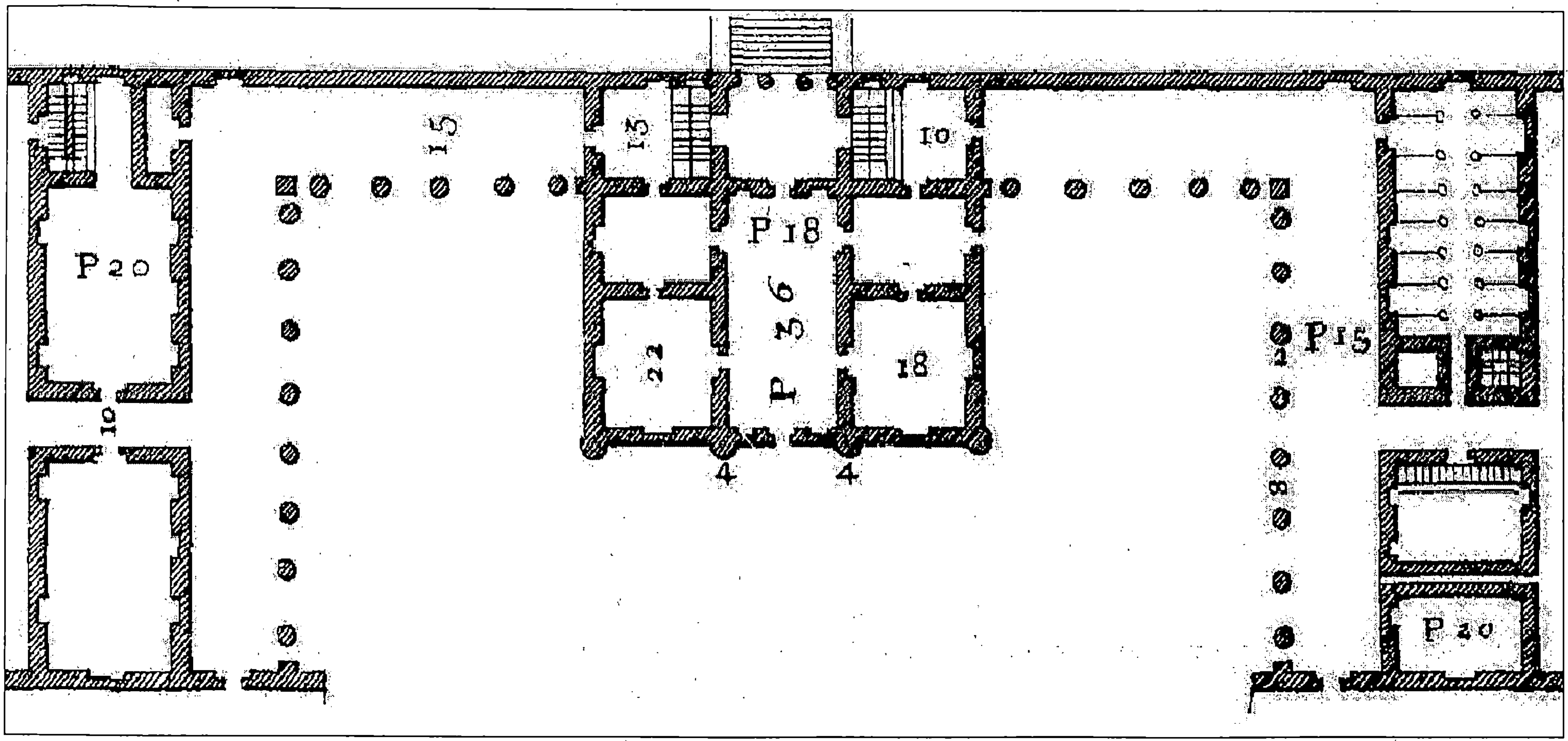


Figure 4.126 Plan Of Giacomo Angarano at Angarano Scanned From Plate 046, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

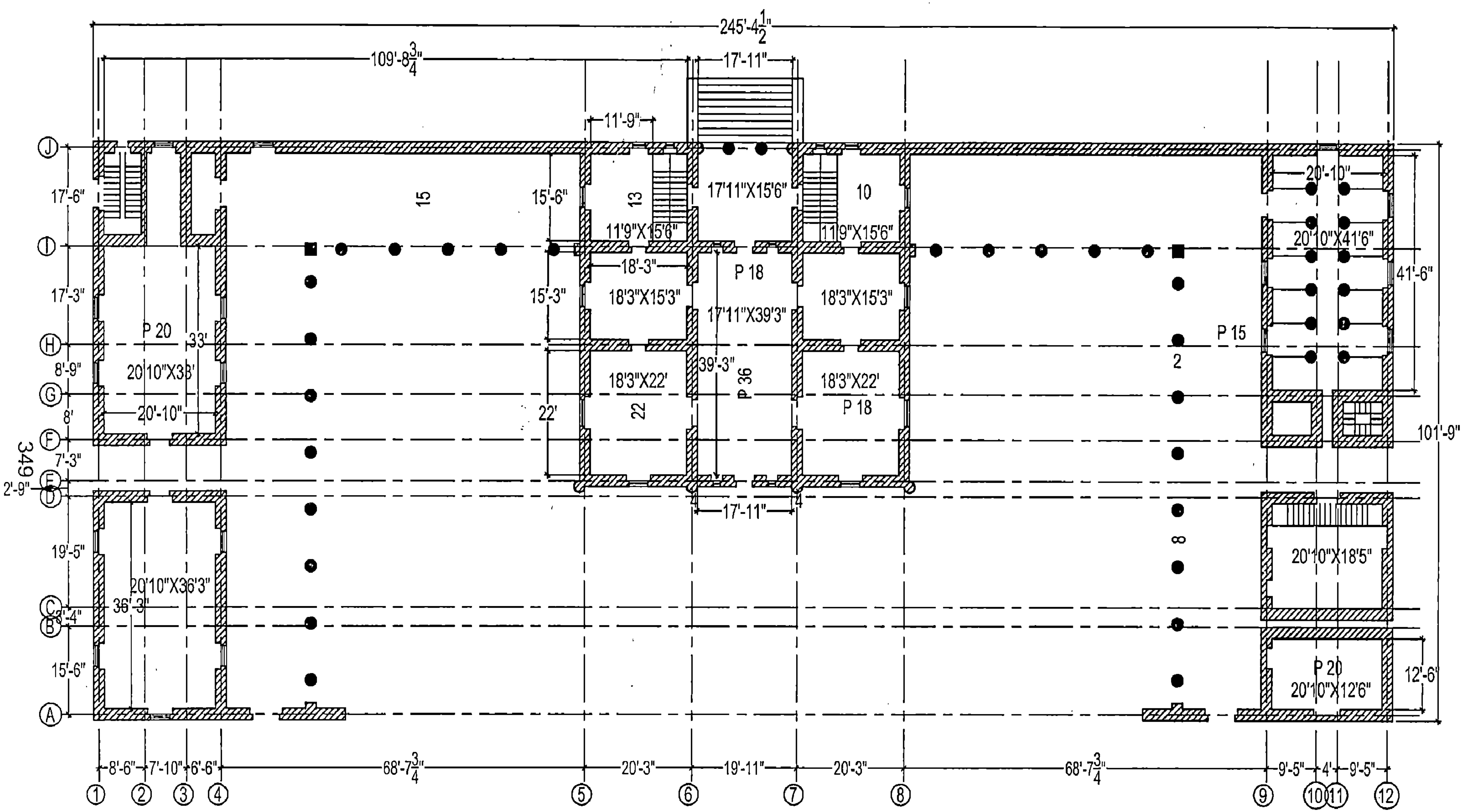


Figure 4.127 Plan Of Giacomo Angarano at Angarano Redrawn From Plate 046, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

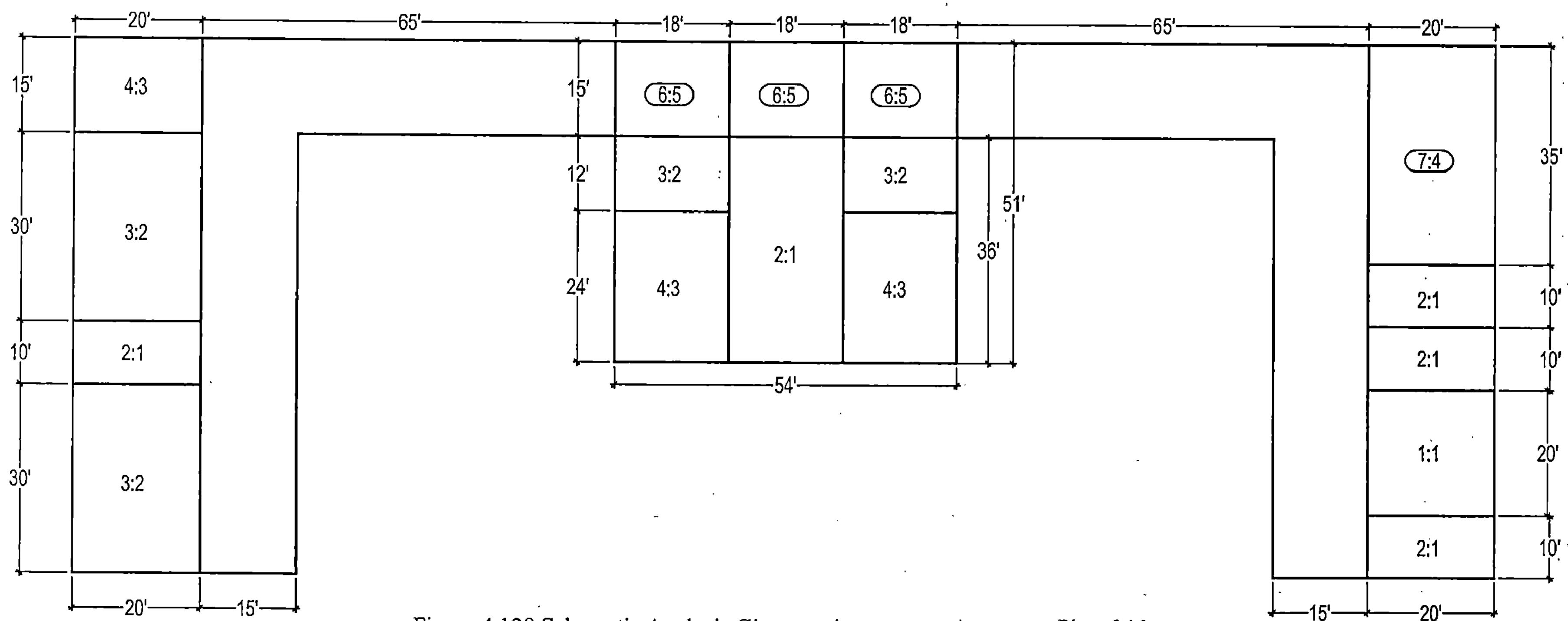


Figure 4.128 Schematic Analysis Giacomo Angarano at Angarano, Plate 046, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 26'

PLATE 46, VILLA GIACOMO ANGARANO AT ANGARANO

We can infer the following from schematic line diagram analysis:

- The main building whole is 54'x 51' which is 18:17 which is close to 1:1.
- The main building without auxiliary wing part of 15' depth at the back is 54':36' which is 3:2
- The 36' front is symmetrically divided in to 18':18':18' which is 1:1:1. 36' side is seen divided as 24':12' which is 2:1.
- Room width of auxiliary rooms and its corridor are related as 20':15' which is 4:3
- Main room sizes and ratios observed are 18'X12', 24'X18'and 36'X18' which could be interpreted as 3:2, 4:3 and 2:1.
- Main room sizes and ratios in auxiliary winds observed are 20'X10', 20'X20' and 30'X20' which could be interpreted as 2:1, 1:1 and 3:2.
- Non standard room ratios like 7:4 and 6:5 are identified.

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

  6:5 could be understood as square and one fifth.It is minor third as musical note. It could be interpreted as ratio formed from division of basic ratio 2:1 / 5:3 = 8:3 (a:b / c:d = bc:ad)

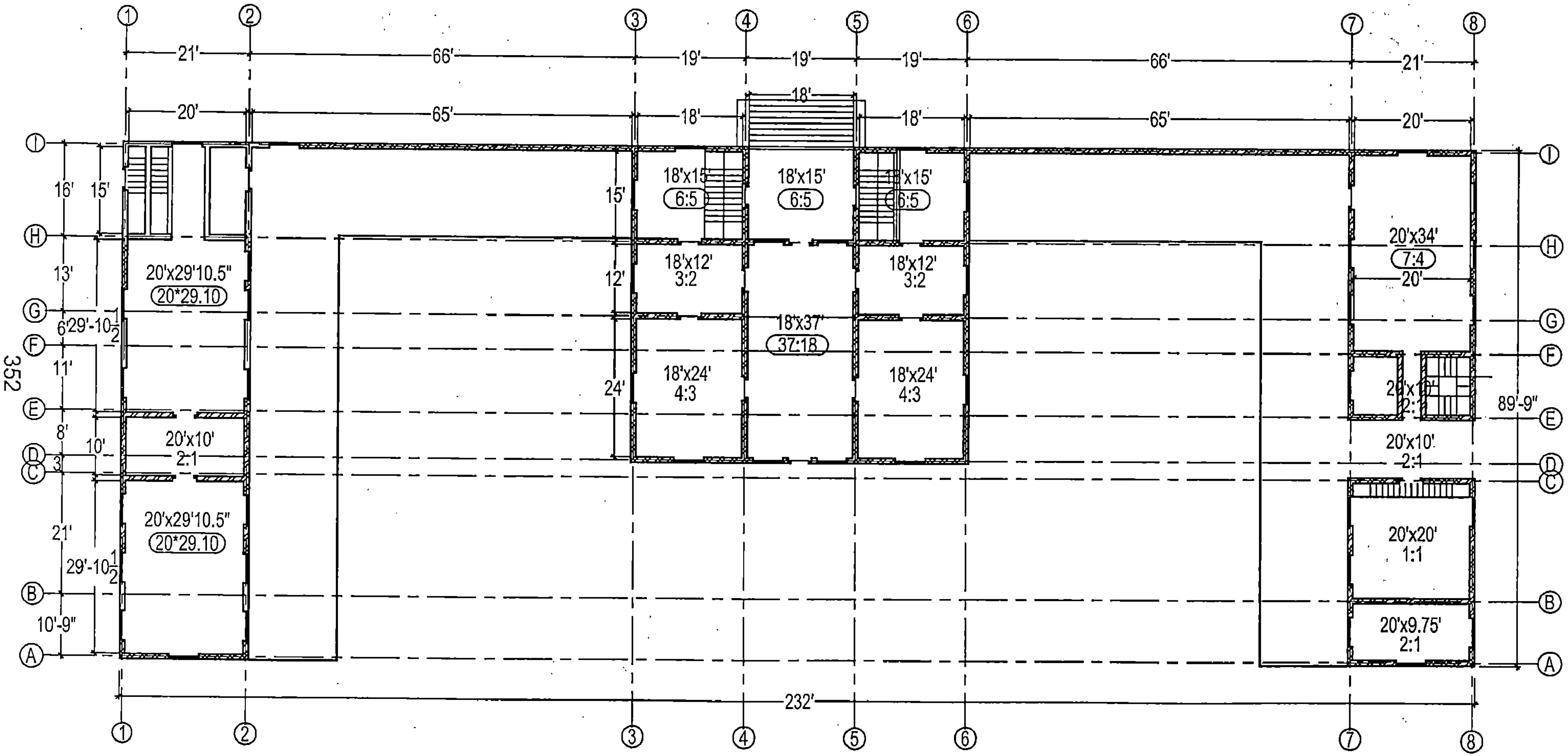
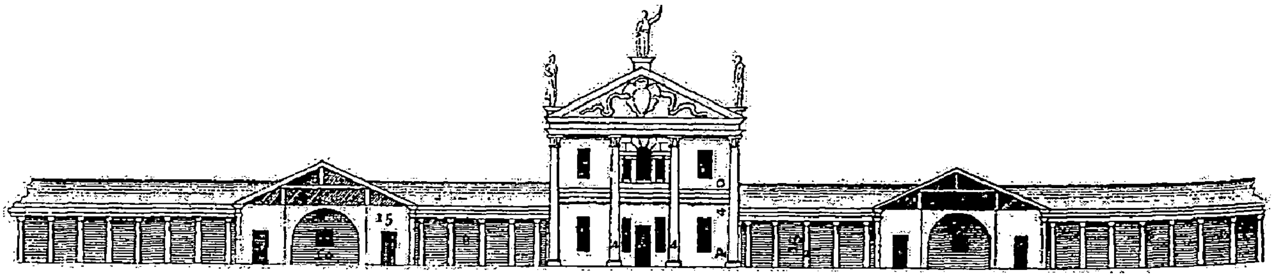
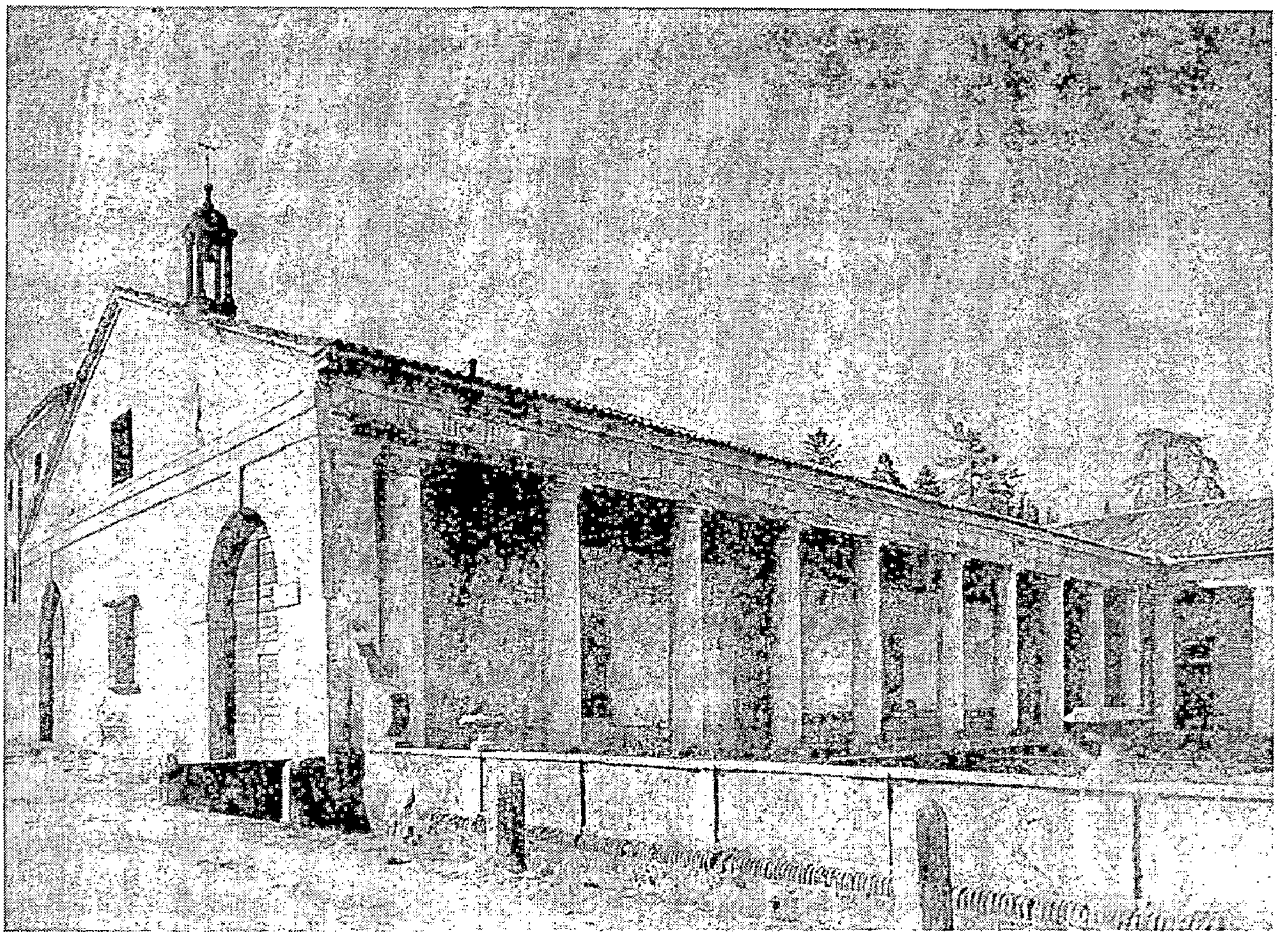


Figure 4.129 Plan of Giacomo Angarano at Angarano, developed on the basis of schematic analysis

Scale 1" = 26'



Source: Plate 46 Villa Giacomo Angarano at Angarano in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 53
Figure 4.130 Elevation & View of Villa Giacomo Angarano

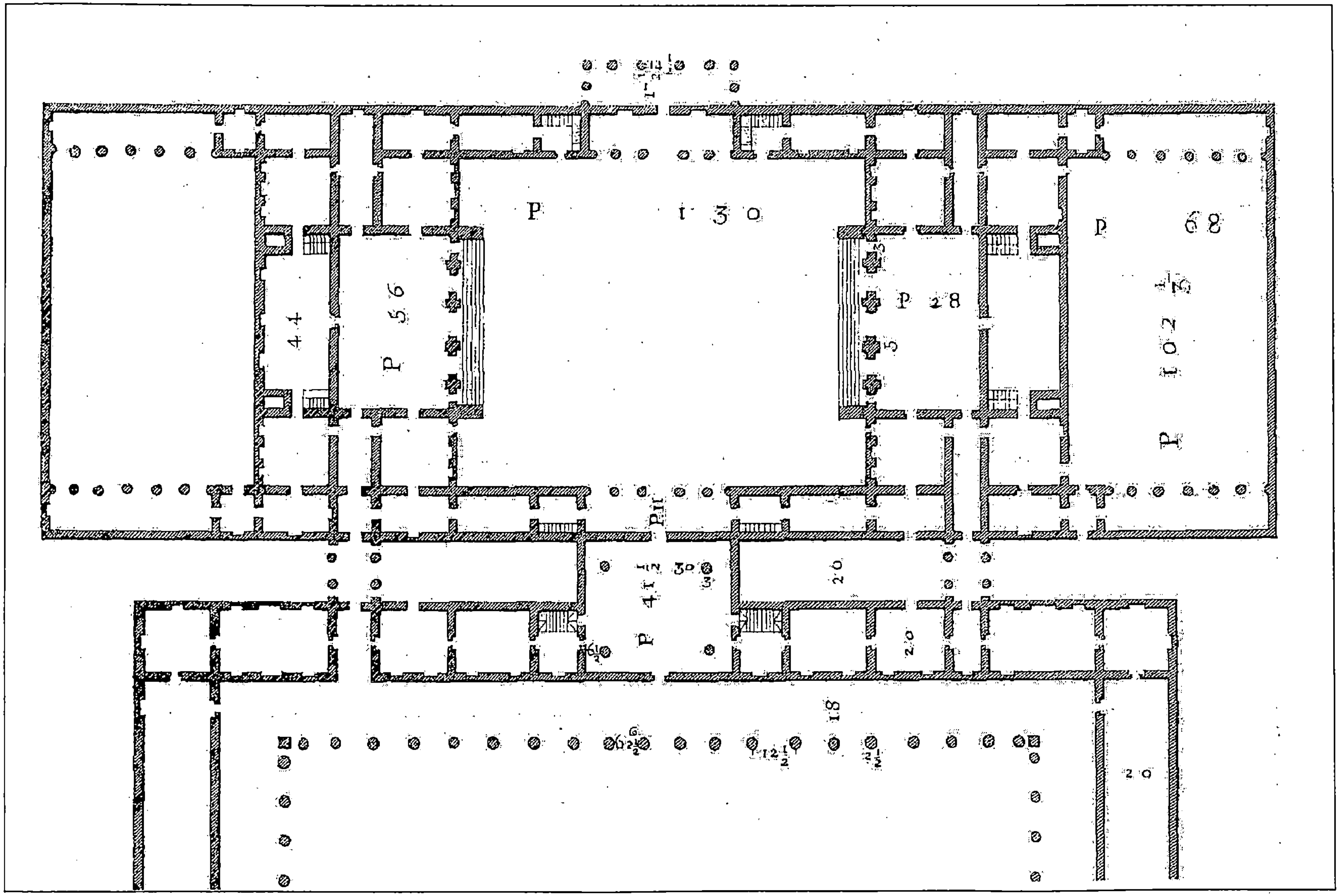


Figure 4.131 Plan Of Ottavio Thiene at quinto Scanned From Plate 047,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 48'

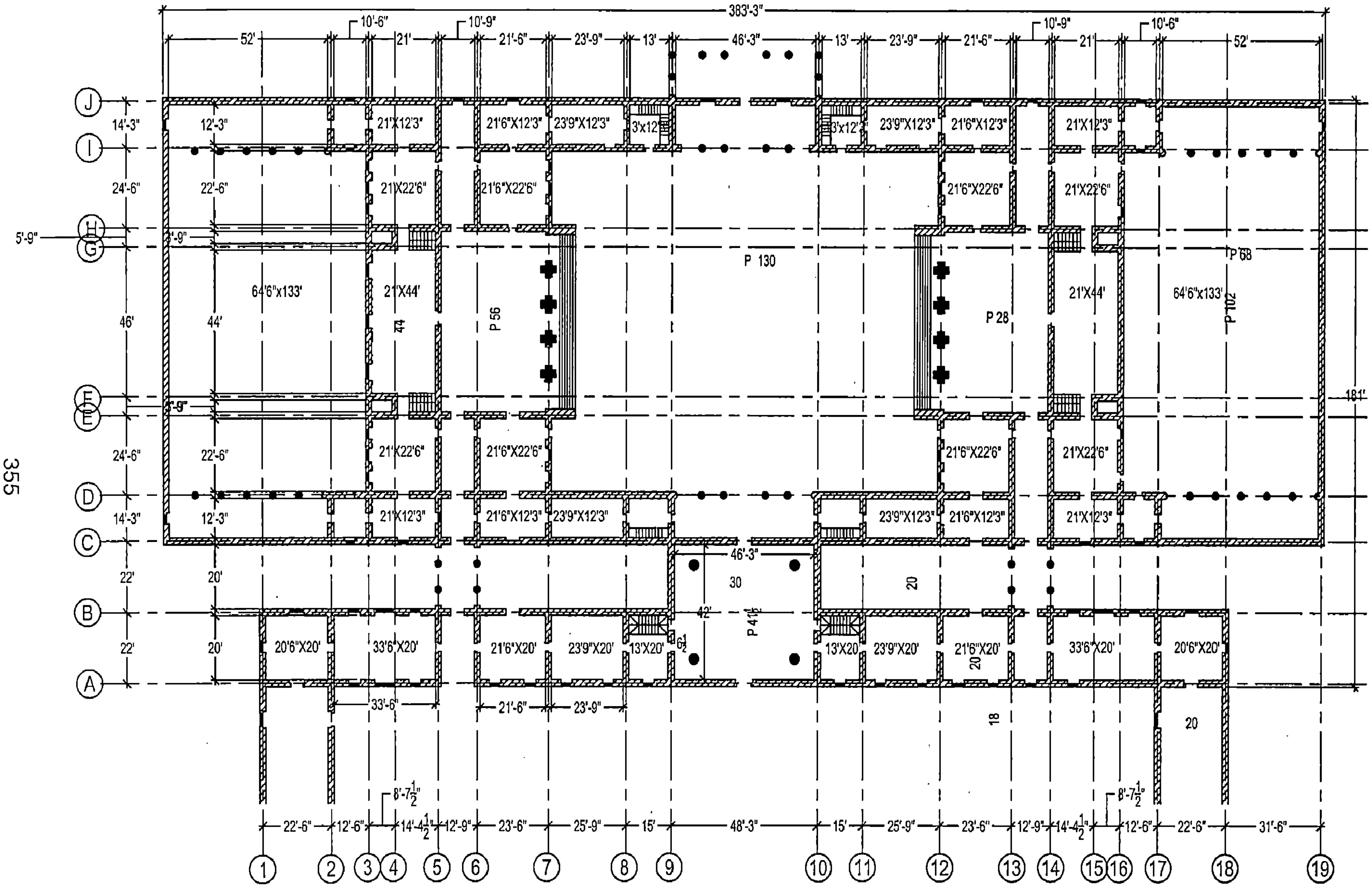


Figure 4.132 Plan Of Ottavio Thiene at quinto Redrawn From Plate 047, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 48'

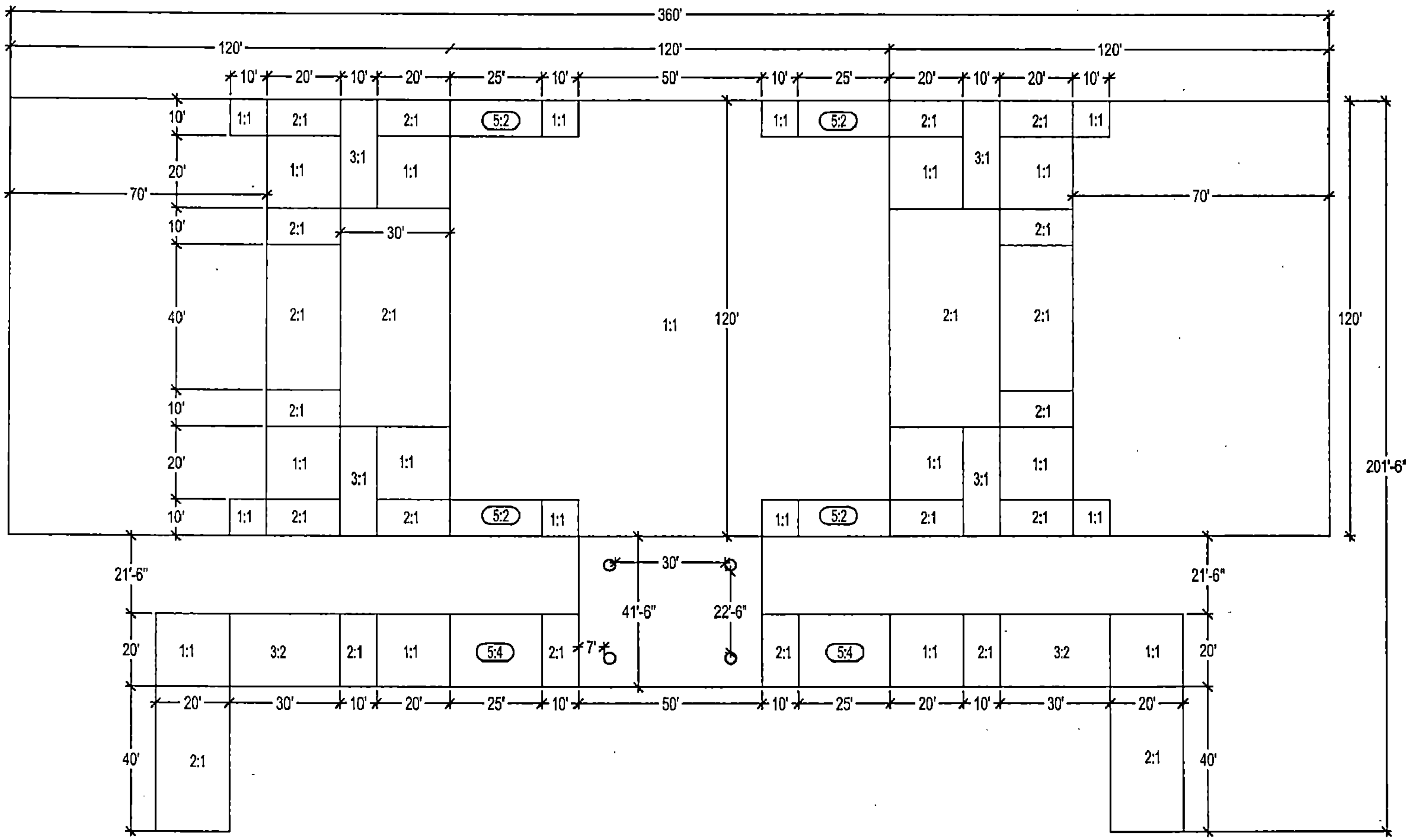


Figure 4.133 Schematic Analysis Ottavio Thiene at quinto, Plate 047,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 48'

PLATE 47, VILLA OTTAVIO (OTTAVIE) THIENE AT QUINTO

We can infer the following from schematic line diagram analysis:

- The main building whole including auxiliary wings is 360'x 120' which is 3:1.
- The 360' front could be seen symmetrically divided in three squares of 120'x120'. 120' side is seen divided as 10':20':10':40':10':20':10' which is 1:2:1:4:1:2:1.
- Main room sizes and ratios observed are 10'X10', 20'X10', 20'X20' and 40'x20' which could be interpreted as 1:1, 2:1, 1:1 and 2:1.
- Non standard room ratio like 5:4 and 5:2 are identified. 5:4 could be understood as square and a fourth. It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad). 5:2 could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).

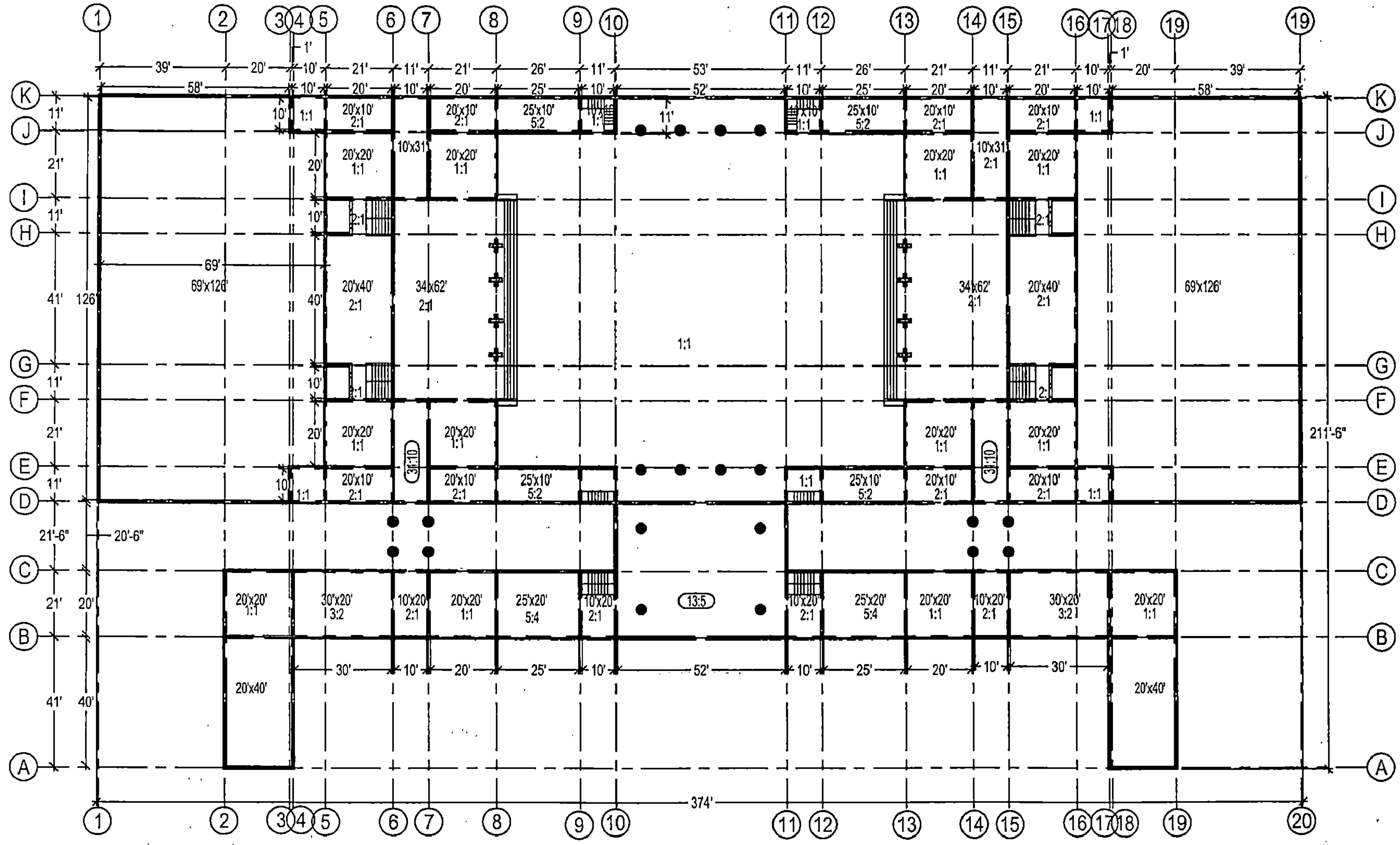
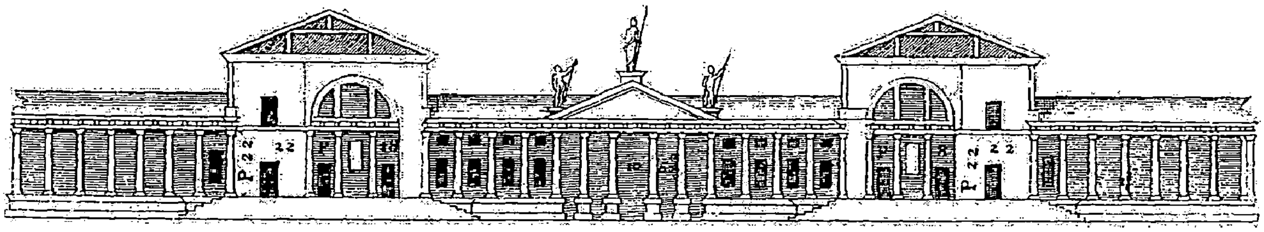
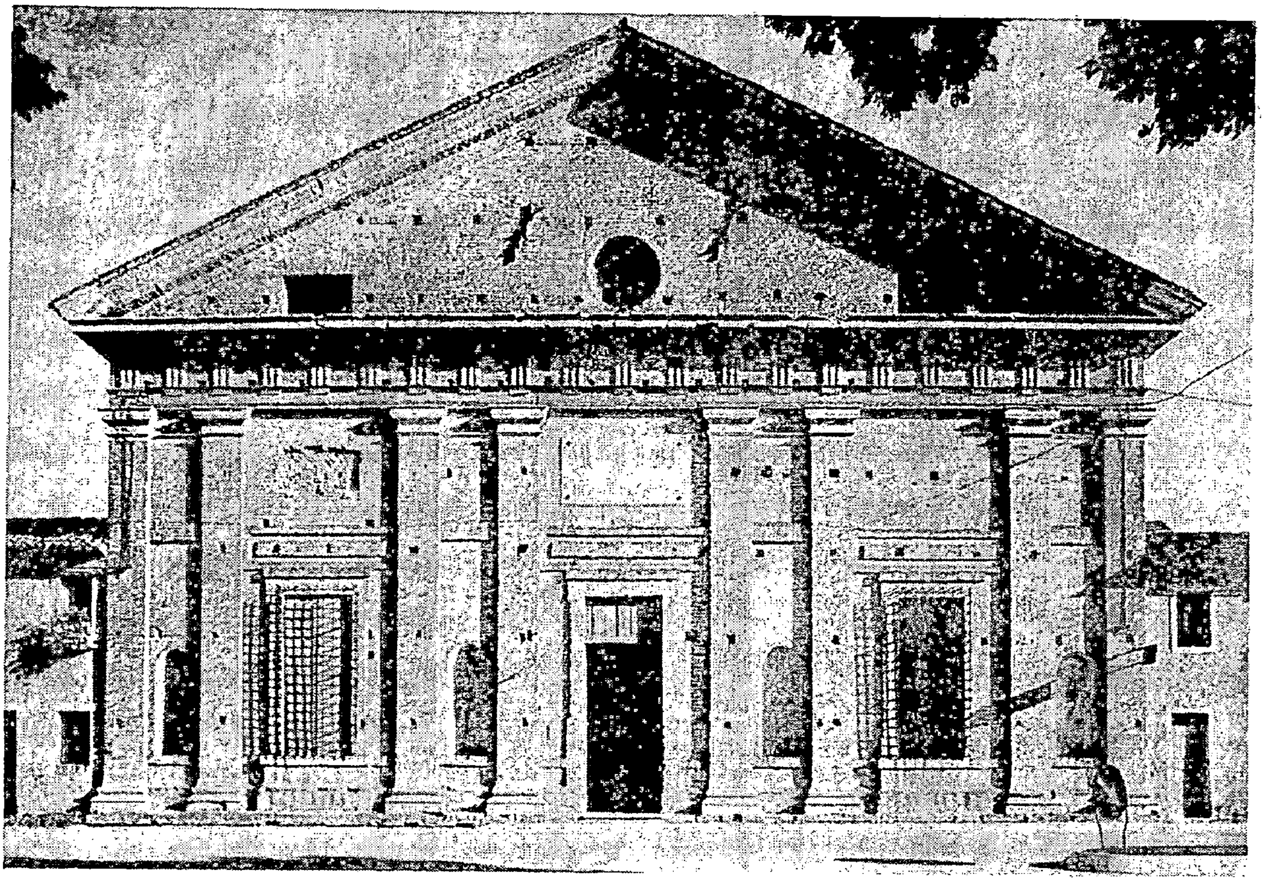


Figure 4.134 Plan of Ottavio Thiene at quinto, developed on the basis of schematic analysis

Scale 1" = 48'



Source: Plate 47 Villa Ottavio (Ottavie) Thiene at Quinto in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 43
Figure 4.135 Elevation & View of Villa Ottavio

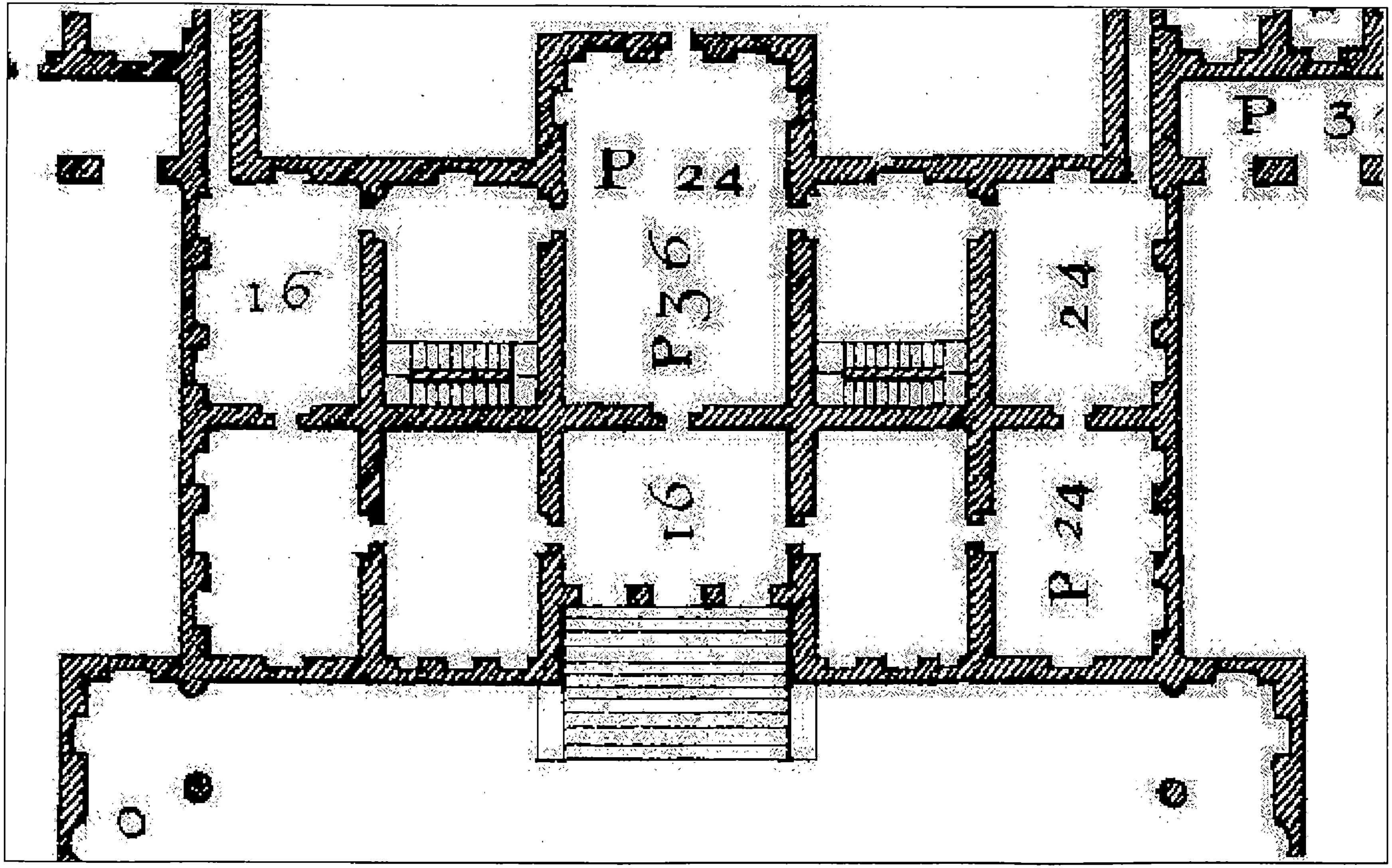


Figure 4.136 Plan of Girolmo Godi at Lonedo Scanned From Plate 048,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

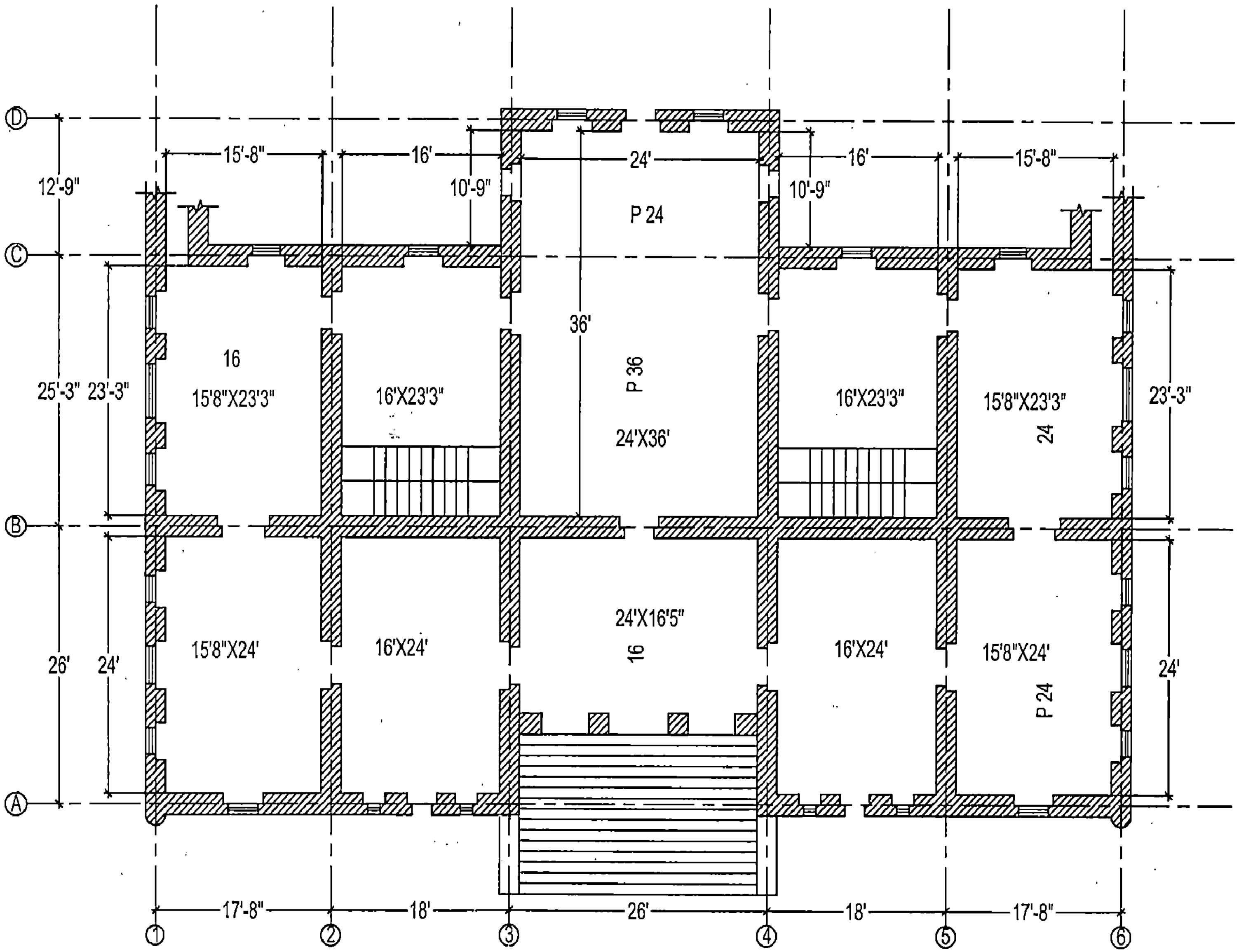


Figure 4.137 Plan of Girolmo Godi at Lonedo Redrawn From Plate 048, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

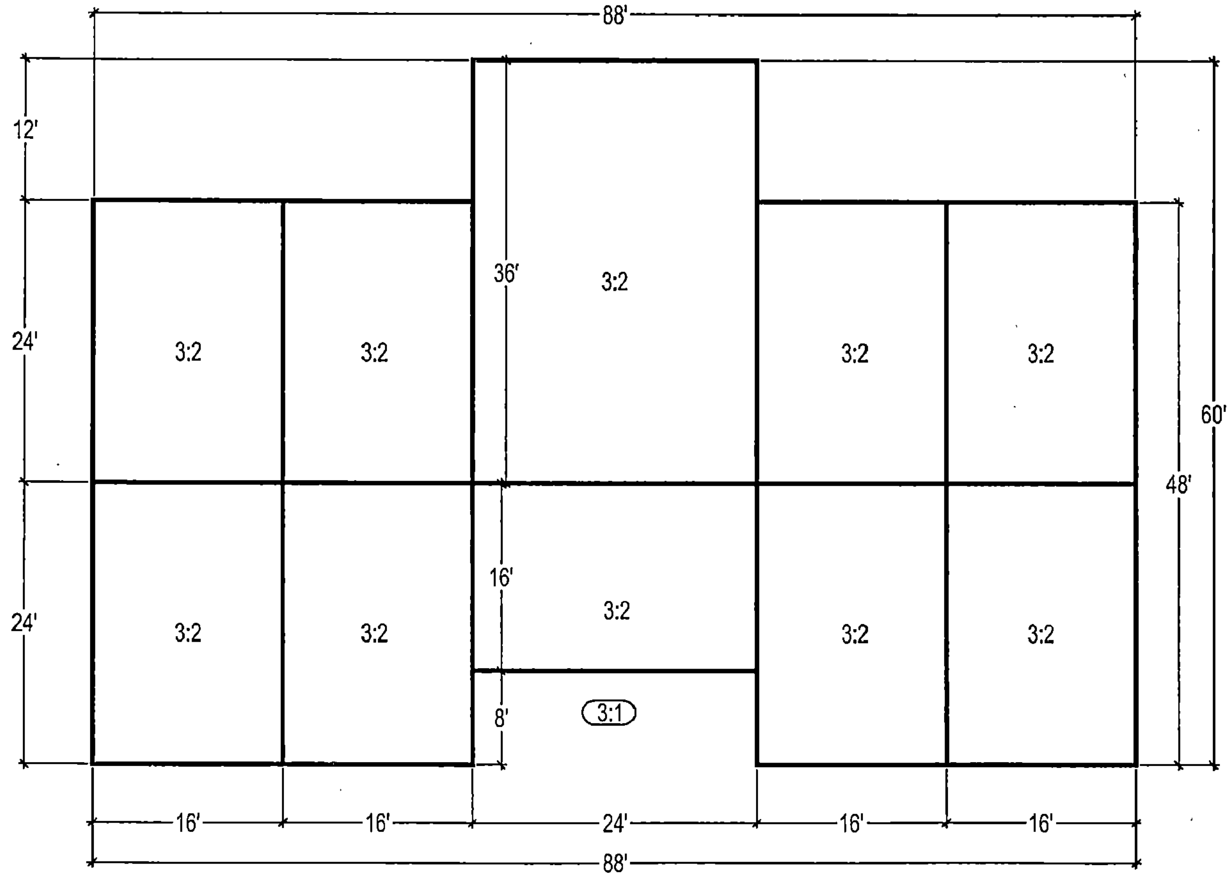


Figure 4.138 Schematic Analysis Girolmo Godi at Lonedo, Plate 048,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 48, VILLA GIROLAMA DE GODI AT LONEDO

We can infer the following from schematic line diagram analysis:

- The main building whole is 88'x 60' which is close to (88'x62'10") 7:5.
- The 88' front could be seen symmetrically divided in to 16':16':24':16':16' which is 4:4:6:4:4. 48' side is seen divided as 24':24' which is 1:1.
- Main room sizes and ratios observed are 24'X16' and 36'X24'which could be interpreted as 3:2 and 3:2 making it unique design of Palladio fully composed of rooms with ratio3:2
- No non standard room ratios are identified.

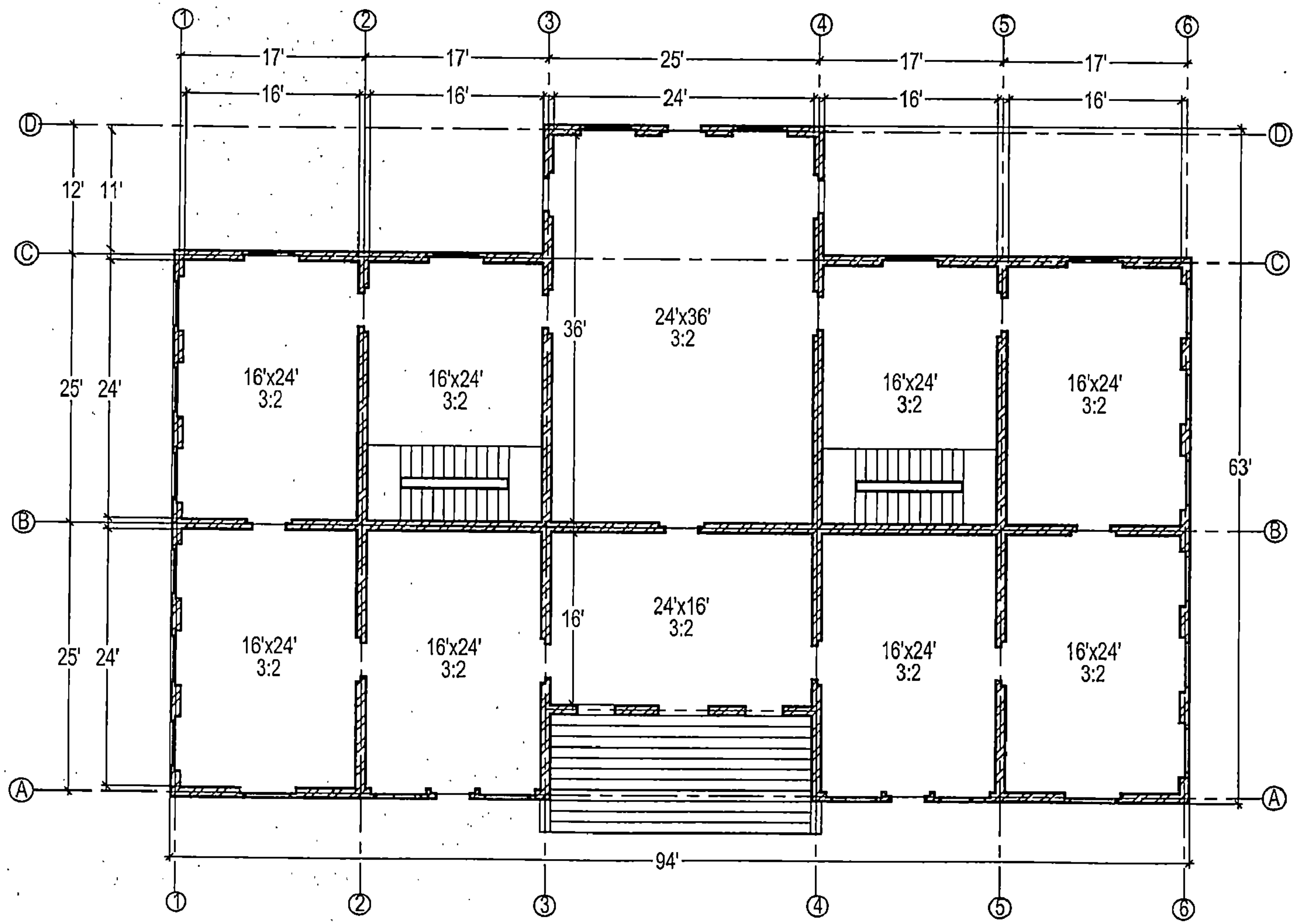
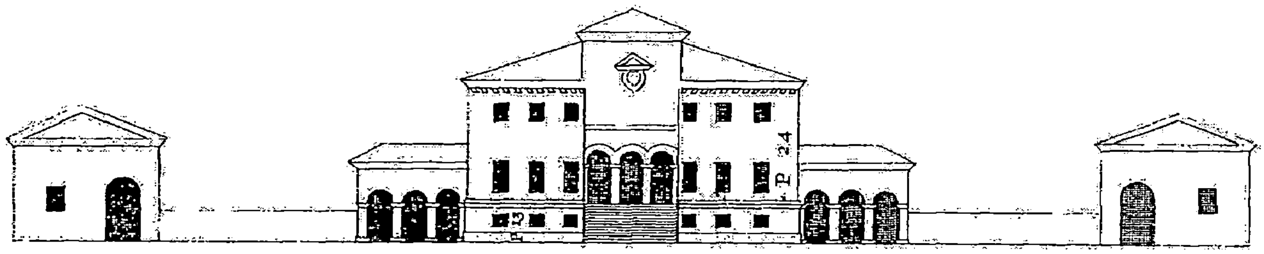
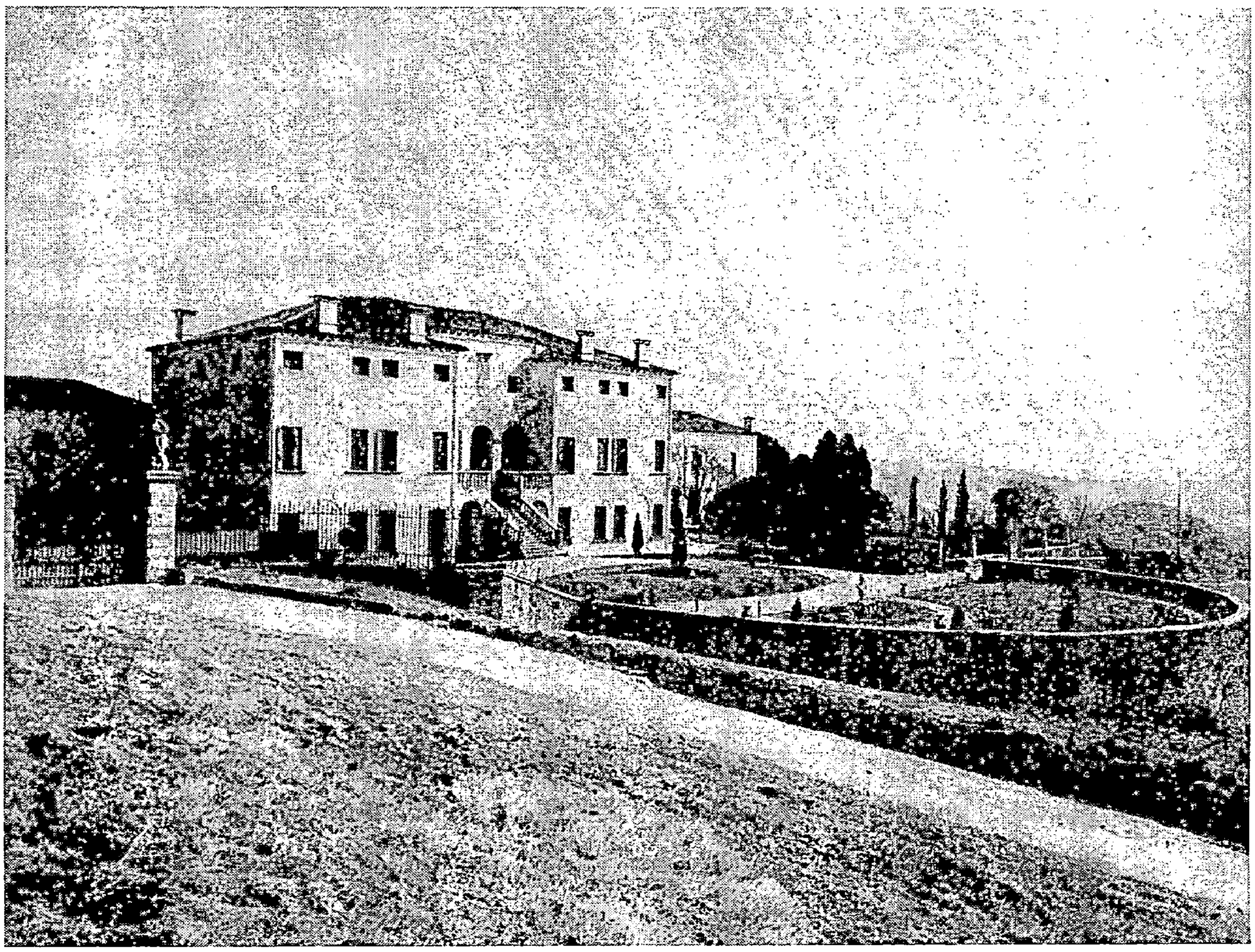


Figure 4.139 Plan of Girolmo Godi at Lonedo, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 48 Villa Girolama De Godi at Lonedo in elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 22
Figure 4.140 Elevation & View of Villa Girolama De Godi

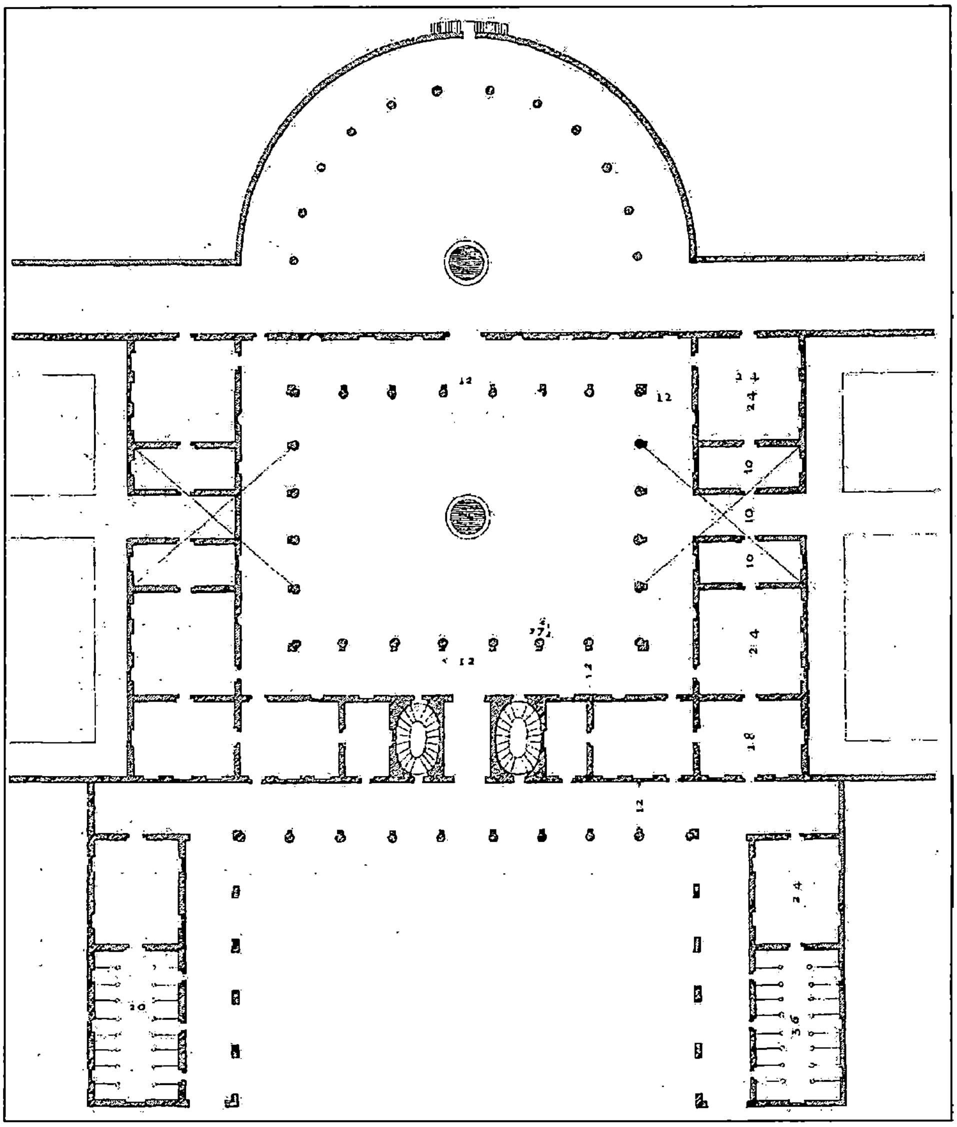


Figure 4.141 Plan of Marc Antonio Sarego at Santa Sofia Scanned From Plate 049,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 44'

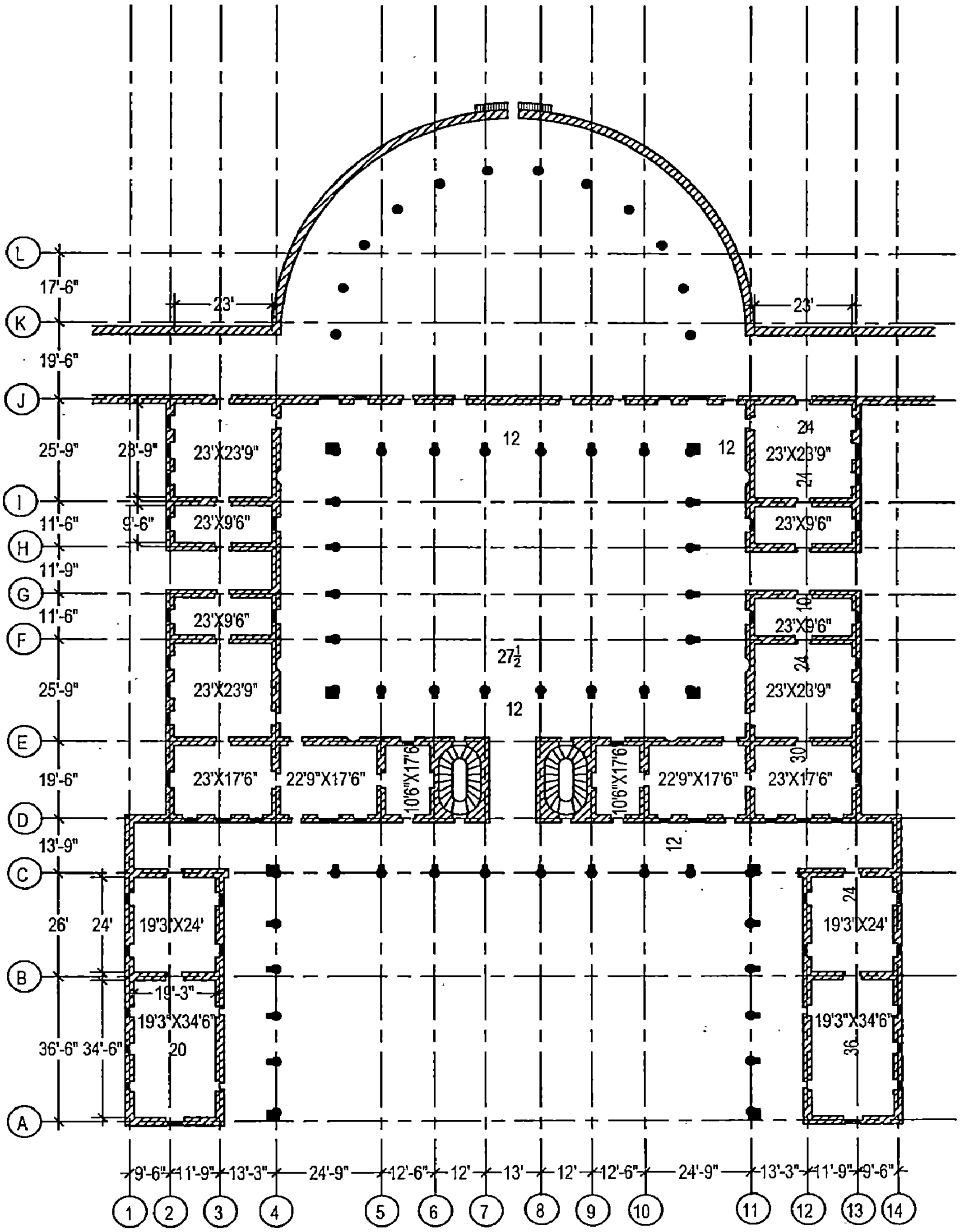


Figure 4.142 Plan of Marc Antonio Sarego at Santa Sofia Redrawn From Plate 049, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 44'

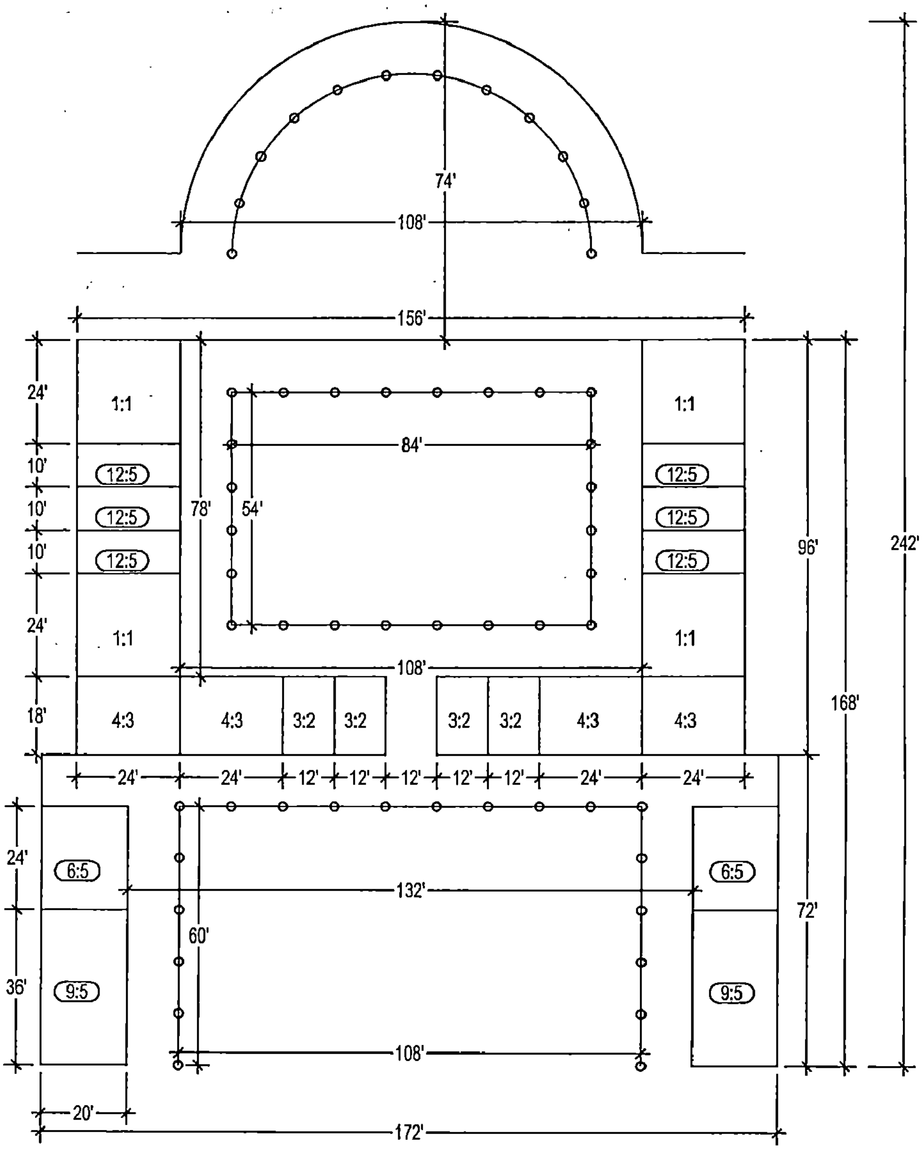


Figure 4.143 Schematic Analysis Marc Antonio Sarego at Santa Sofia, Plate 049,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 44'

PLATE 49, VILLA MARC' ANTONIO SAREGO AT SANTA SOFIA

We can infer the following from schematic line diagram analysis:

- The main building whole including auxiliary wings is 242'x 172' which is 7:5.
- The 156' front could be seen symmetrically divided in 24':24':12':12':12':12':12':24':24' which is 2:2:1:1:1:1:1:2:2.
- 96' deep rear wing is related to 72' deep front wing by 4:3.
- Main room width and its corridor are related as 24':12' which is 2:1
- Main room sizes and ratios observed are 18'X12', 24'X18'and 24'X24' which could be interpreted as 3:2, 4:3 and 1:1.
- Main room dimensions 12':18':24' are related by 2:3:6
- Non standard room ratios like 12:5, 9:5 and 6:5 are identified.

  12:5 It is close to rational convergent of square root five, 11:5

  9:5 could be understood as square and four fifths.

  6:5 could be understood as square and one fifth. It is minor third as musical note. It could be interpreted as ratio formed from division of basic ratio 2:1 / 5:3 = 6:5 (a:b / c:d = bc:ad)

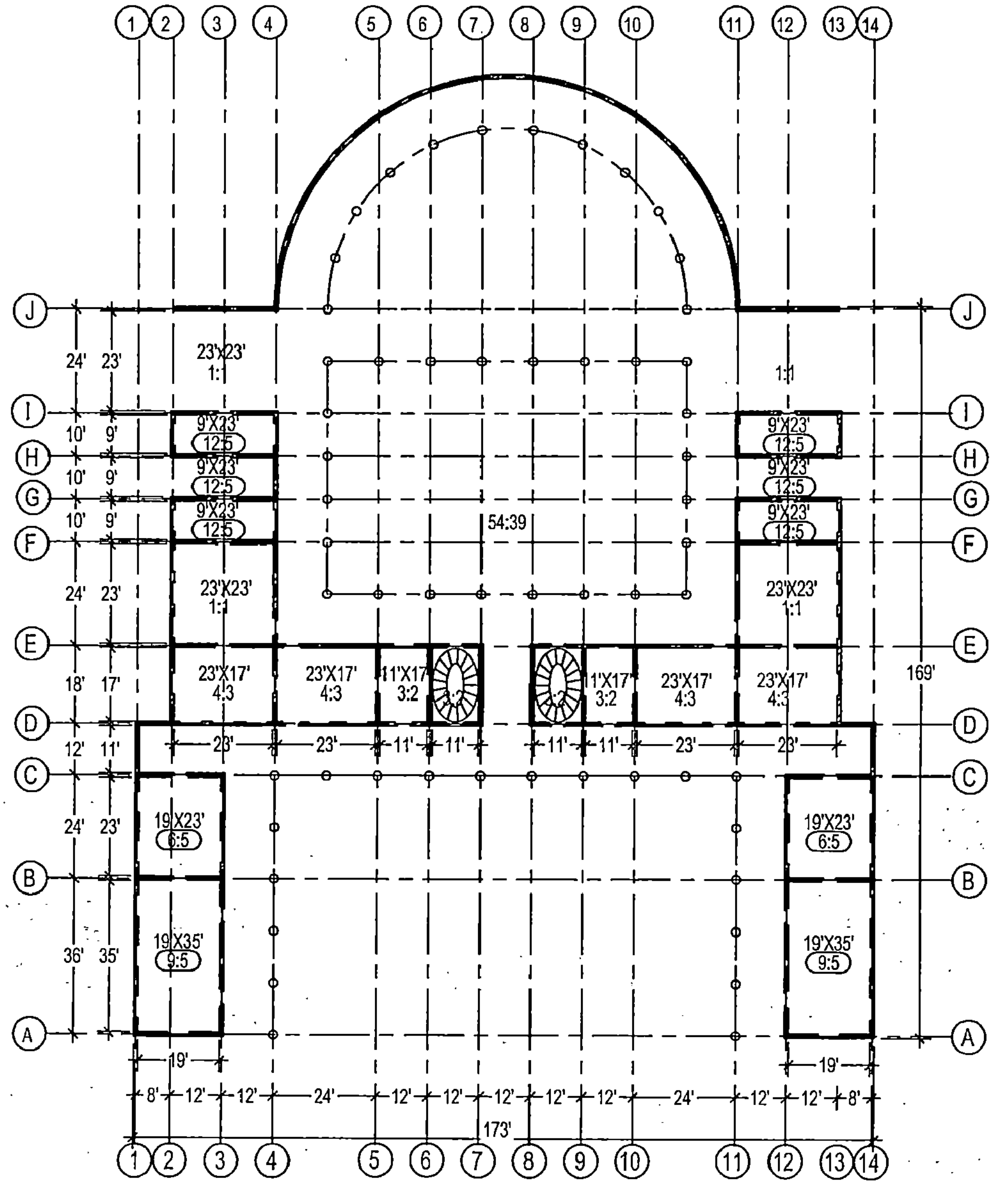
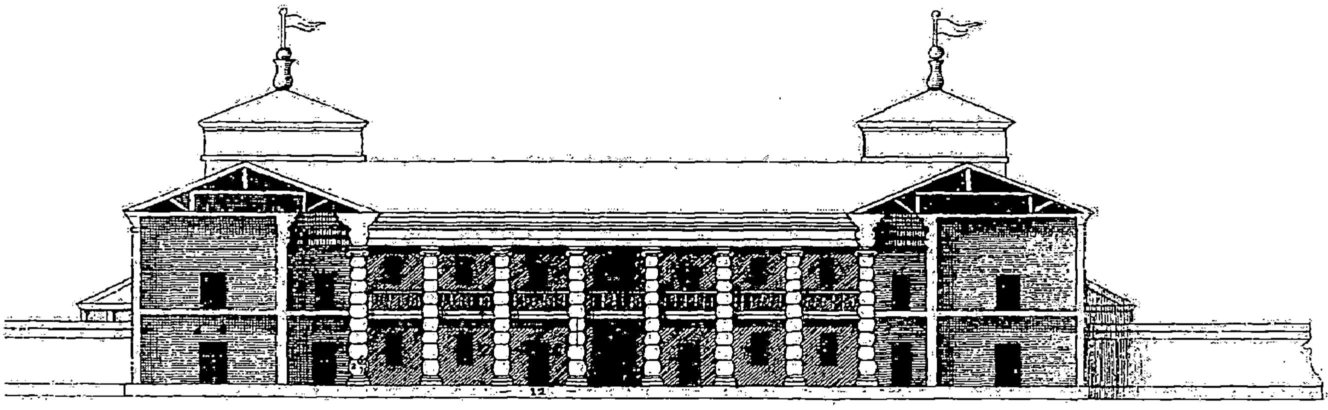
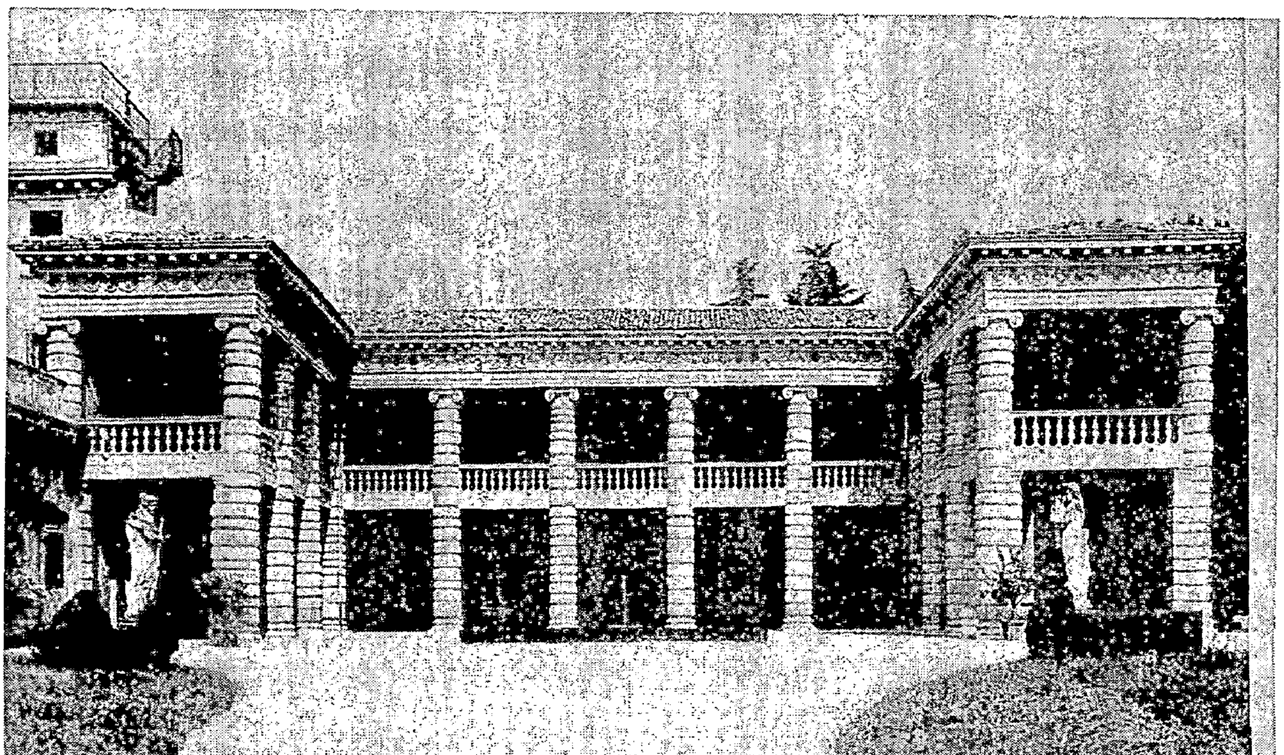


Figure 4.144 Plan of Marc Antonio Sarego at Santa Sofia, developed on the basis of schematic analysis

Scale 1" = 44'



Source: Plate 49 Villa Marc' Antonio Sarego at Santa Sofia in sectional elevation



Source: Constant Caroline, 'The Palladio Guide', pg. 70
Figure 4.145 Elevation & View of Villa Marc' Antonio Sarego

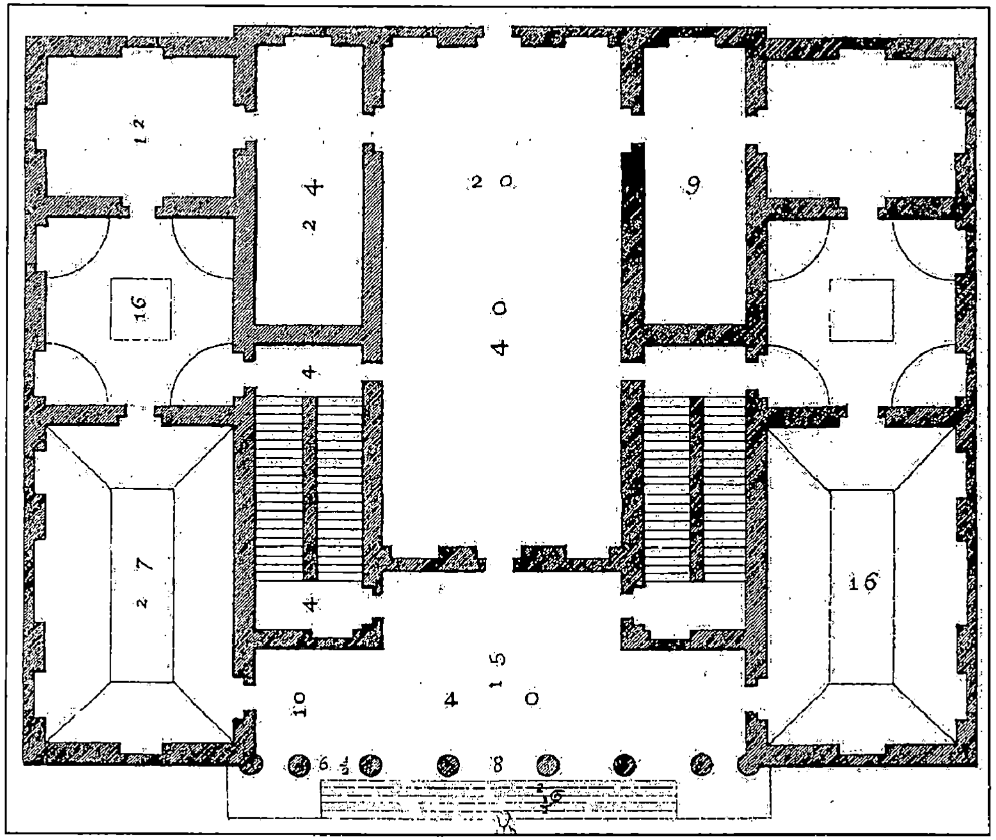


Figure 4.146 Plan Of Annibale Sarego at La Miga Scanned From Plate 050, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

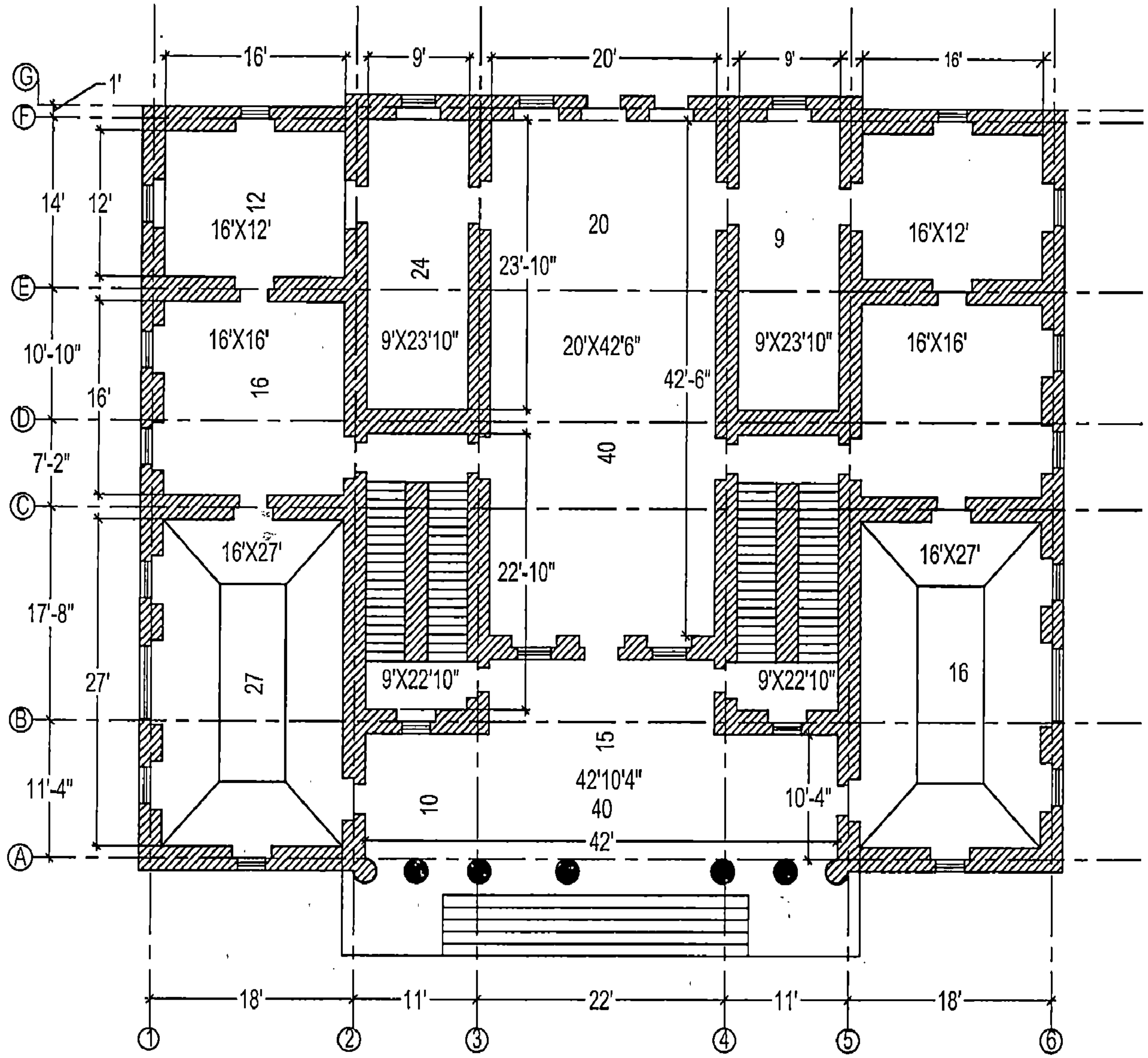


Figure 4.147 Plan Of Annibale Sarego at La Miga Redrawn From Plate 050, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

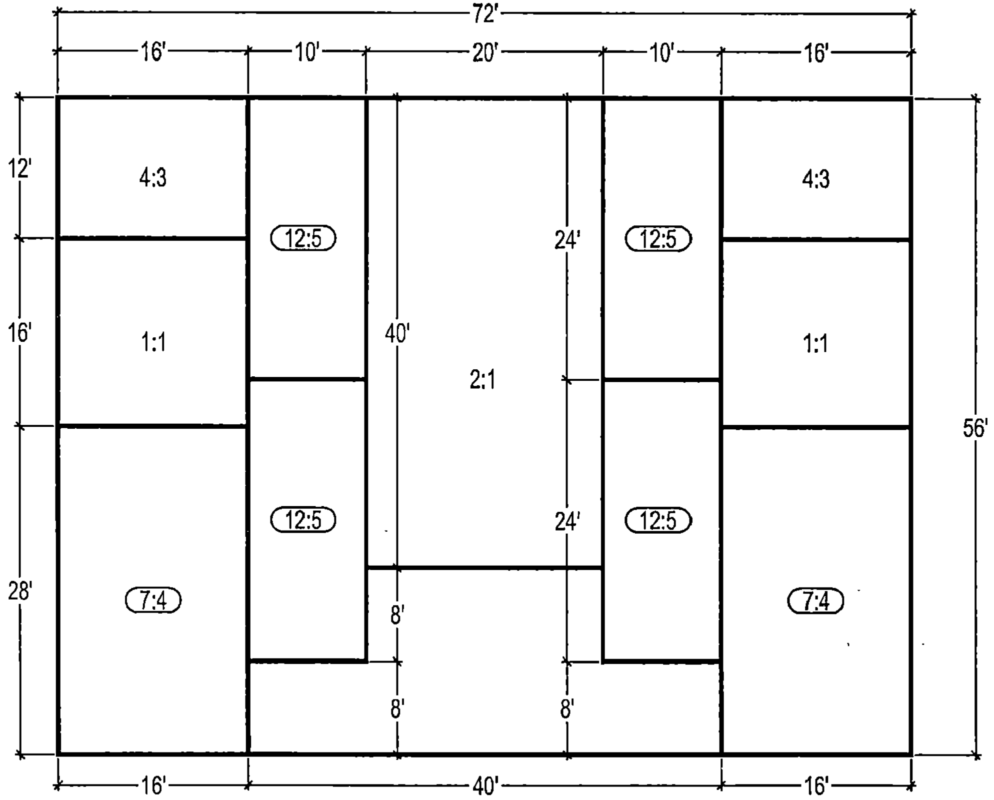


Figure 4.148 Schematic Analysis Annibale Sarego at La Miga, Plate 050,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 50, VILLA ANIBALE SAREGO AT LA MIEGA

We can infer the following from schematic line diagram analysis:

- The main building whole is 72' x 56' which is 9:7.
- The 72' front is symmetrically divided in to 16':40':16' which is 2:5:2. 56' side is seen divided as 12':16':28' which is 3:4:7.
- Main room sizes and ratios observed are 16'X12', 16'X16' and 40'X20' which could be interpreted as 4:3, 1:1 and 2:1.
- Non standard room ratios like 12:5 and 7:4 are identified.

  12:5 It is close to rational convergent of square root five, 11:5

  7:4 could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.

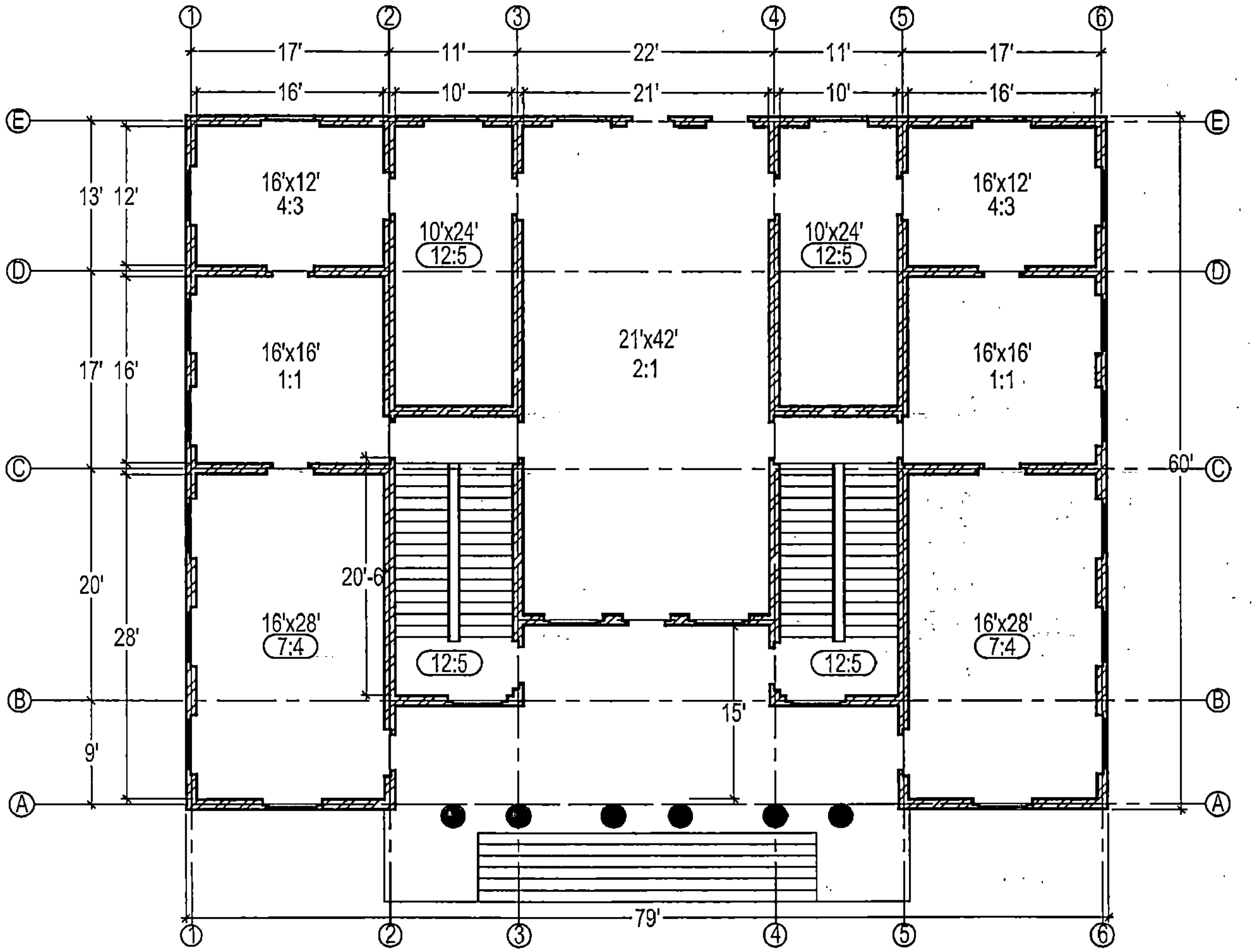
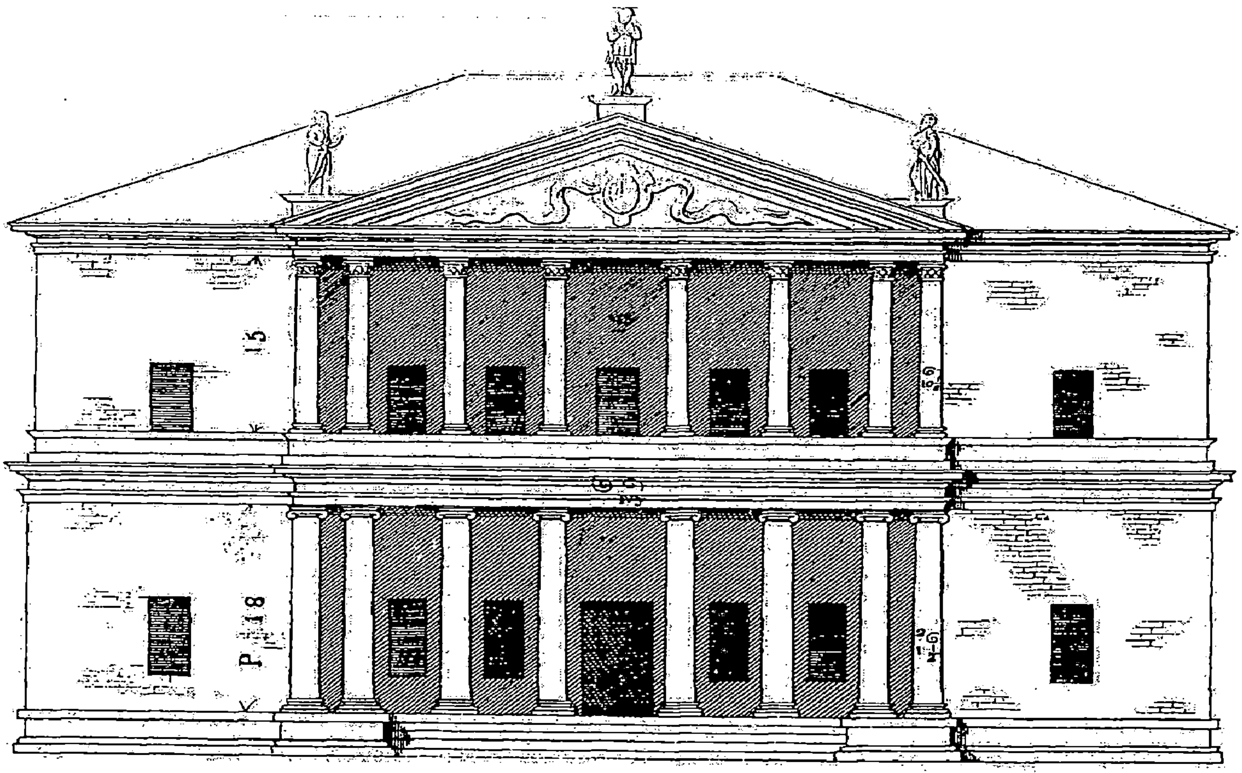


Figure 4.149 Plan of Annibale Sarego at La Miga, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 50 Villa Anibale Sarego at La Miega in elevation

Figure 4.150 Elevation Villa Anibale Sarego at La Miega

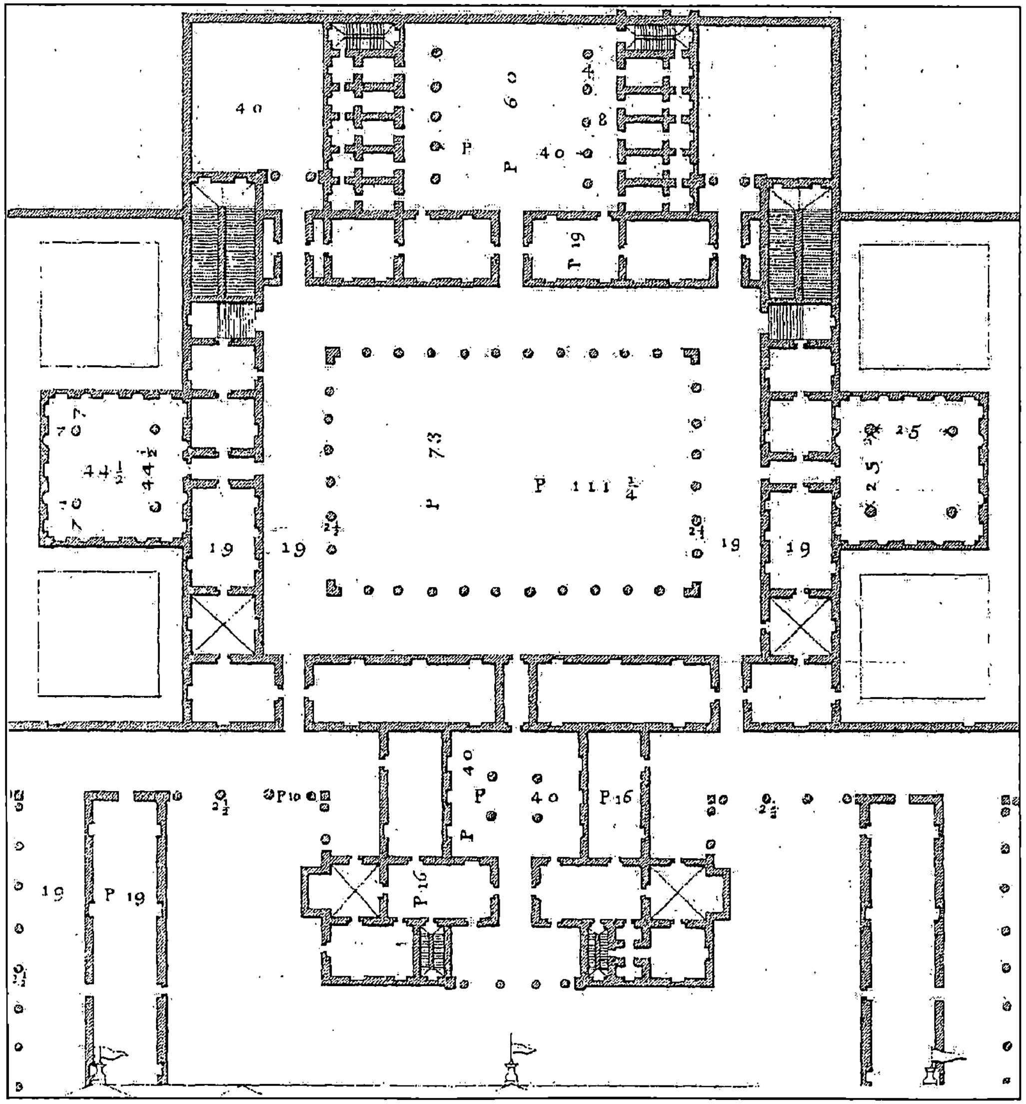


Figure 4.151 Plan Of Villa of the Ancients Scanned From Plate 051, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 60'

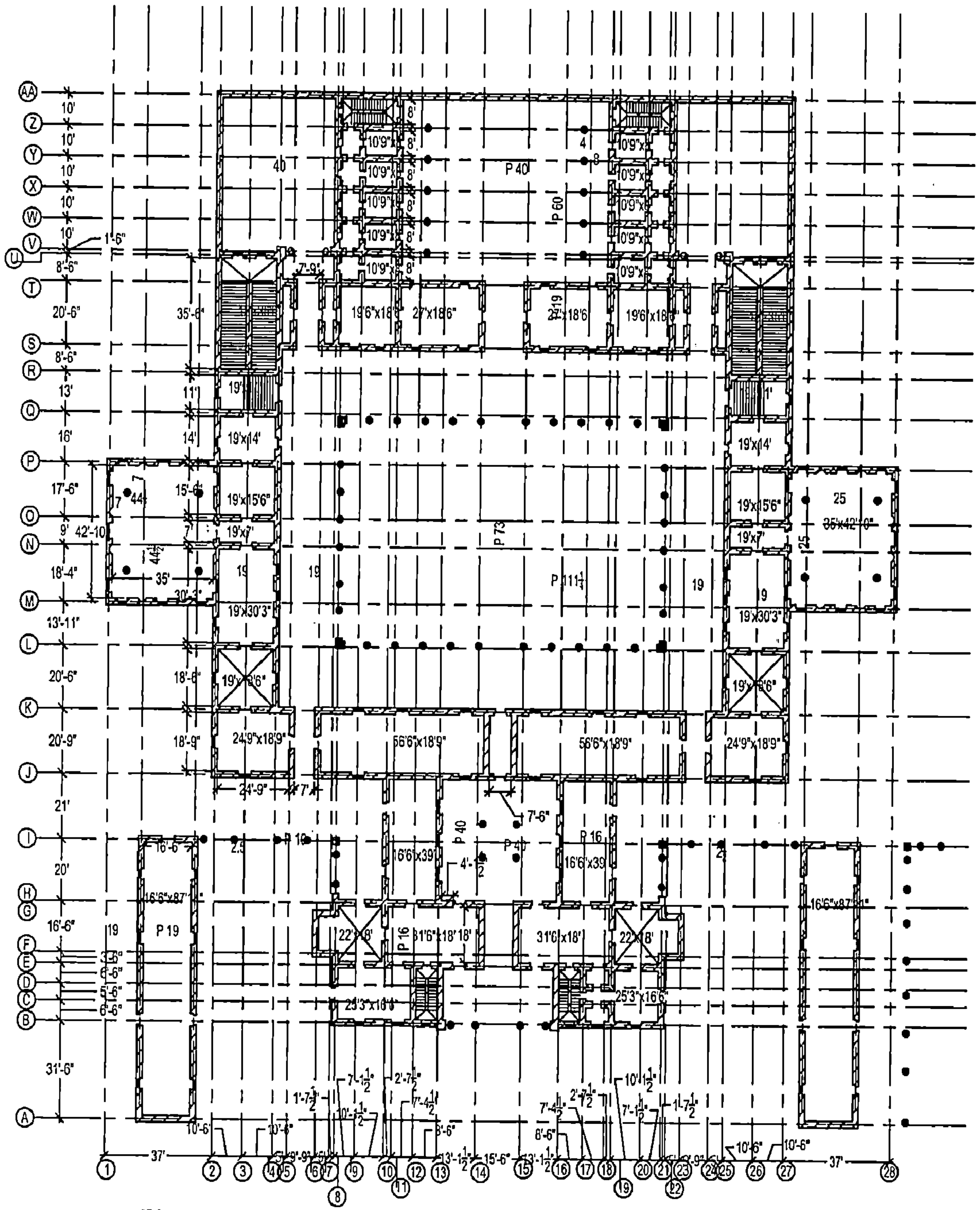


Figure 4.152 Plan Of Villa of the Ancients Redrawn From Plate 051, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 60'

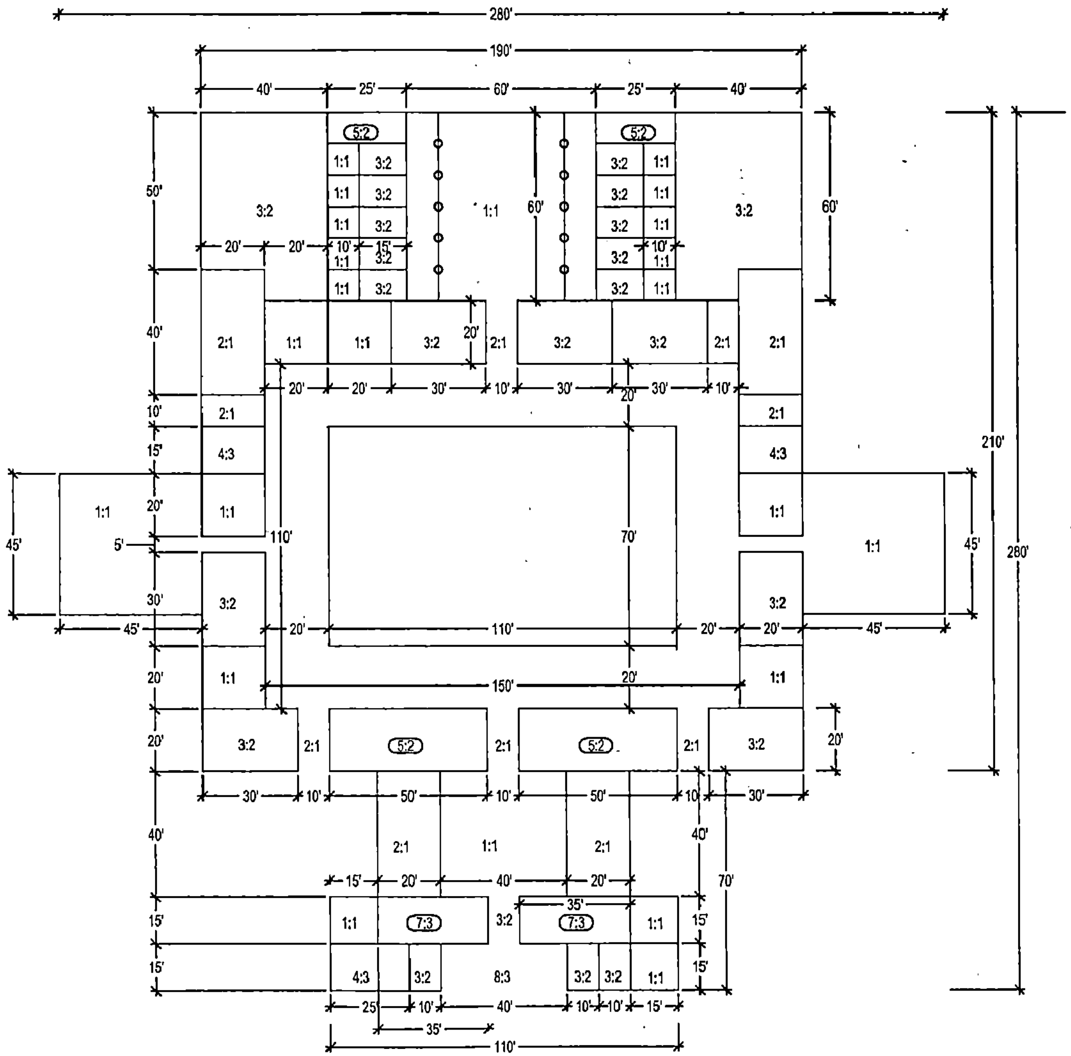


Figure 4.153 Schematic Analysis Villa of the Ancients, Plate 051,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 60'

PLATE 51, VILLA OF THE ANCIENTS

We can infer the following from schematic line diagram analysis:

- The main building whole is 280’ x 280’ which is 1:1.
- The main building whole without side wing rooms is 280’x 190’ which is close to (280’x200’) 7:5.
- The main central court yard with peripheral corridor is 150’x110’ which is close to (150’x112’6”) 4:3
- The central court yard is 110’x70’ which is close to (110’x 73’3”) 3:2
- The four column atrium in front with is side rooms is 80’x 40’ which is 2:1.
- The font entrance wing leading to four column atrium is of two parts of 50’ x 30’ which is 5:3
- Entrance wing with four column atrium is 110’ x 70’ which is same as central court yard
- The 190’ front is symmetrically divided in to 30’:10’:50’:10’:50’:10’:30’ which is 3:1:5:1:5:1:3
- Main room sizes and ratios observed are 20’X10’, 20’X15’, 20’x20’, 30’x 20’, 40’x 40’, 60’x 40’and 45’X45’ which could be interpreted as 2:1, 4:3, 1:1, 3:2, 1:1, 3:2 and 1:1.
- Non standard room ratios like 7:3 and 5:2 are identified.
  7:3 could be related to rational convergent of root 5.
  5:2 could be related to rational convergent of root 6.

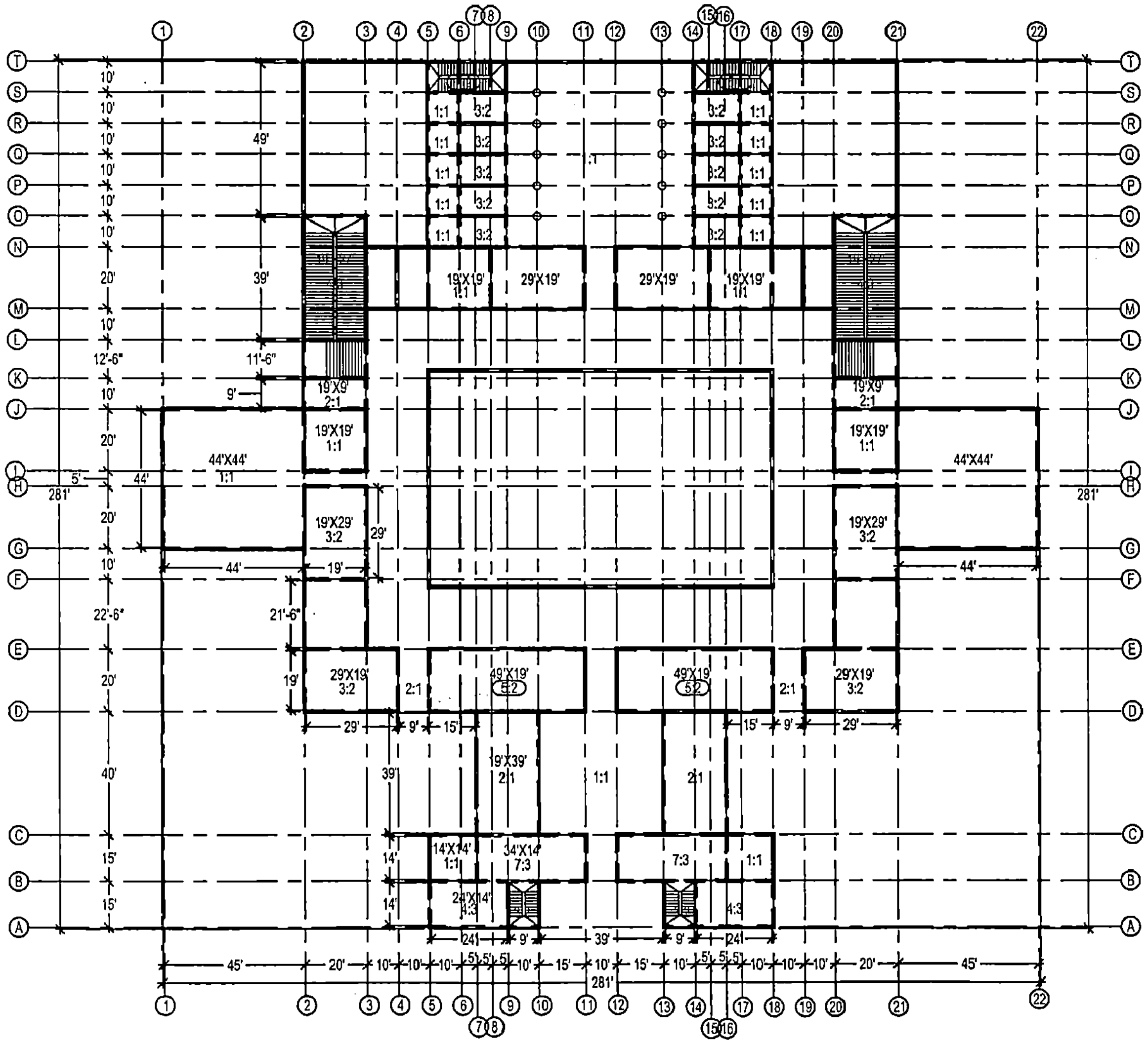
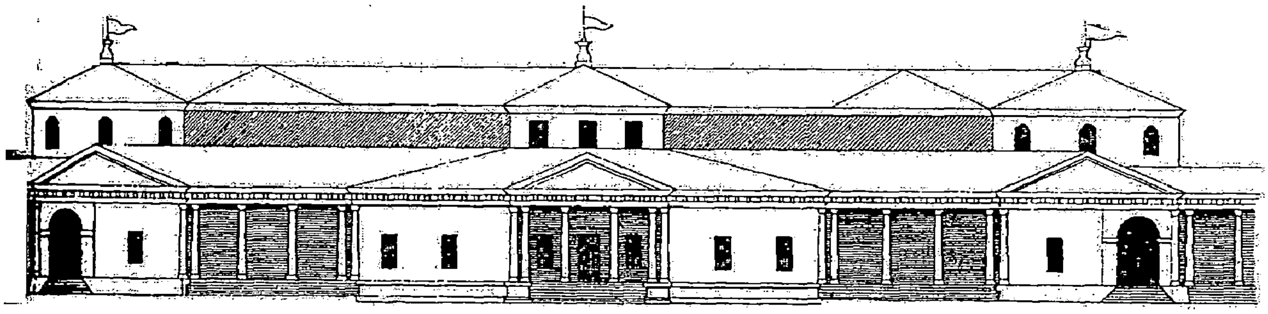


Figure 4.154 Plan of Villa of the Ancients, developed on the basis of schematic analysis

Scale 1" = 60'



Source: Plate 51 Villa of the Ancients in elevation

Figure 4.155 Elevation of Villa of the Ancients

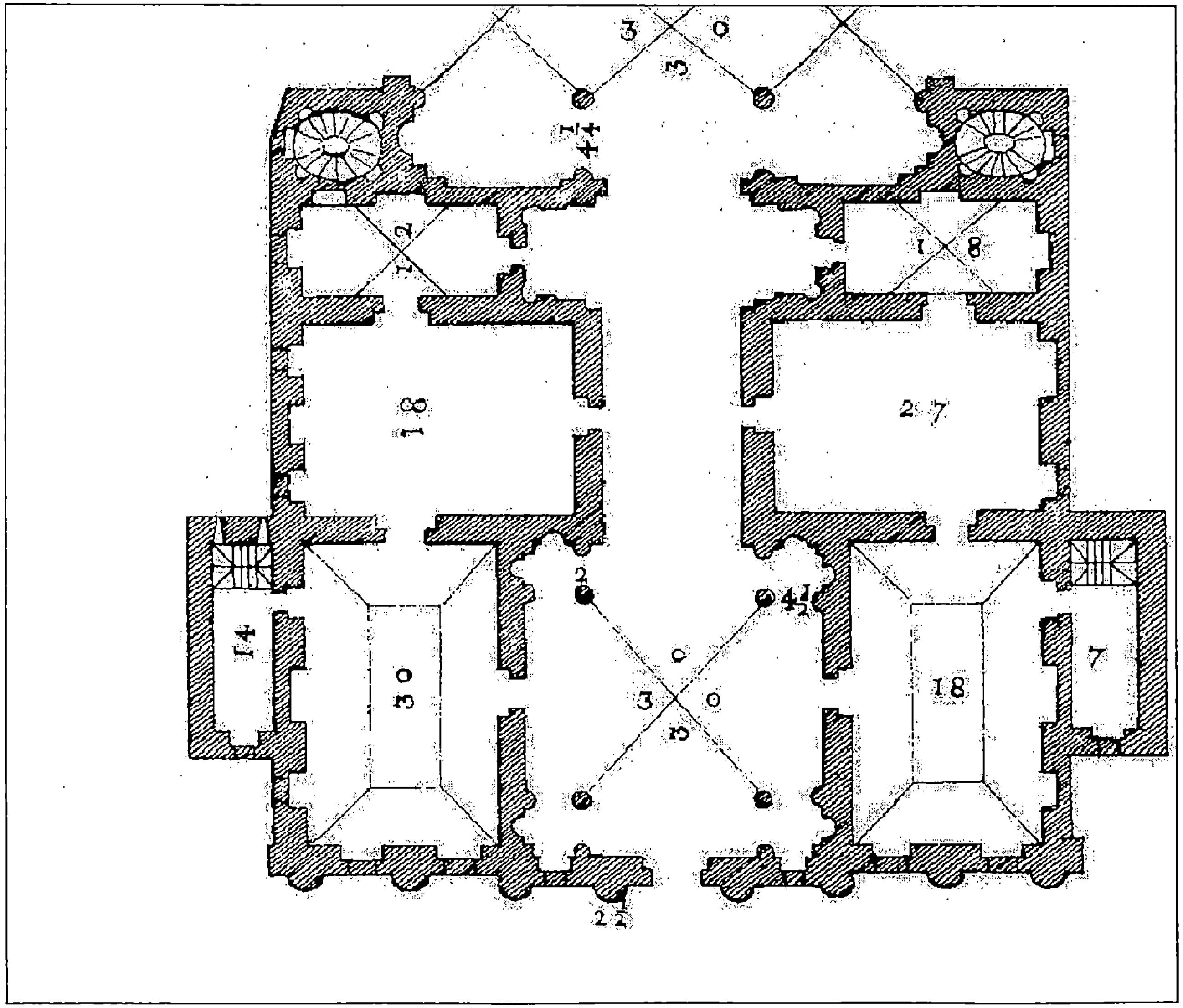


Figure 4.156 Plan Of First Invention According to the Diverse site Scanned From Plate 052, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

Scale 1" = 16'

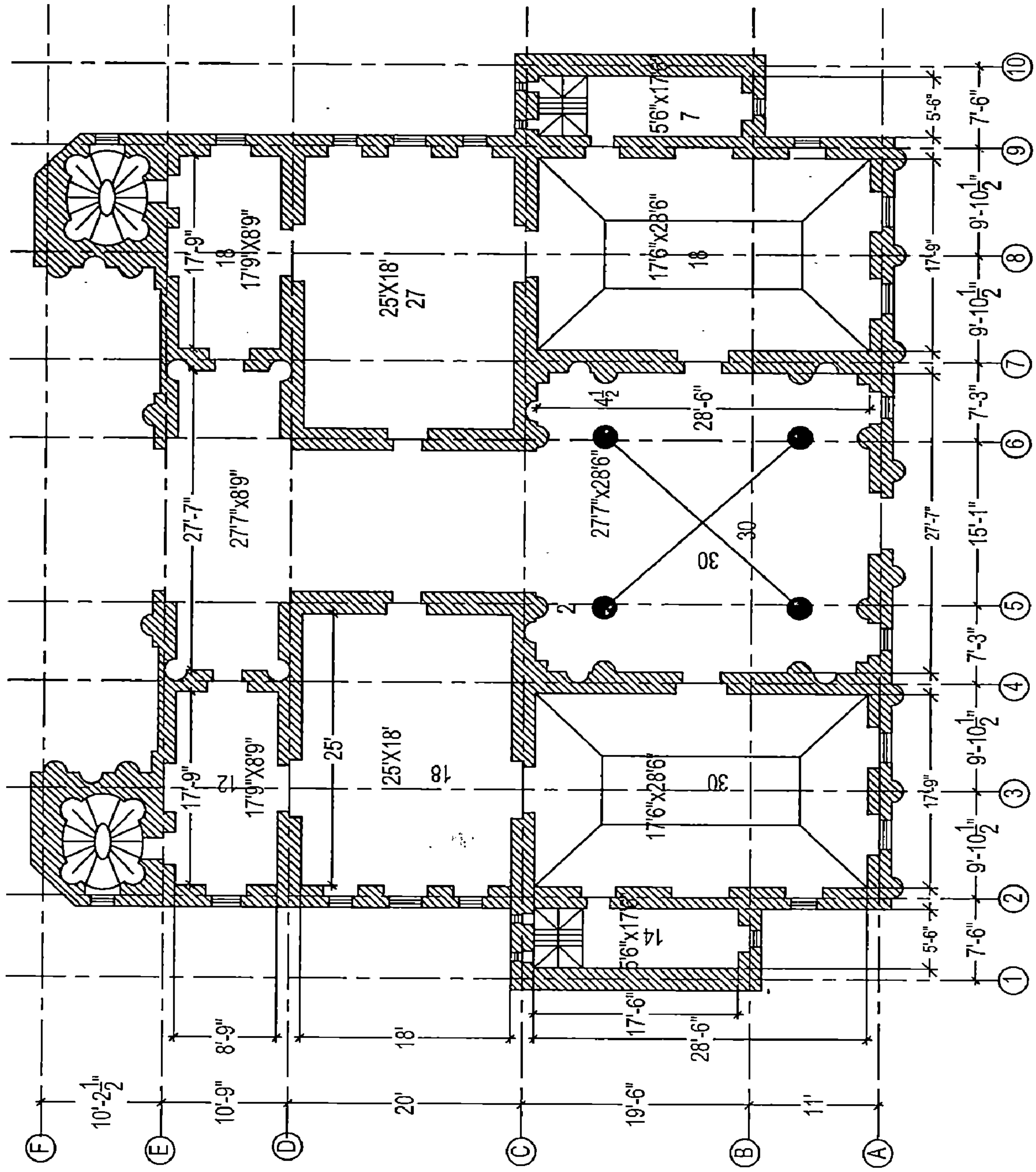


Figure 4.157 Plan Of First Invention According to the Diverse site Redrawn From Plate 052, 'I Quattro Libri Dell' Architecttura', Book-2

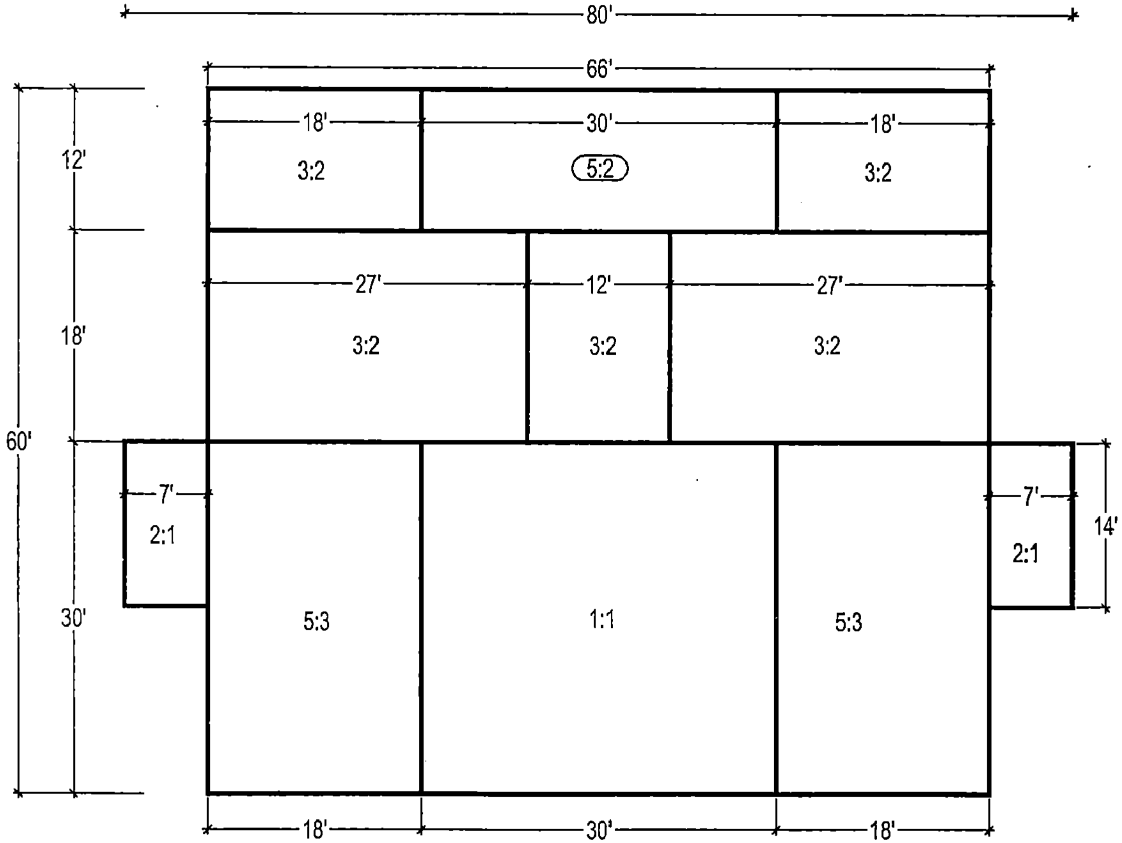


Figure 4.158 Schematic Analysis First Invention According to the Diverse site, Plate 052, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 52, A PROJECT FOR A PALAZZO ON A TRIANGULAR SITE

We can infer the following from schematic line diagram analysis:

- The main building whole up to the rear court yard is 80' x 60' which is 4:3.
- The 66' front is symmetrically divided in to 18':30':18' which is 3:5:3.
- Main room sizes and ratios observed are 14'X7', 18'X12', 27'X18', 30' X18'and 30'X30' which could be interpreted as 2:1, 3:2, 3:2, 5:3 and 1:1.
- Non standard room ratio like 5:2 is identified

  5:2 could be related to rational convergent of root 6.

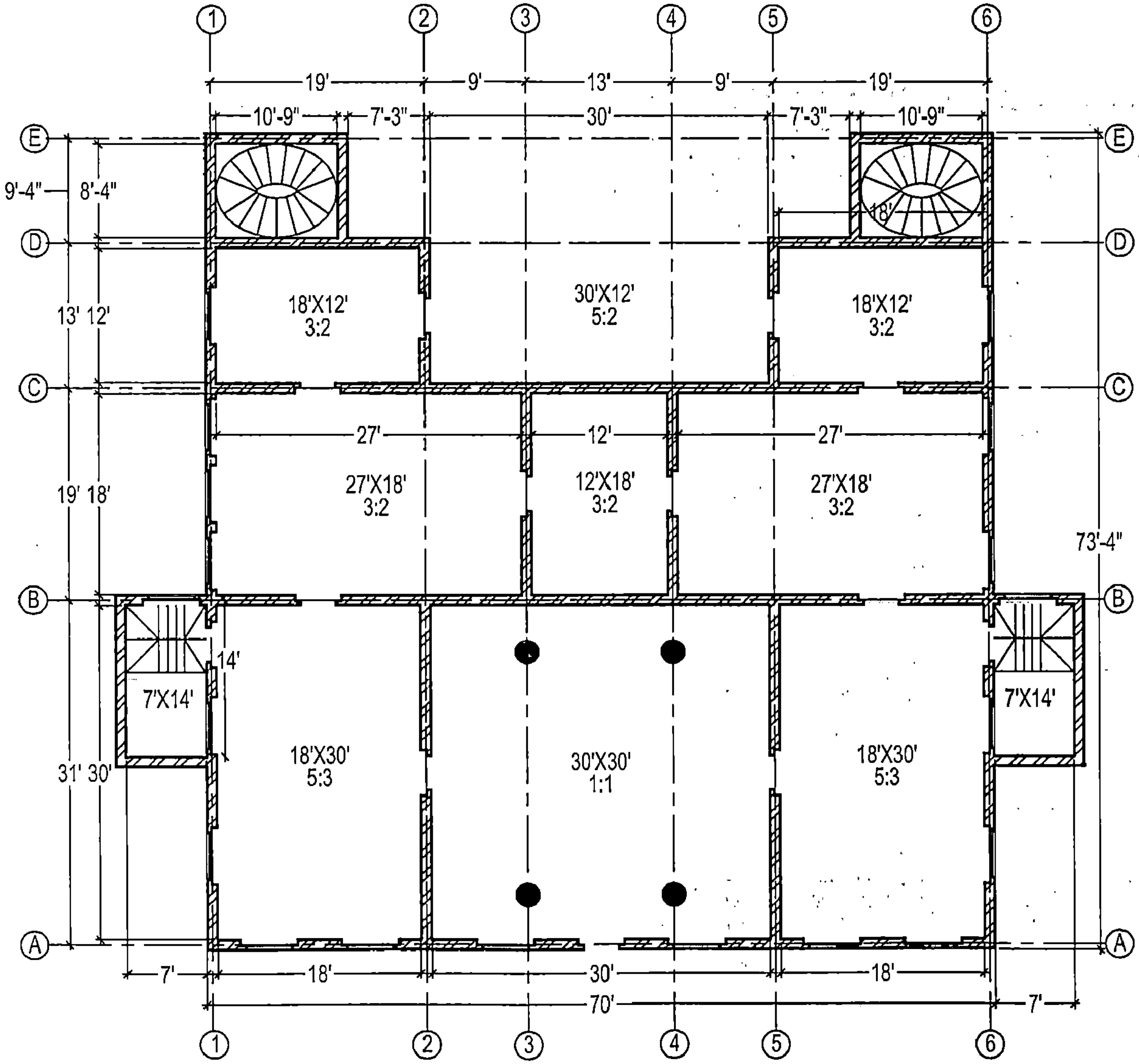
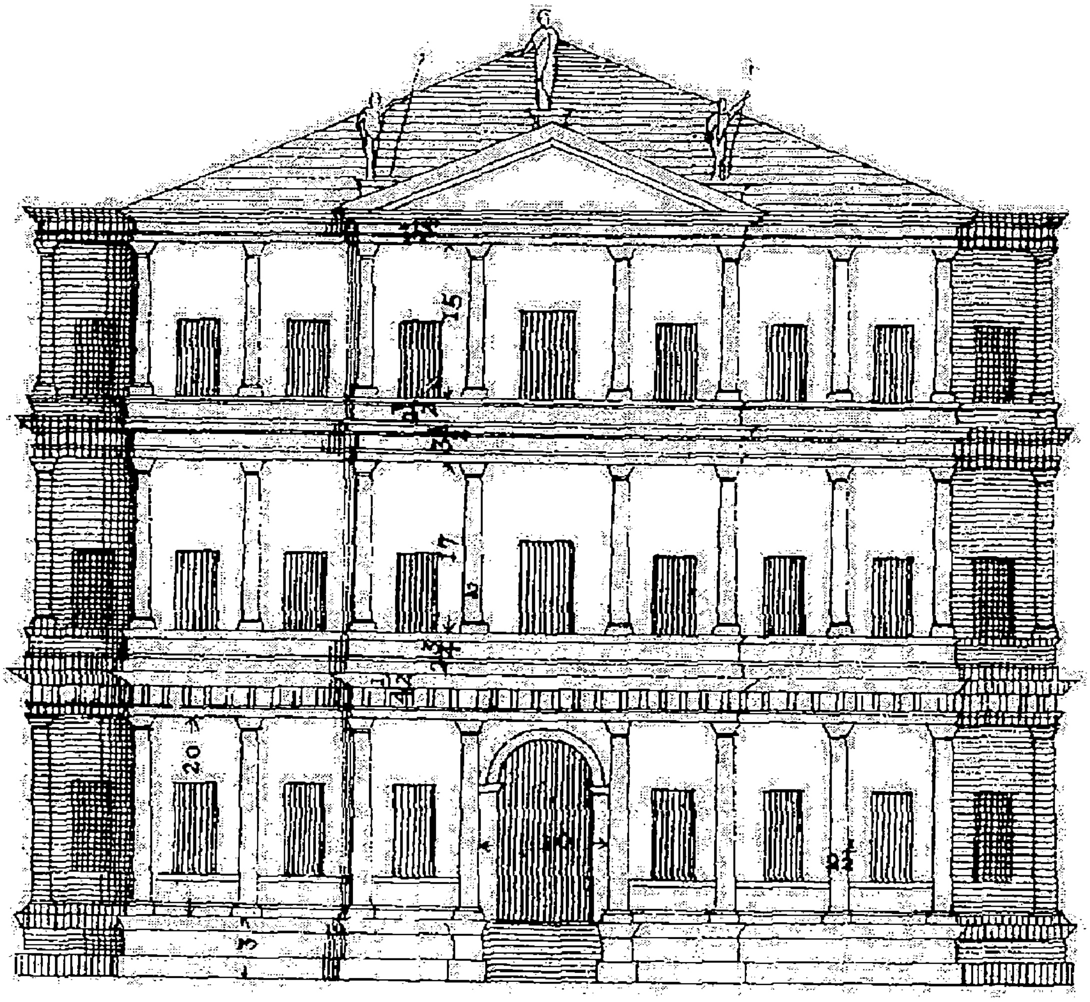


Figure 4.159 Plan of First Invention According to the Diverse site, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 52 A project for a palazzo on a triangular site in elevation

Figure 4.160 Elevation of a palazzo on a triangular site

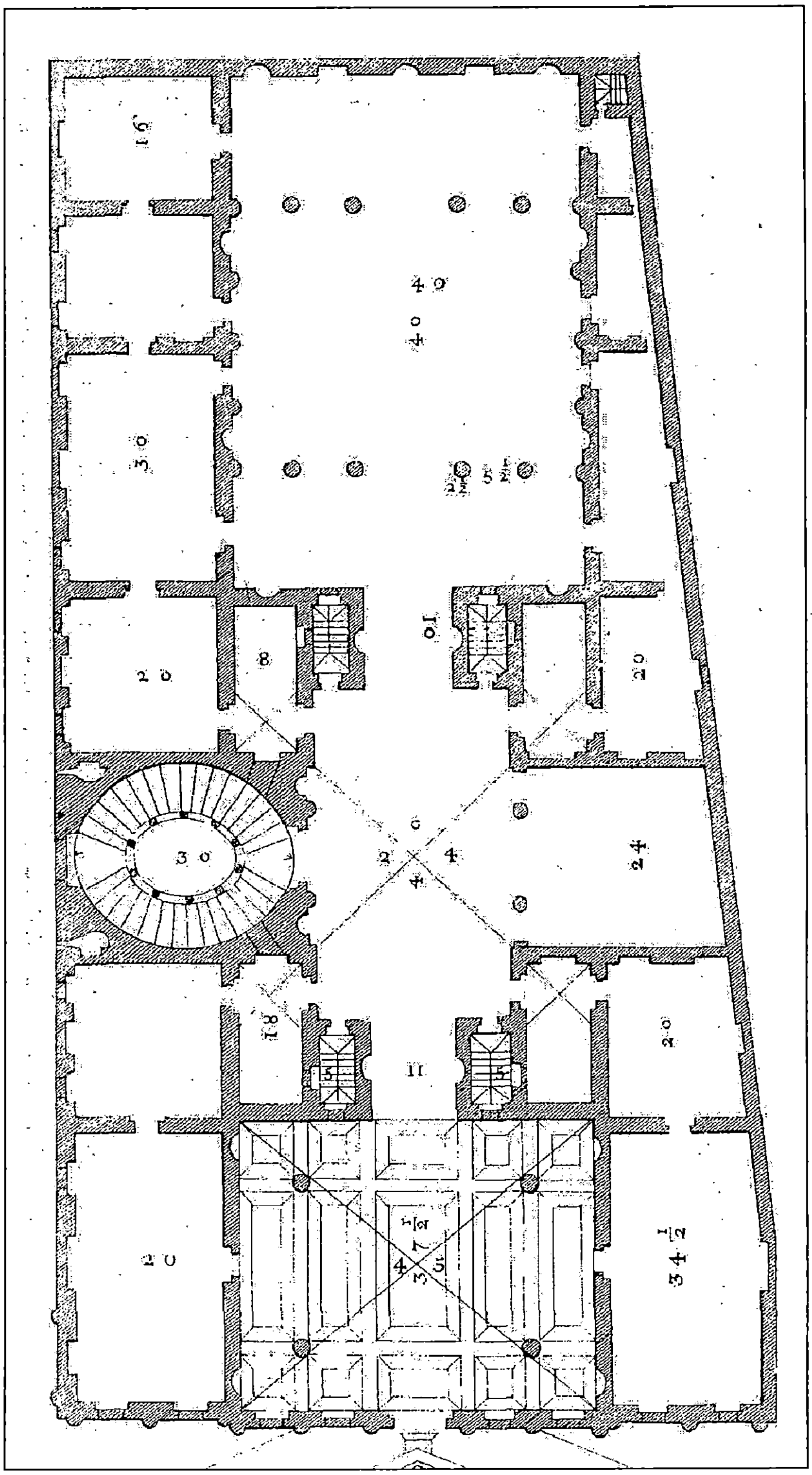


Figure 4.161 Plan Of Second Invention According to Diverse Site in Venetia Scanned From Plate 053, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

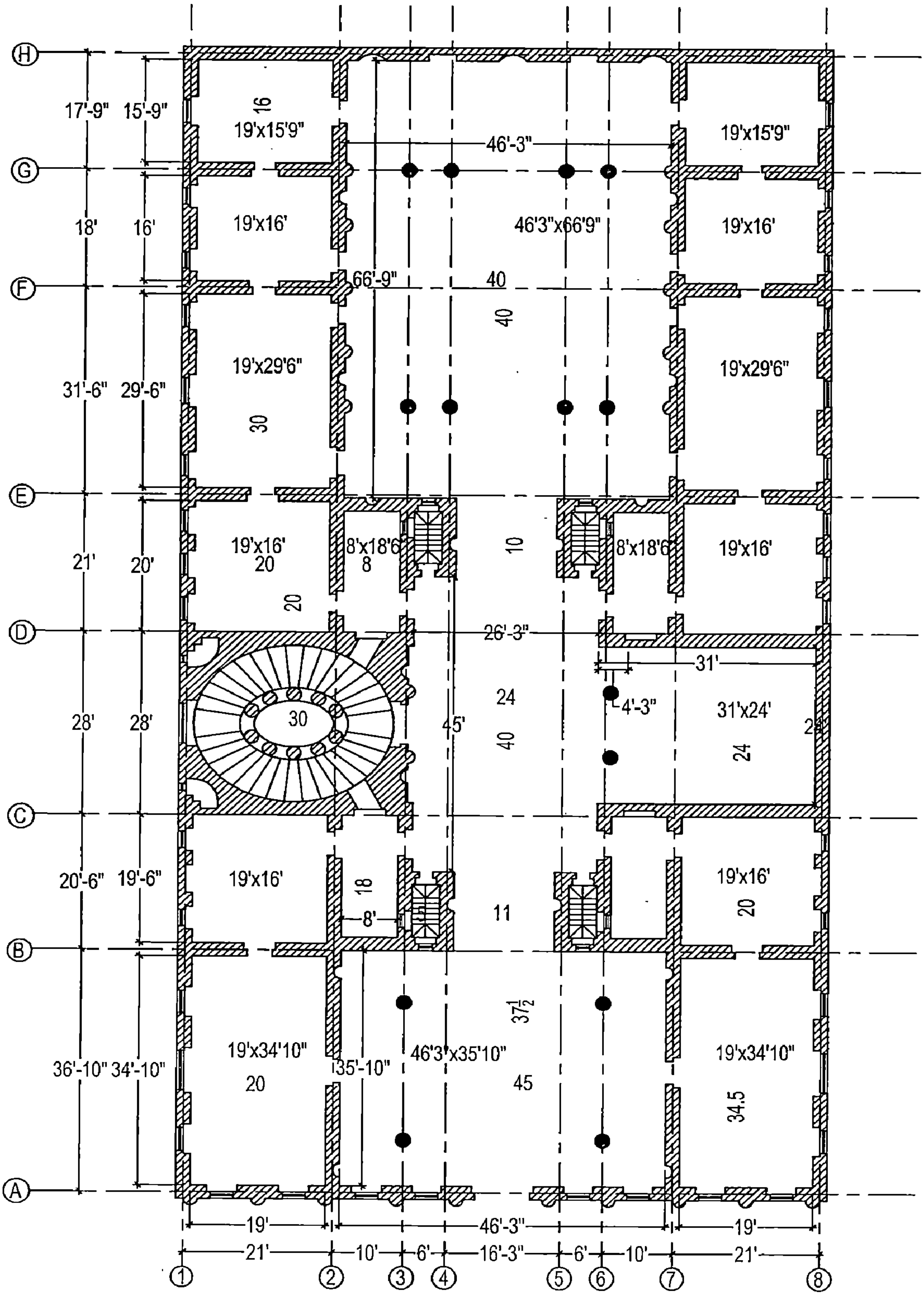


Figure 4.162 Plan Of Second Invention According to Diverse Site in Venetia Redrawn From Plate 053, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

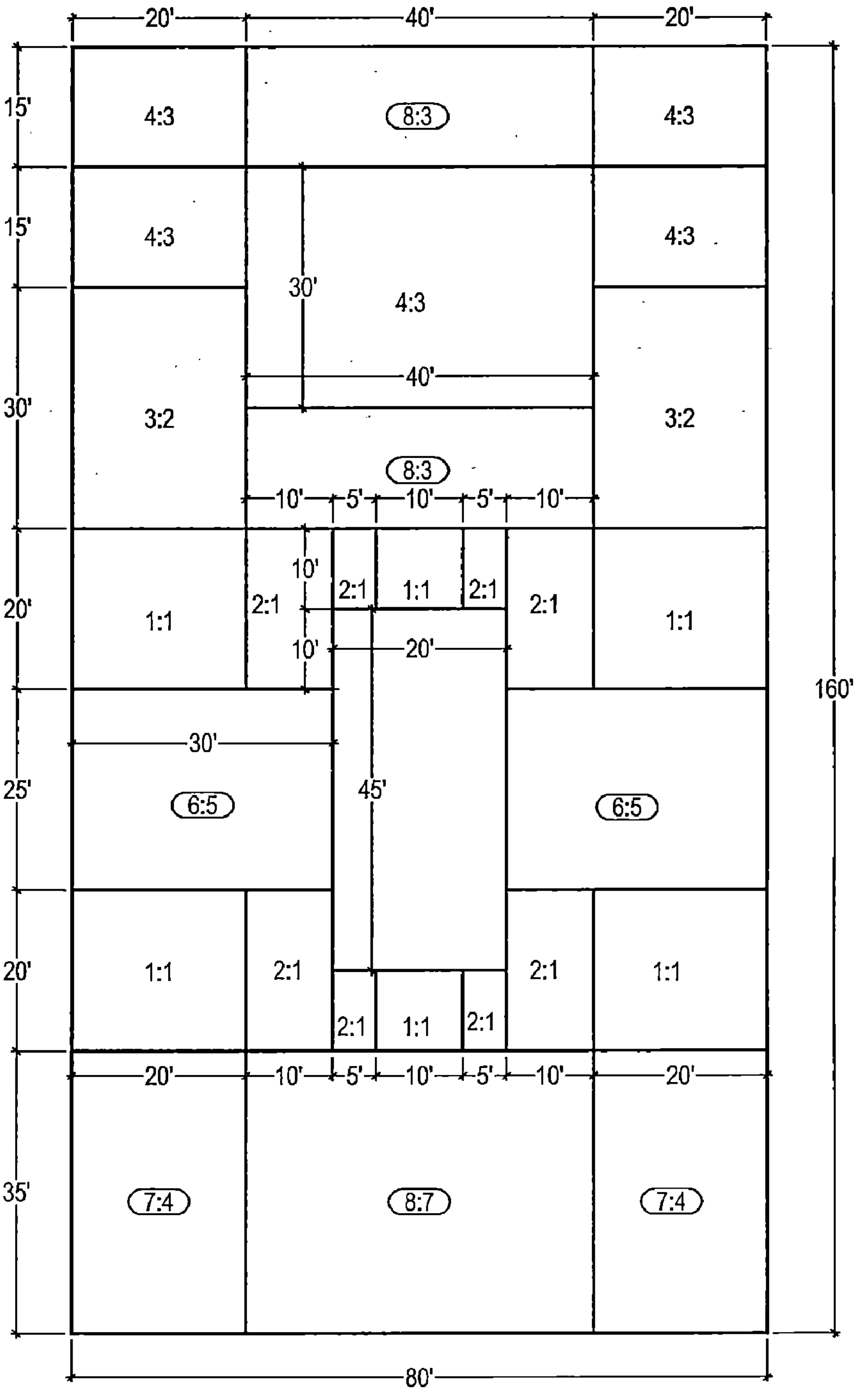


Figure 4.163 Schematic Analysis Second Invention According to Diverse Site in Venetia, Plate 053, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24

PLATE 53, A PROJECT FOR A PALAZZO ON A SITE IN VENICE

We can infer the following from schematic line diagram analysis (generated after eliminating irregular site profile):

- The main building whole is 160' x 80' which is 2:1.
- The 80' front is symmetrically divided in to 20':40':20' which is 1:2:1.
- Main room sizes and ratios observed are 5'X10', 10'X10', 20'X10', 20'X15', 20'X20', 30'X20'and 40'X30' which could be interpreted as 2:1, 1:1, 2:1, 4:3, 1:1, 3:2 and 4:3.
- Non standard room ratios like 8:7, 7:4 and 6:5 are identified.
  8:7 could be understood as square and one seventh.
  7:4 is identified which could be related to rational convergent of root 3.
  6:5 could be understood as square and one fifth. It is minor third as musical note. It could be interpreted as ratio formed from division of basic ratio 2:1 / 5:3 = 6:5 (a:b / c:d = bc:ad)

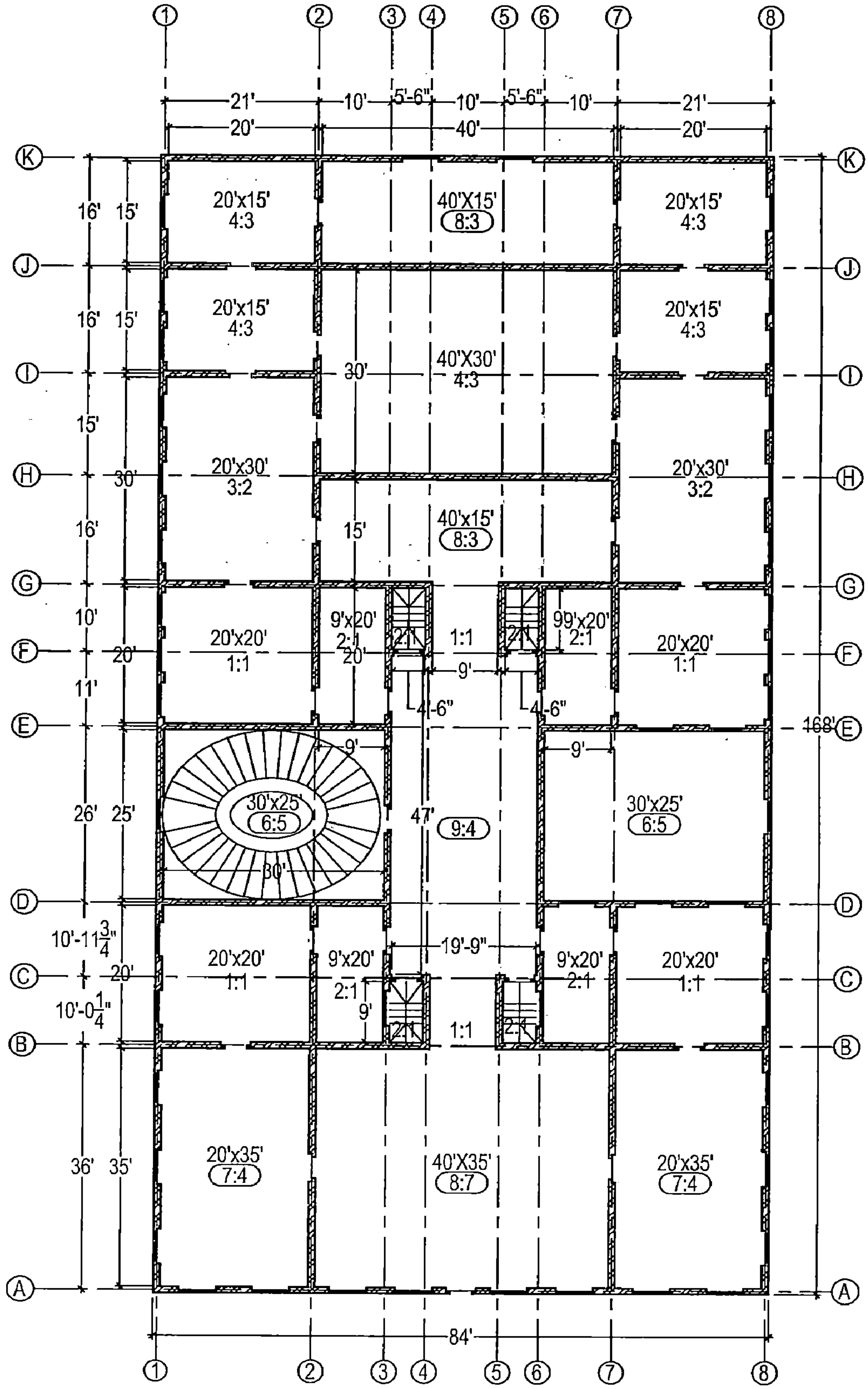
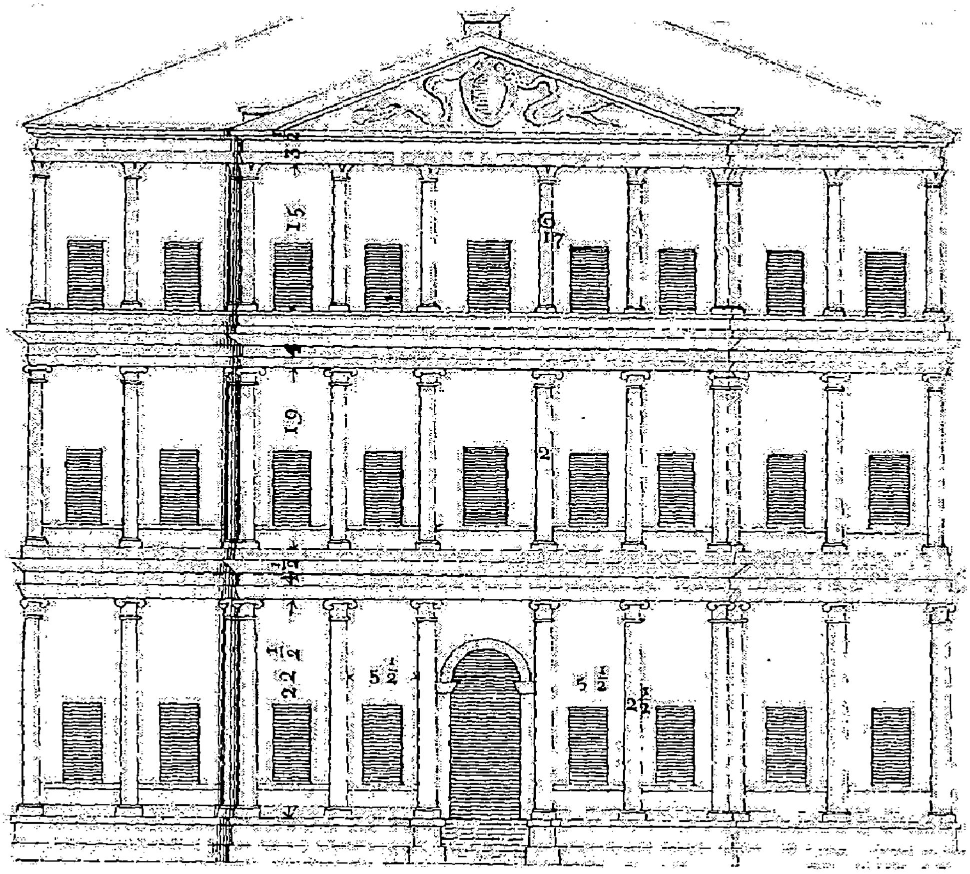


Figure 4.164 Plan of Second Invention According to Diverse Site in Venetia, developed on the basis of schematic analysis

Scale 1"



Source: Plate 53 A project for a palazzo on a site in Venice in elevation

Figure 4.165 Elevation of a palazzo on a site in Venice

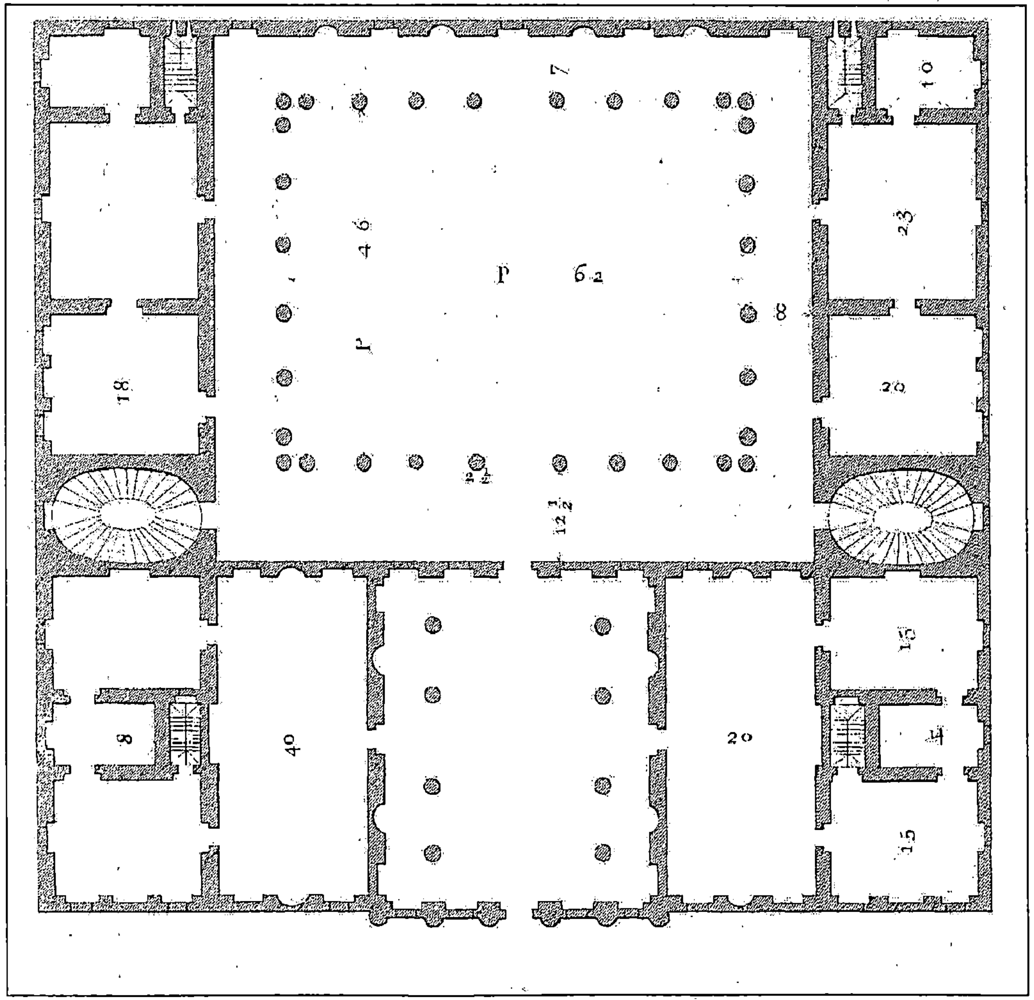


Figure 4.166 Plan Of Francesco & Lodovico Trissini in Vicenza Scanned From Plate 054, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

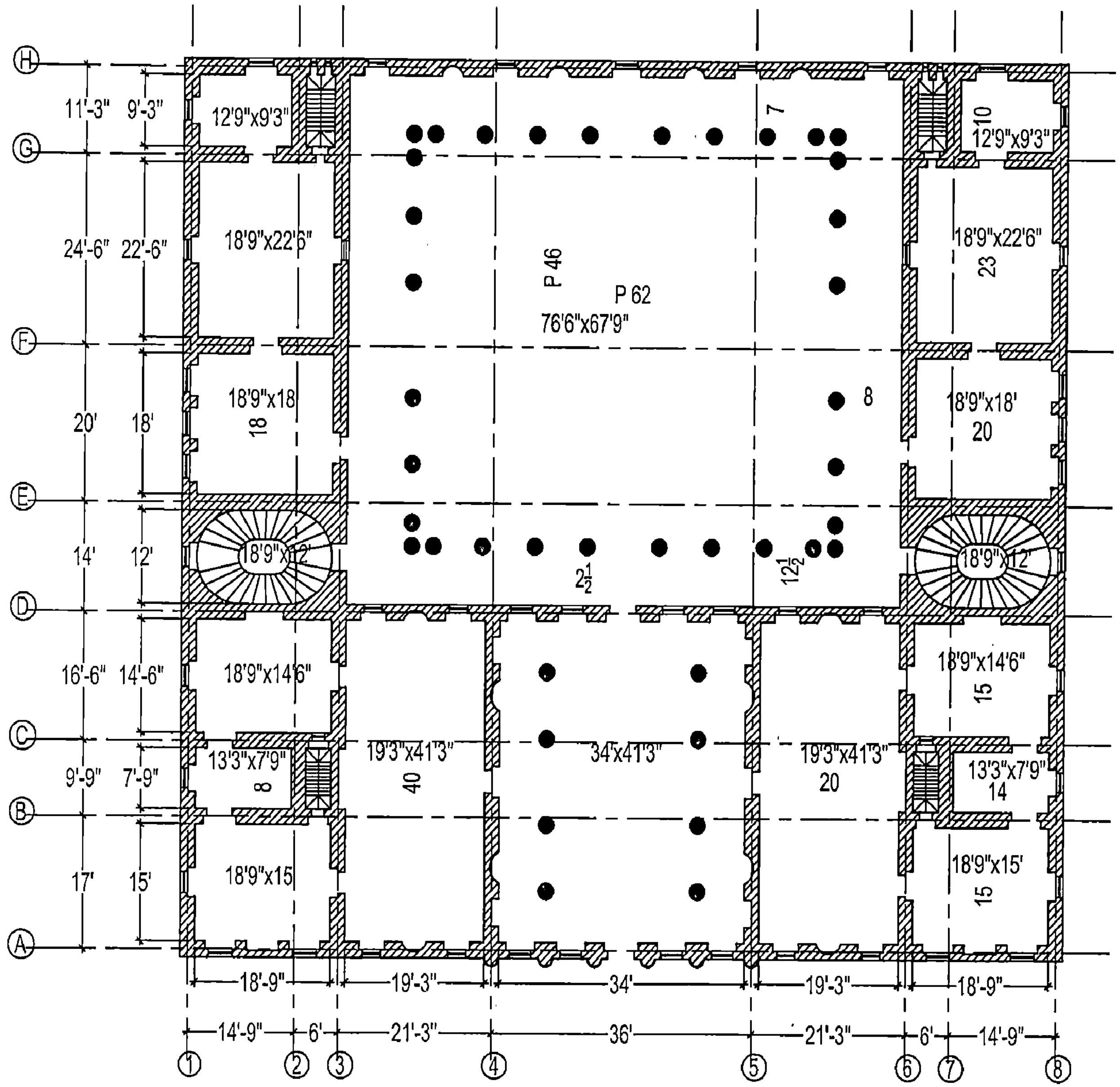


Figure 4.167 Plan Of Francesco & Lodovico Trissini in Vicenza Redrawn From Plate 054, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

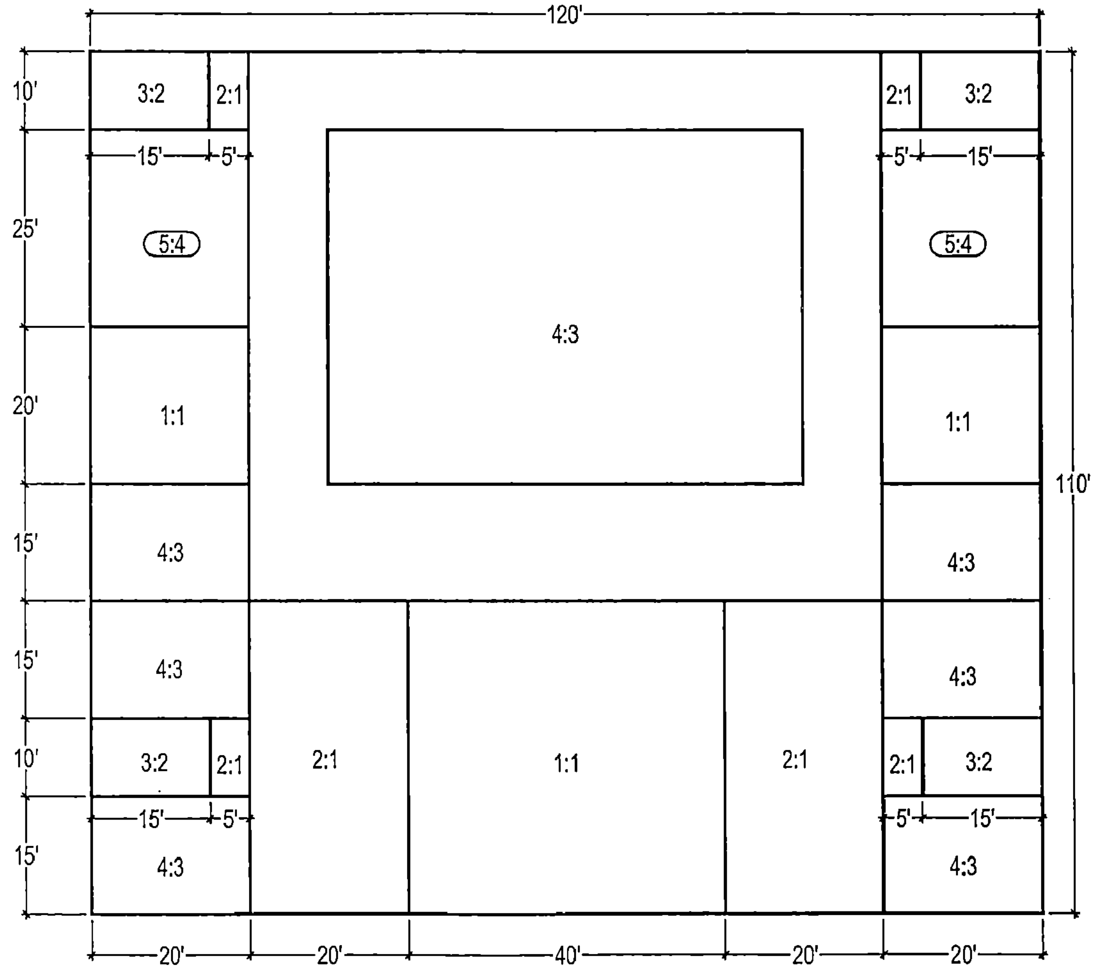


Figure 4.168 Schematic Analysis Francesco & Lodovico Trissini in Vicenza, Plate 054, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 24'

PLATE 54, A PROJECT FOR A PALAZZO FOR FRANCESCO AND LODOVICO TRISSINO IN VICENZA

We can infer the following from schematic line diagram analysis:

- The main building whole up to the rear court yard is 120' x 110' which is 12:11 and close to 1:1 (120' X 120').
- The 120' front is symmetrically divided in to 20':20':40': 20':20' which is 1:1:2:1:1.
- Main room sizes and ratios observed are 10'X5', 15'X10', 20'X15', 20' X20'and 40'X40' which could be interpreted as 2:1, 3:2, 4:3, 1:1 and 1:1.
- Non standard room ratio like 5:4 is identified which could be understood as square and one fourth.

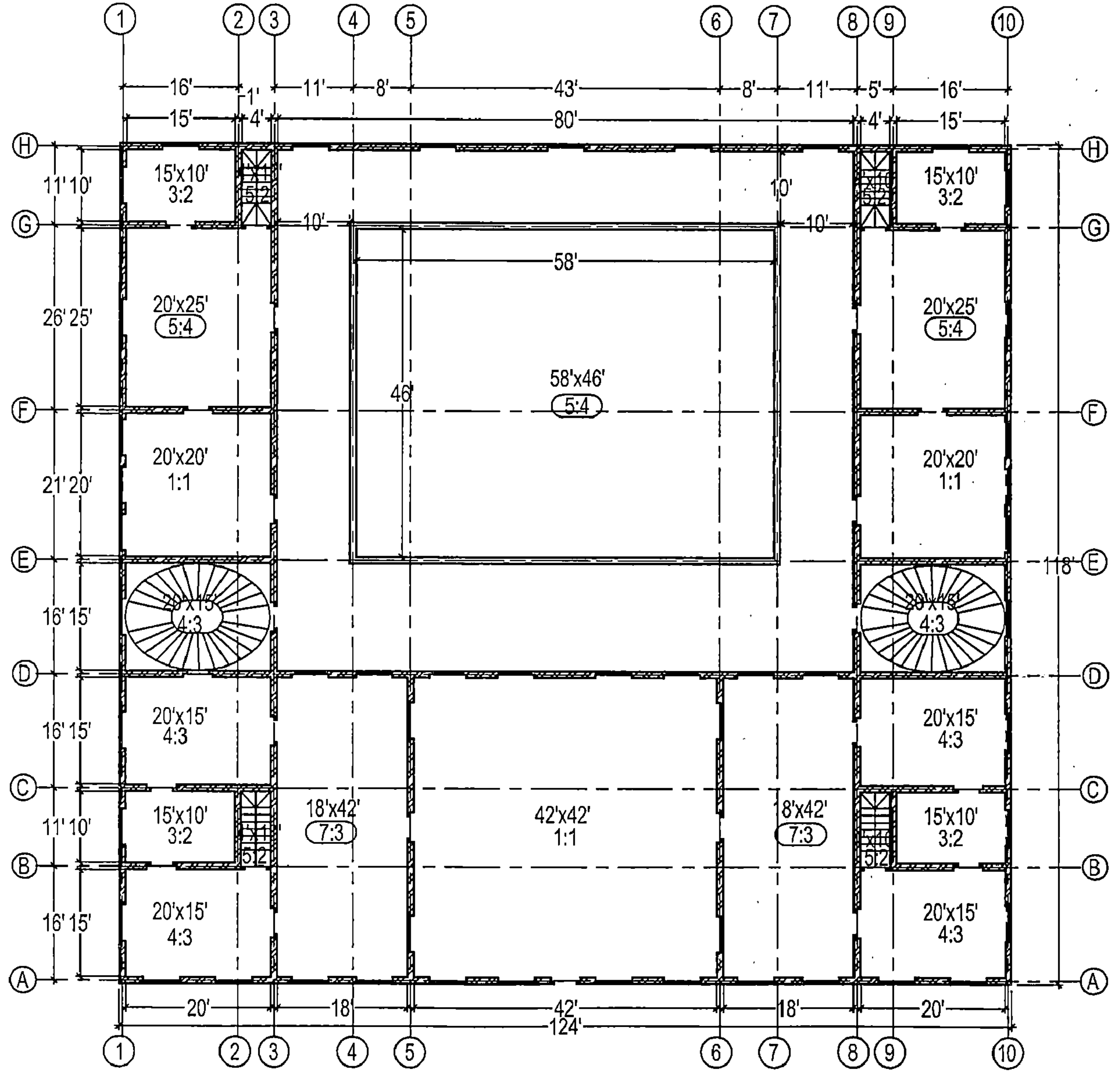
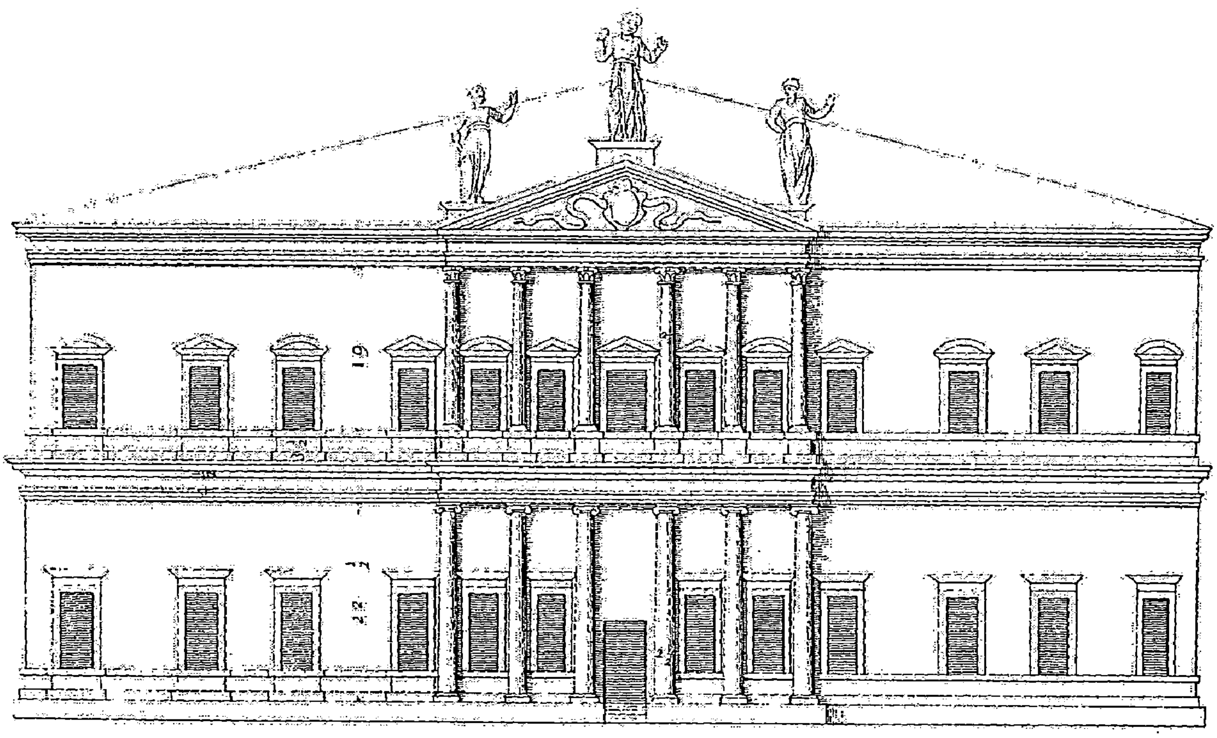


Figure 4.169 Plan of Francesco & Lodovico Trissini in Vicenza, developed on the basis of schematic analysis

Scale 1" = 24'



Source: Plate 54 A project for a palazzo for Francesco and Lodovico Trissino in Vicenza in elevation

Figure 4.170 Elevation of a palazzo for Francesco and Lodovico Trissino in Vicenza

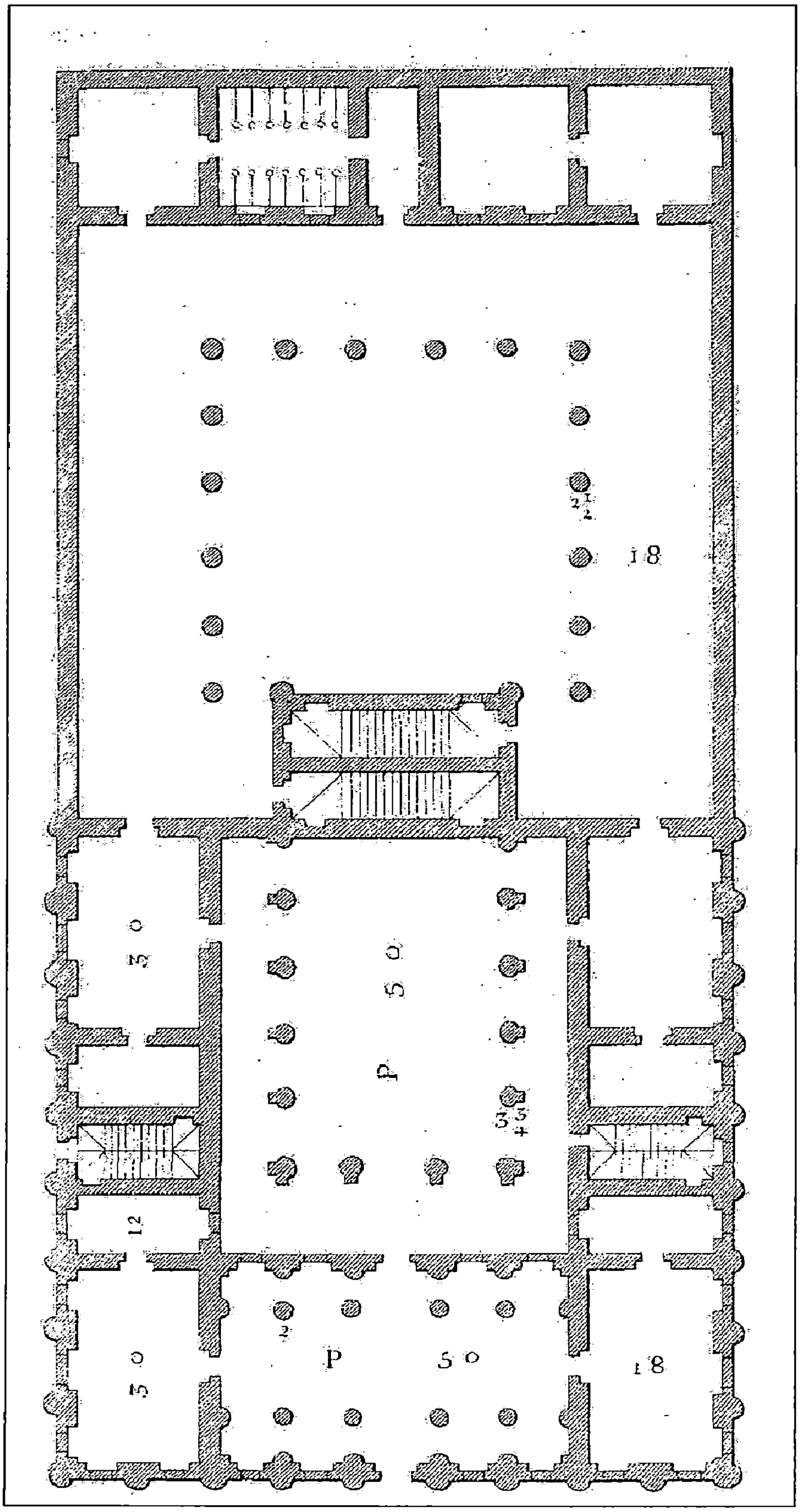


Figure 4.171 Plan Of Giacomo Angarano in Vicenza Scanned From Plate 055,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1

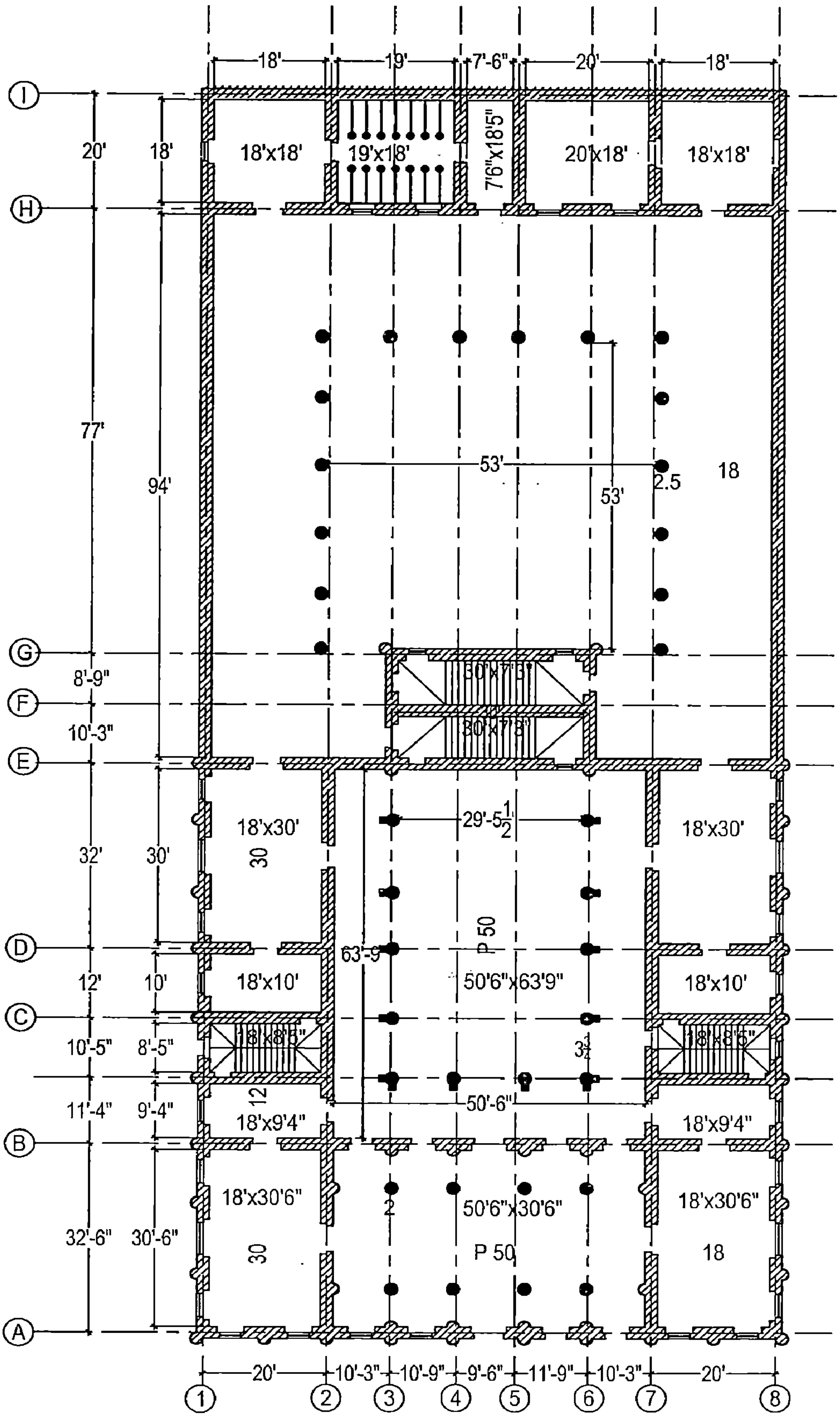


Figure 4.172 Plan Of Giacomo Angarano in Vicenza Redrawn From Plate 055, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 28'

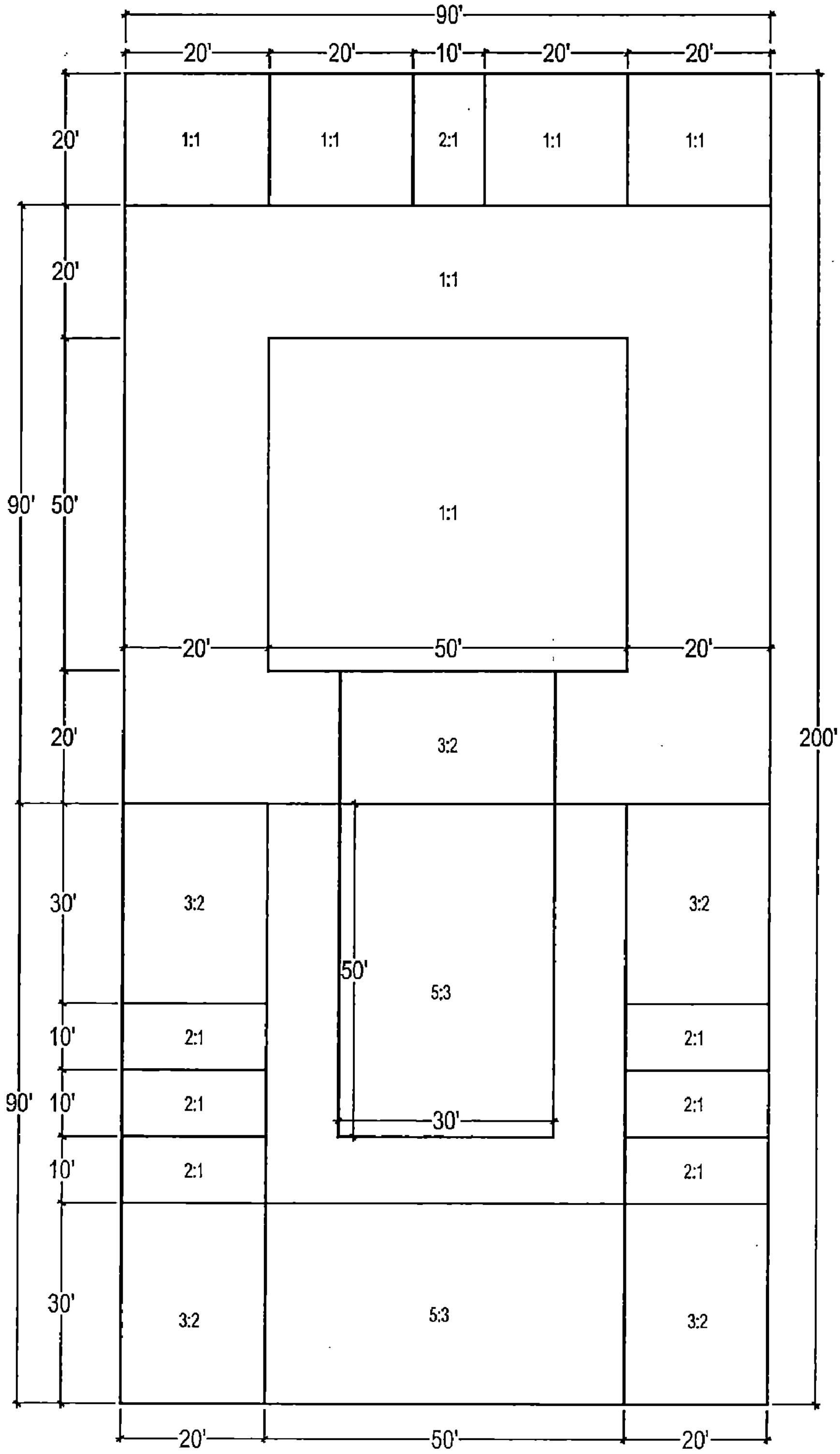


Figure 4.173 Schematic Analysis Giacomo Angarano in Vicenza, Plate 055, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1

PLATE 55, A PROJECT OF PALAZZO FOR GIACOMO ANGARANO IN VICENZA

We can infer the following from schematic line diagram analysis:

- The main building whole is 200'x90' which is 20:9 and close to 2:1 (200' x 100').
- The main building whole after eliminating back wing is 180'x90' which is 2:1
- The 90' front is symmetrically divided in to 20':50':20' which is 2:5:2.
- Main room sizes and ratios observed are 20'X10', 20'X20', 30'X20' and 50'X30' which could be interpreted as 2:1, 1:1, 3:2 and5:3.
- No non standard room ratios are identified.

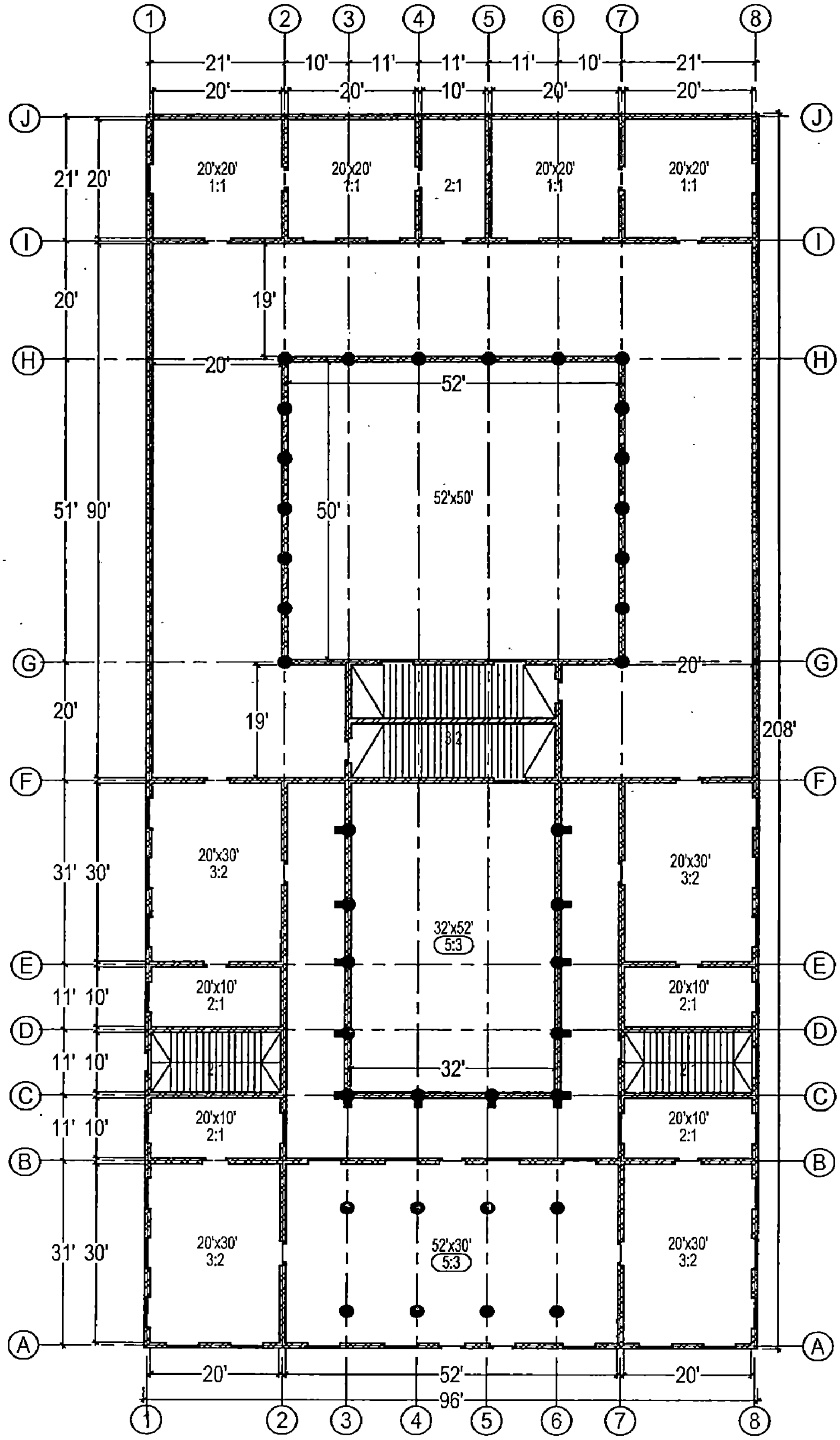
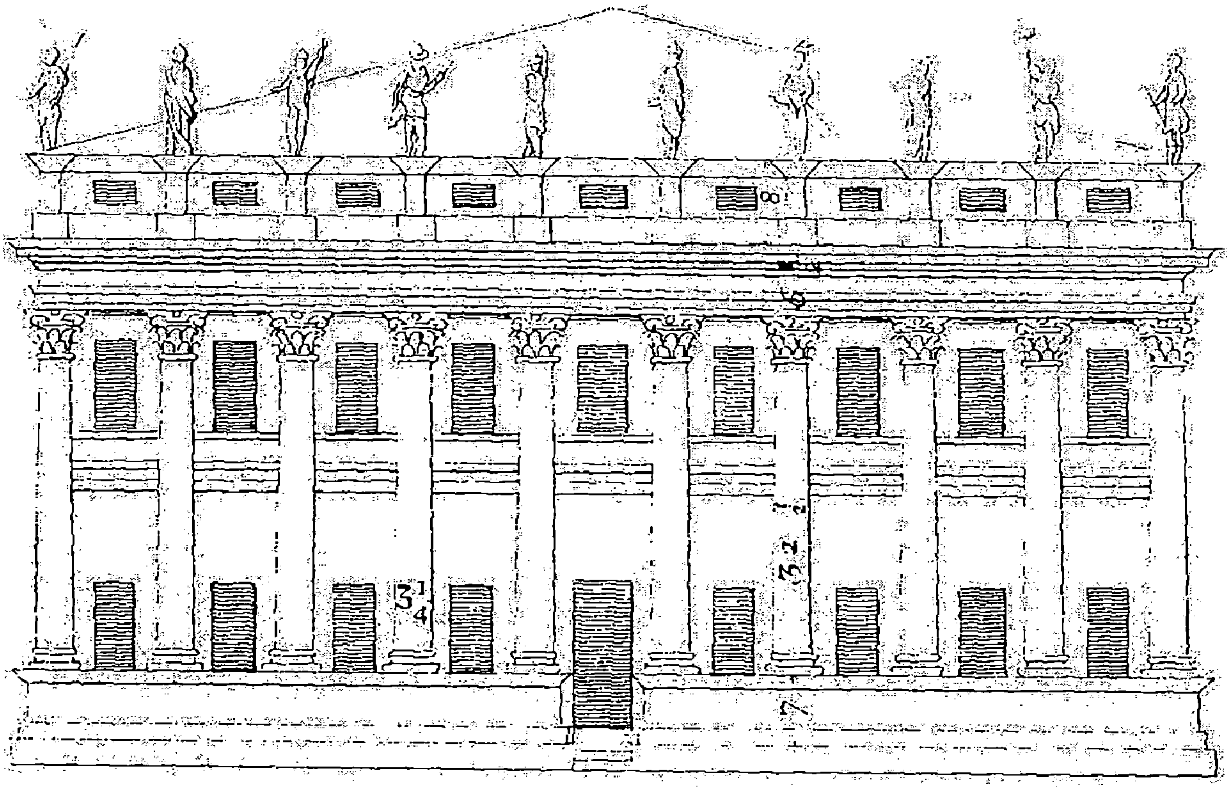


Figure 4.174 Plan of Giacomo Angarano in Vicenza, developed on the basis of schematic analysis



Source: Plate 55 A project of Palazzo for Giacomo Angarano in Vicenza in elevation

Figure 4.175 Elevation of Palazzo for Giacomo Angarano in Vicenza

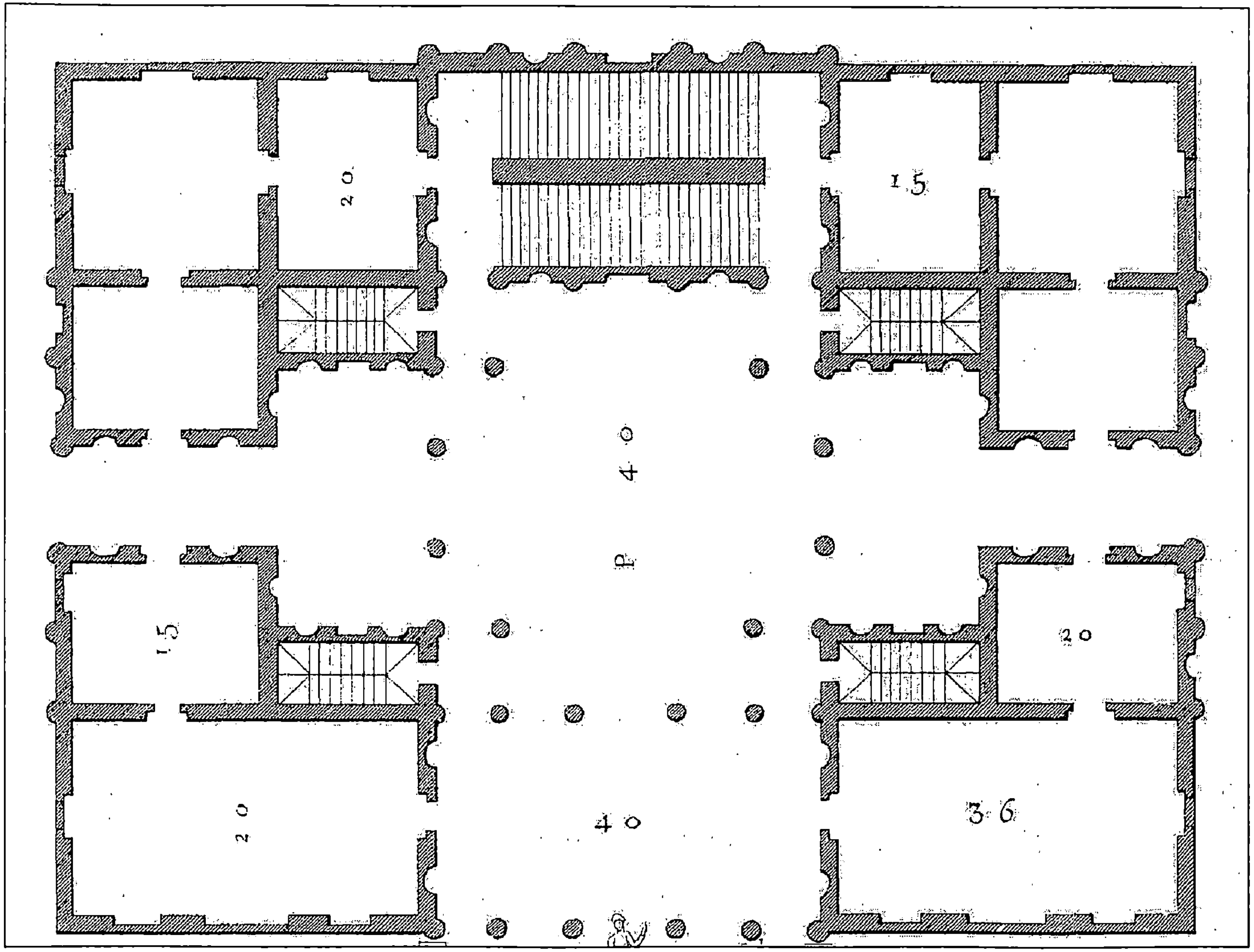


Figure 4.176 Plan Of Gio Battista dalla Torre in Verona Scanned From Plate 056,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

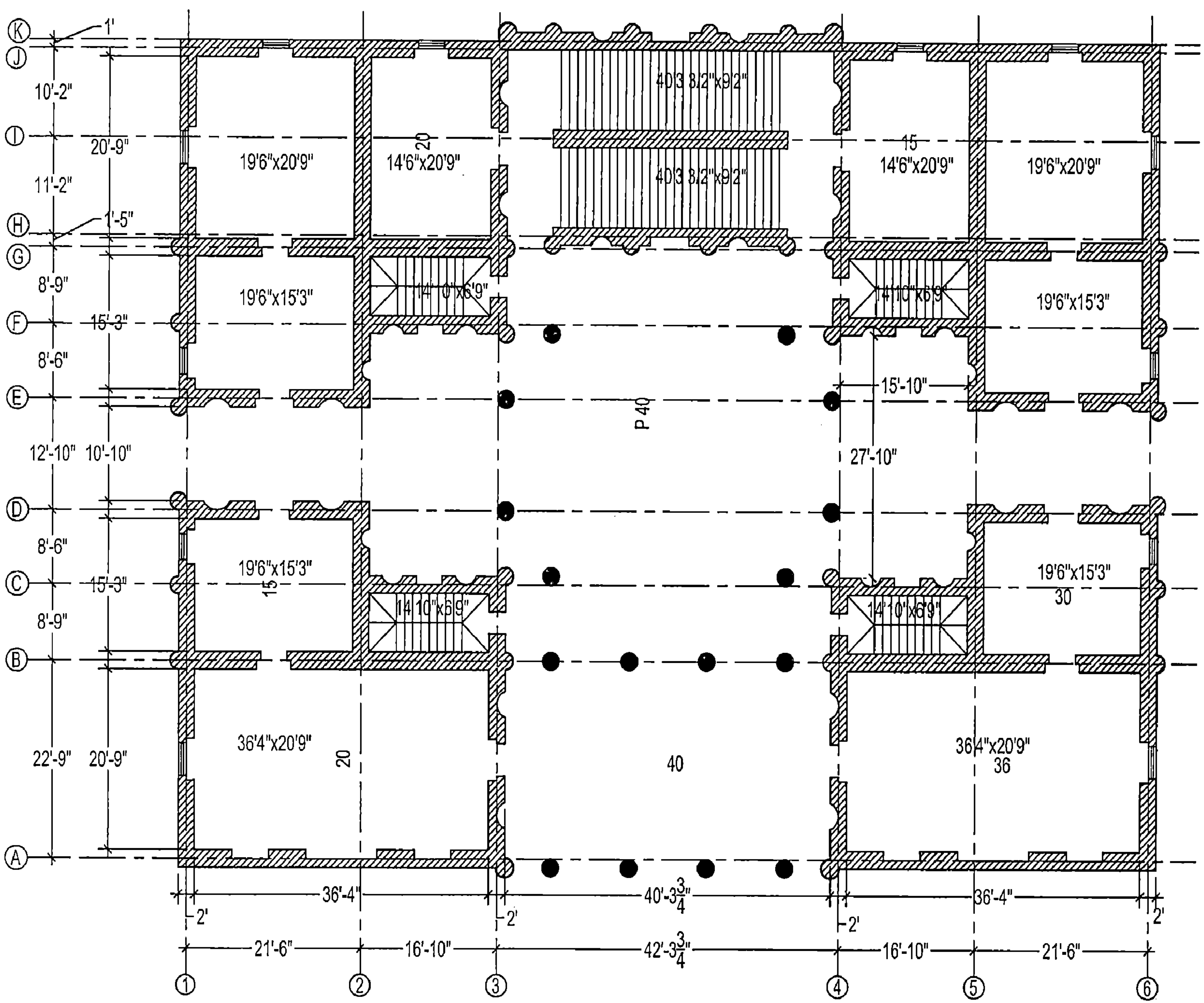


Figure 4.177 Plan Of Gio Battista dalla Torre in Verona Redrawn From Plate 056, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

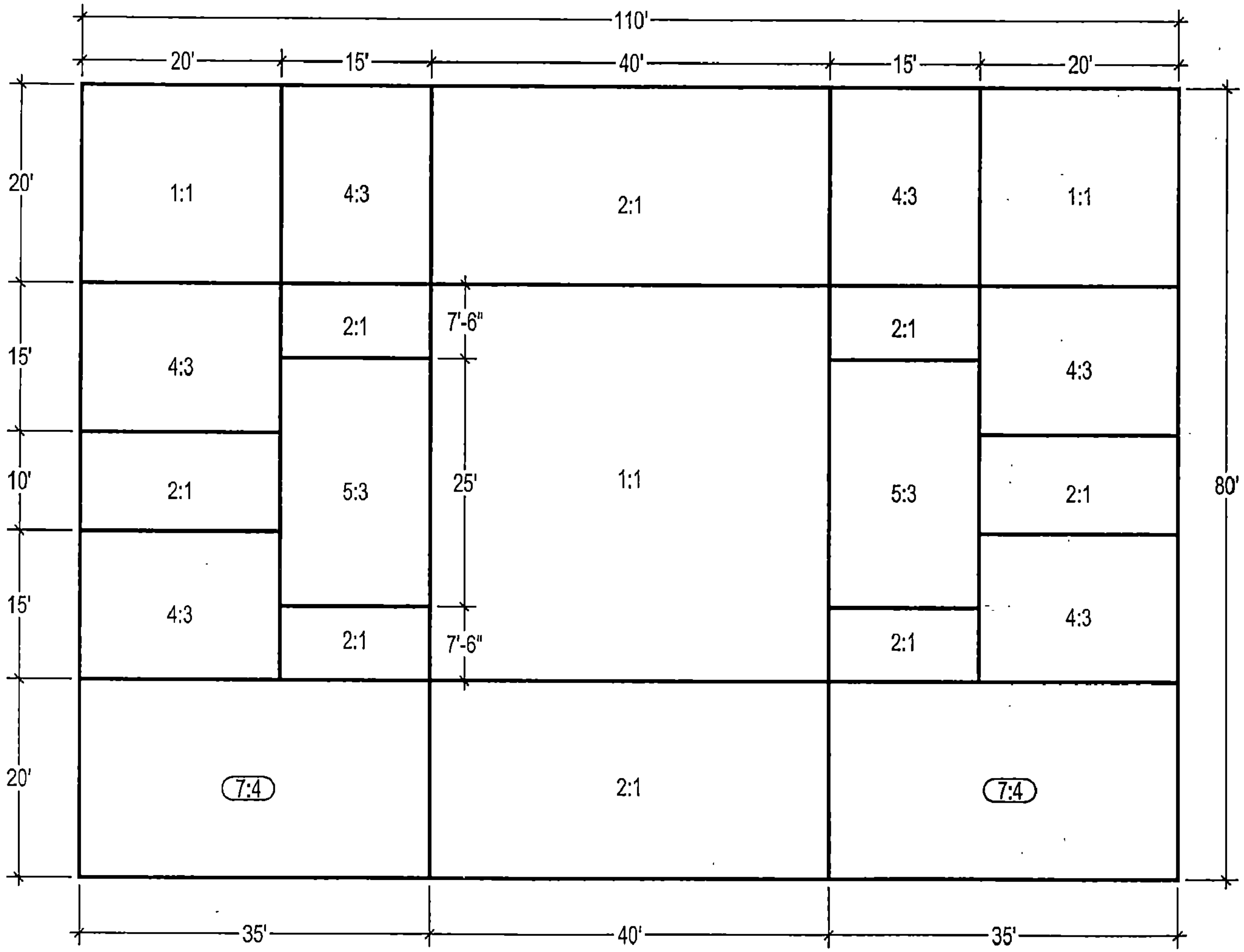


Figure 4.178 Schematic Analysis Gio Battista dalla Torre in Verona, Plate 056,
'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 18'

PLATE 56, A PROJECT OF PALAZZO FOR GIO. BATTISTA DELLA TORRE IN VERONA

We can infer the following from schematic line diagram analysis:

- The main building whole is 110'x80' which is 11:8 and close to 3:2 (120' X 80').
- The 110' front is symmetrically divided in to 35':40':35' which is 7:8:7. If the front was 120' wide this division could be 40':40':40' of 1:1:1
- Main room sizes and ratios observed are 15'X7.5', 20'X15', 20'X10', 20'X20' and 40'X20' which could be interpreted as 2:1, 4:3, 2:1 and 1:1.
- Non standard room ratio like 7:4 is identified which could be related to rational convergent of root 3.

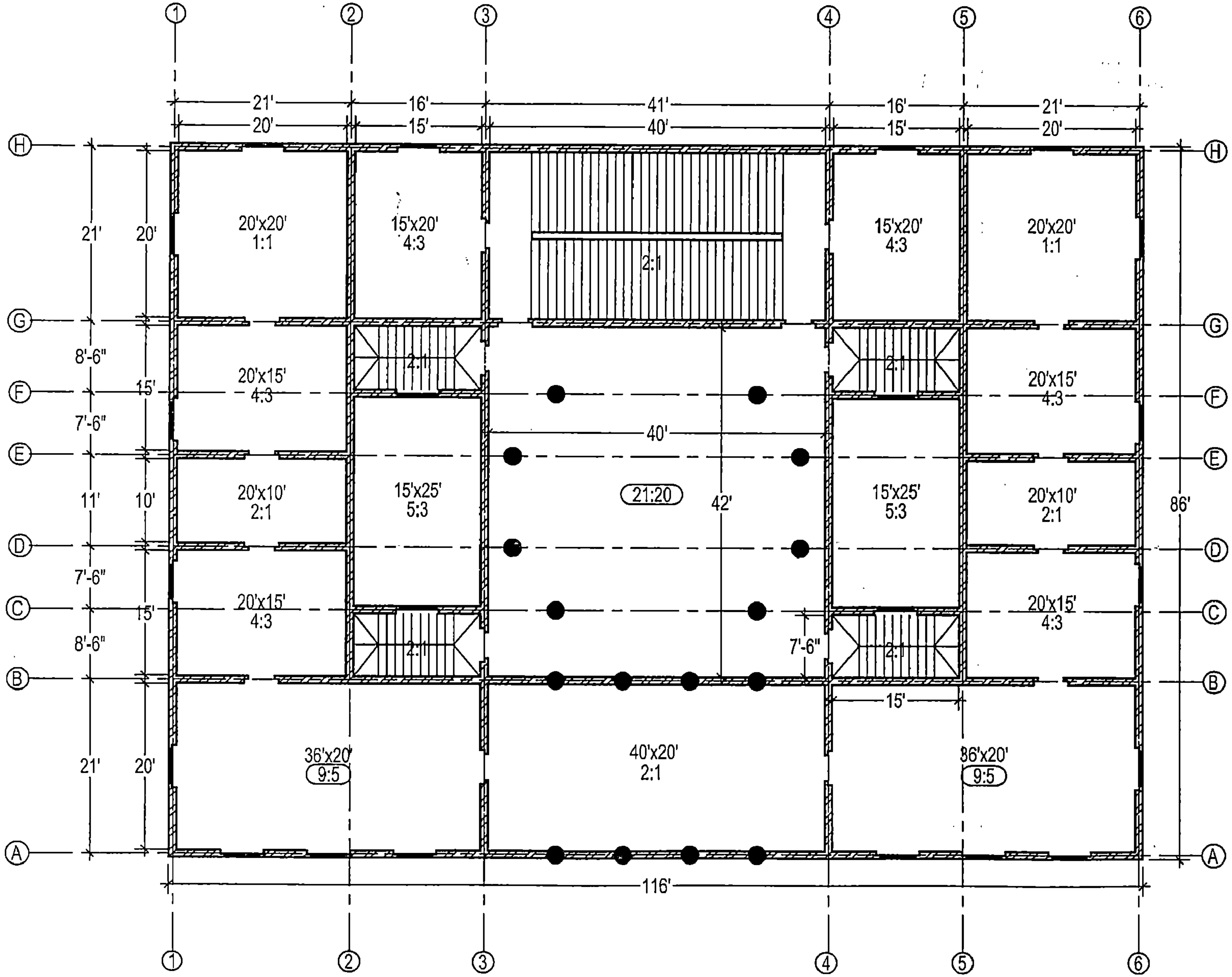
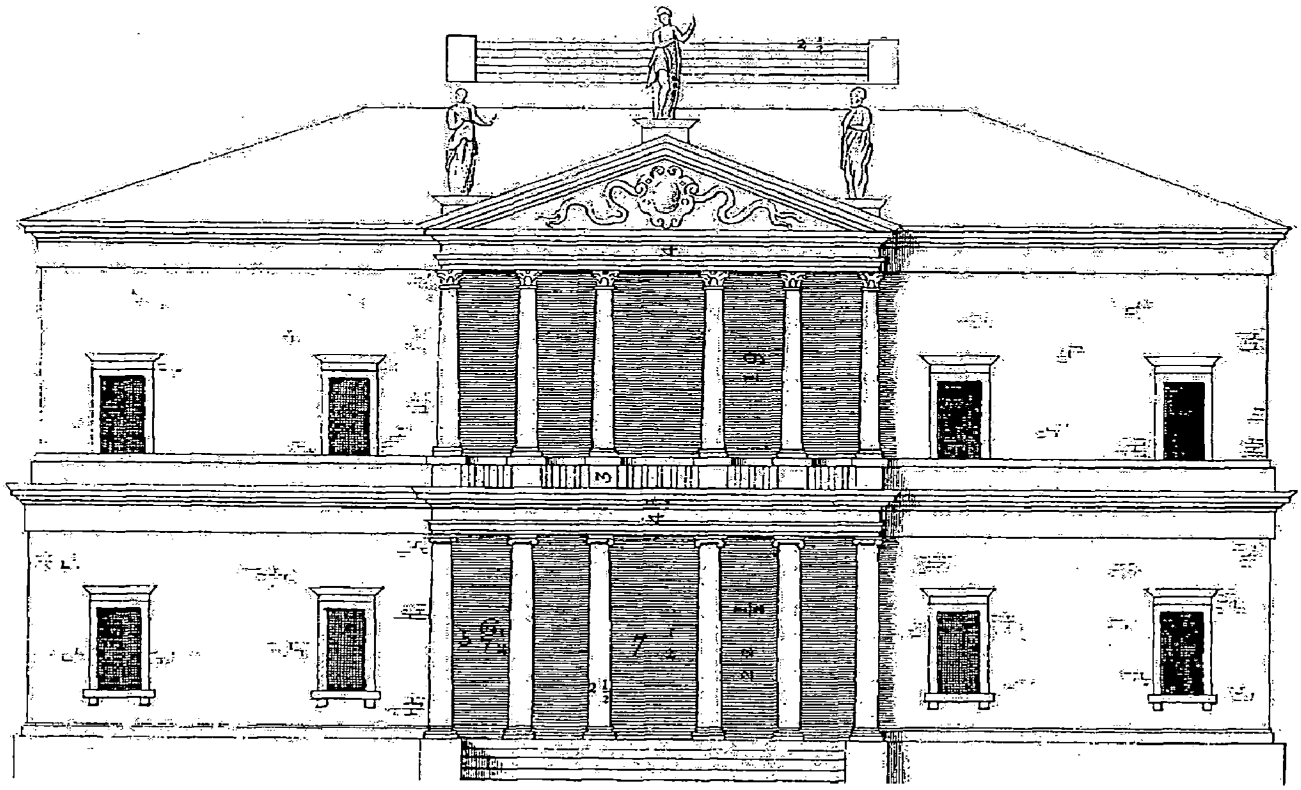


Figure 4.179 Plan of Gio Battista dalla Torre in Verona, developed on the basis of schematic analysis

Scale 1" = 18'



Source: Plate 56 A project of Palazzo for Gio. Battista Della Torre in Verona in elevation

Figure 4.180 Elevation of project Palazzo for Gio. Battista Della Torre in Verona

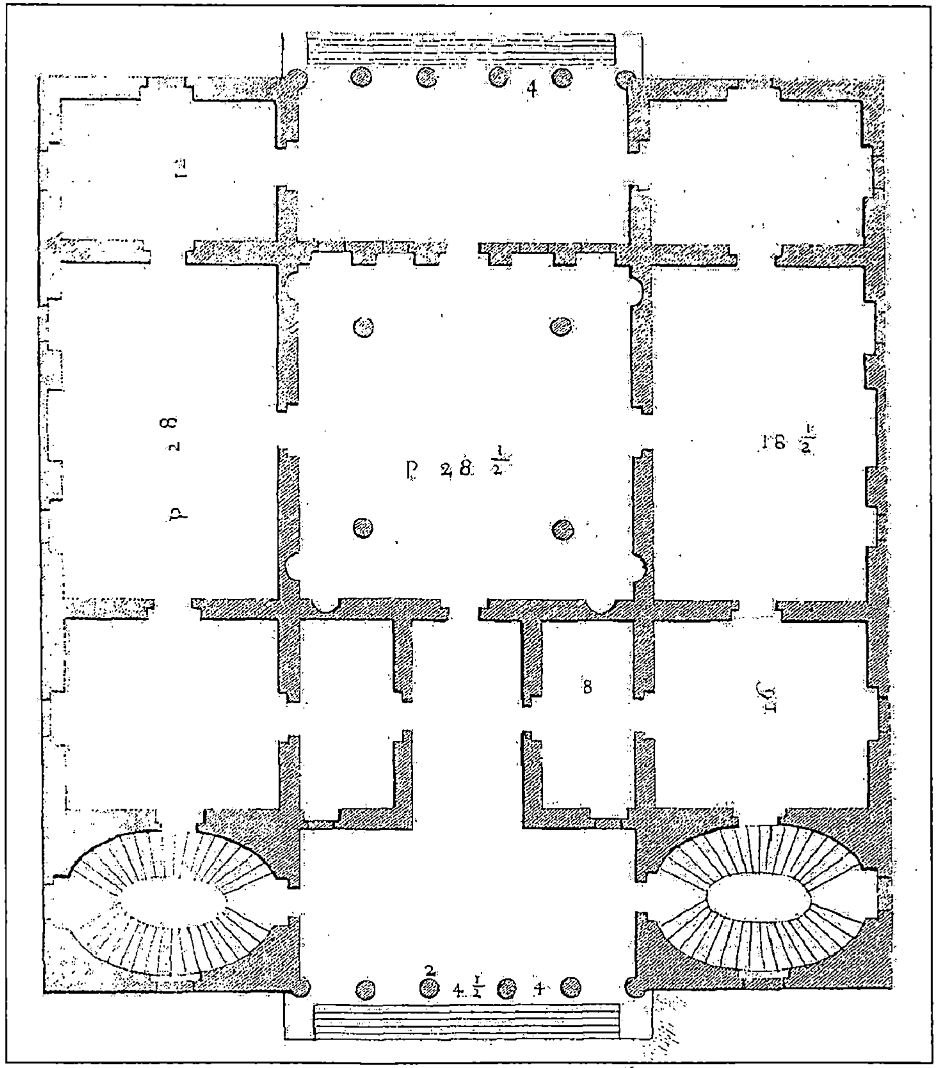


Figure 4.181 Plan Of Gio Battista Gazadore in Vicenza Scanned From Plate 057, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

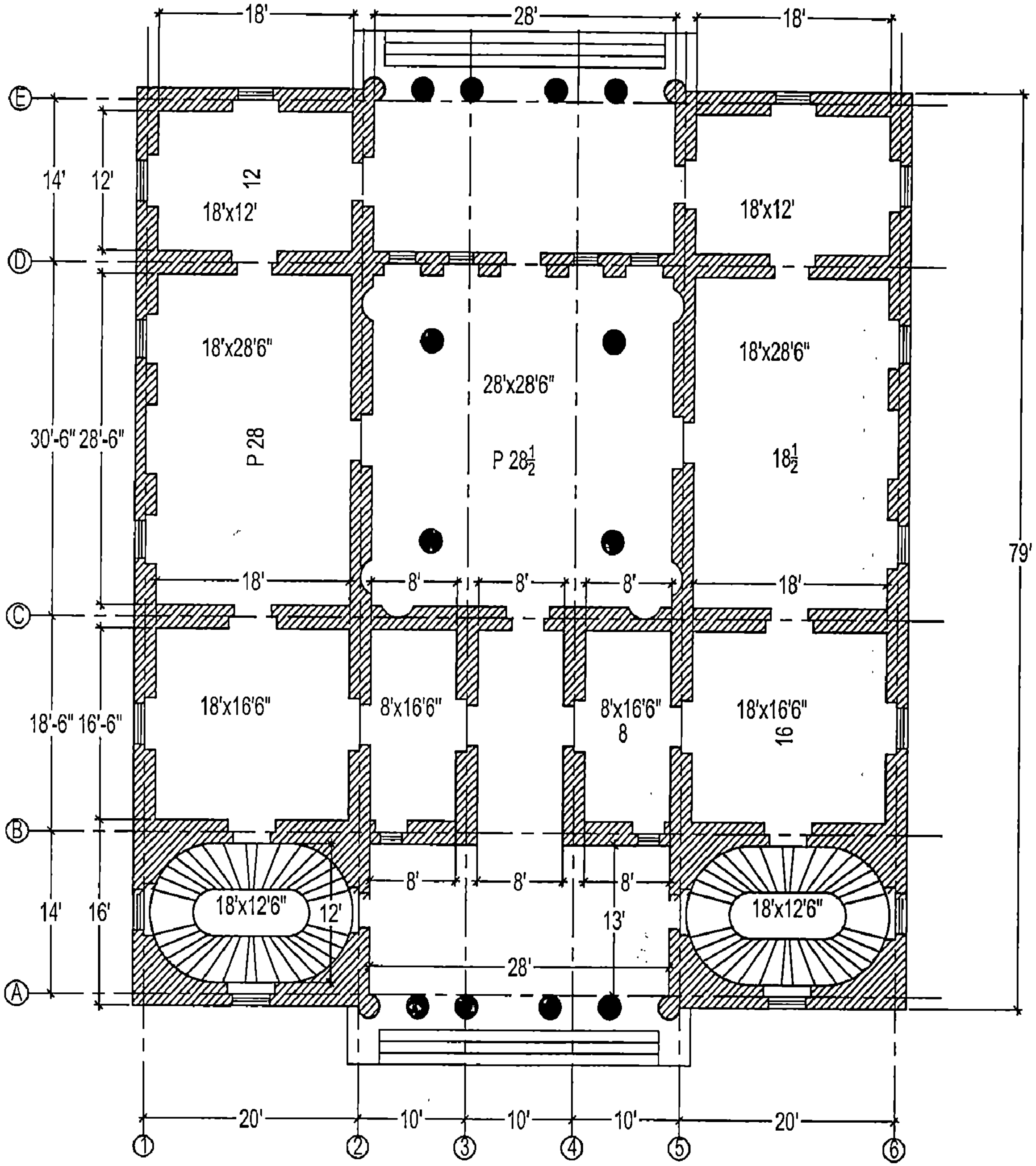


Figure 4.182 Plan Of Gio Battista Gazadore in Vicenza Redrawn From Plate 057, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

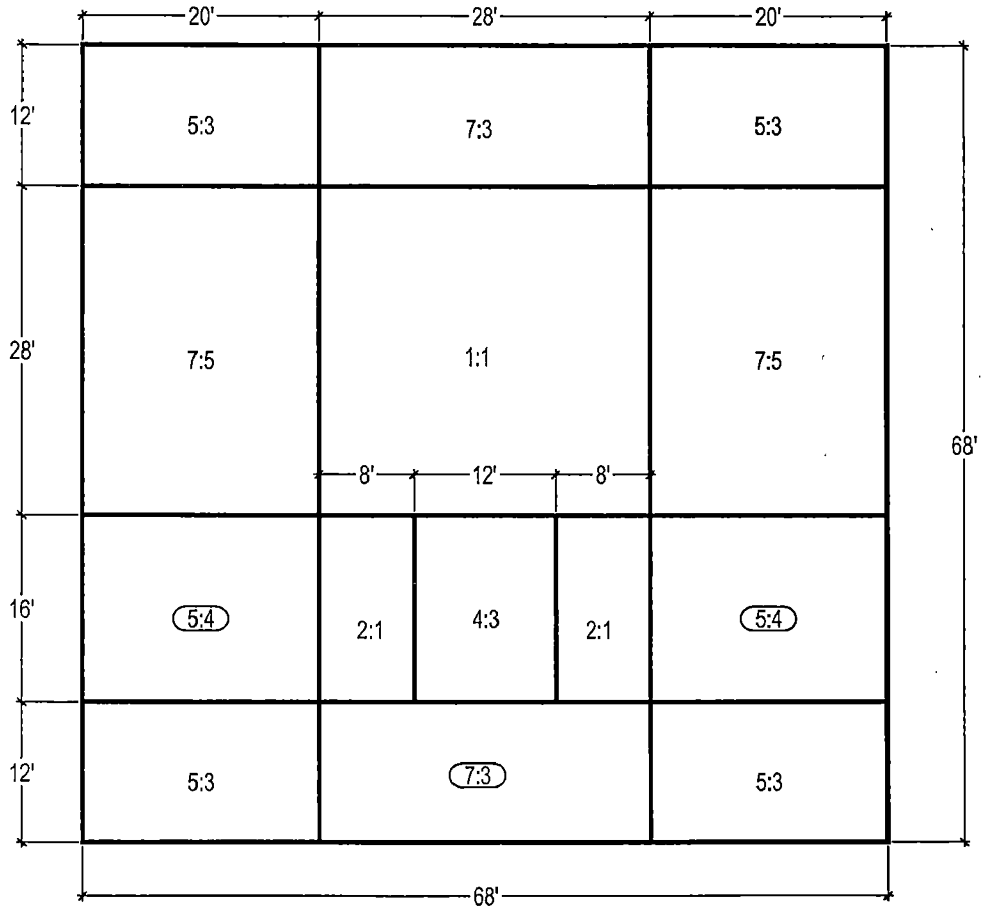


Figure 4.183 Schematic Analysis Gio Battista Gazadore in Vicenza, Plate 057, 'I Quattro Libri Dell' Architecttura', Book-2

Scale 1" = 16'

PLATE 57, A PROJECT OF PALAZZO FOR GIO. BATTISTA GARZADORE IN VICENZA

We can infer the following from schematic line diagram analysis:

- The main building whole is 68'x 68' which is 1:1.
- The 68' front is symmetrically divided in to 20':28':20' which is 5:7:5.
- Main room sizes and ratios observed are 16'X8', 16'X12', 20'X12', 28':20' and 28'X28' which could be interpreted as 2:1, 4:3, 5:3, 7:5 and 1:1.
- Non standard room ratios like 7:3 and 5:4 are identified.
  7:3 could be related to rational convergent of root 5.
  5:4 could be understood as square and one fourth.

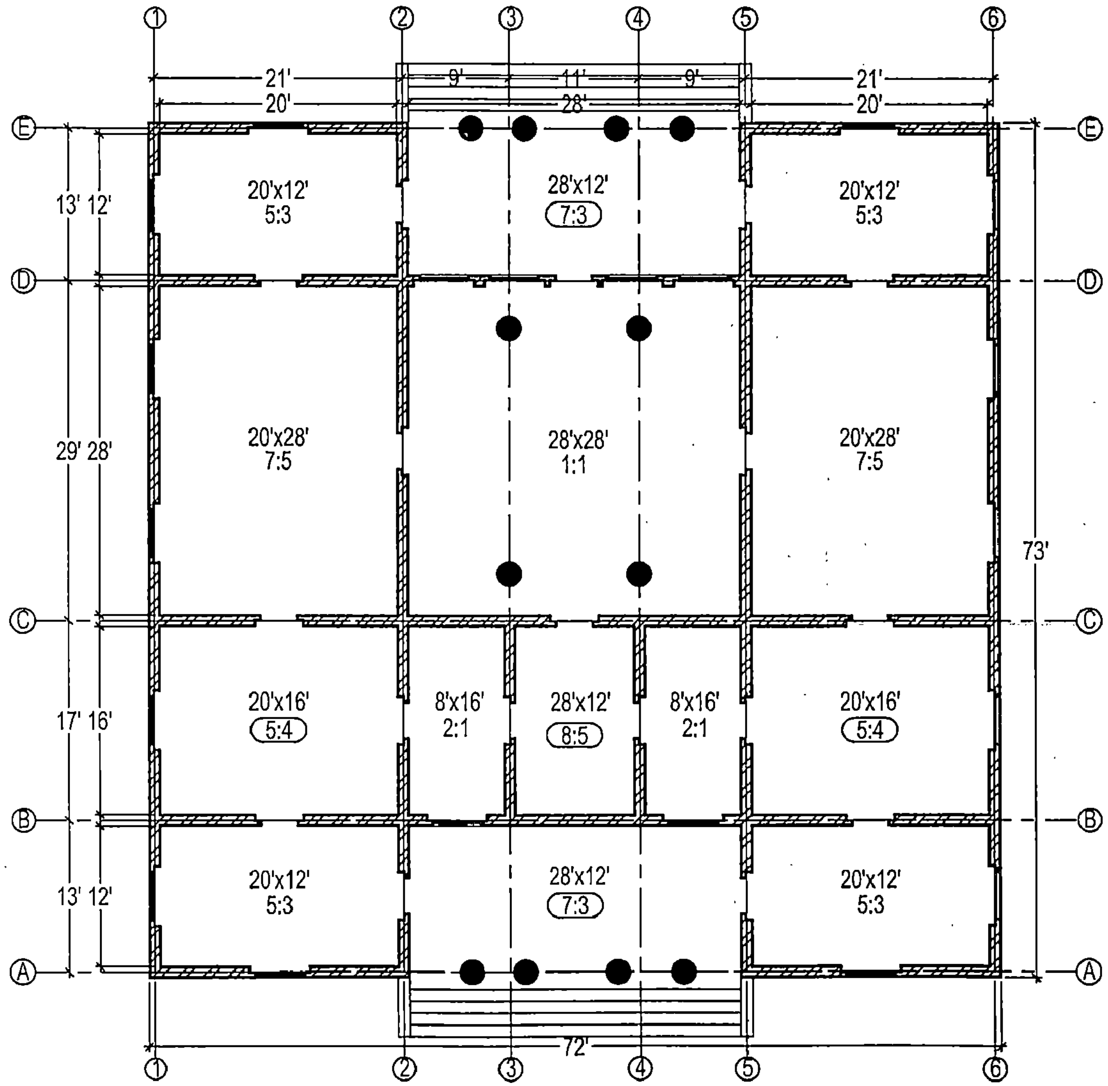
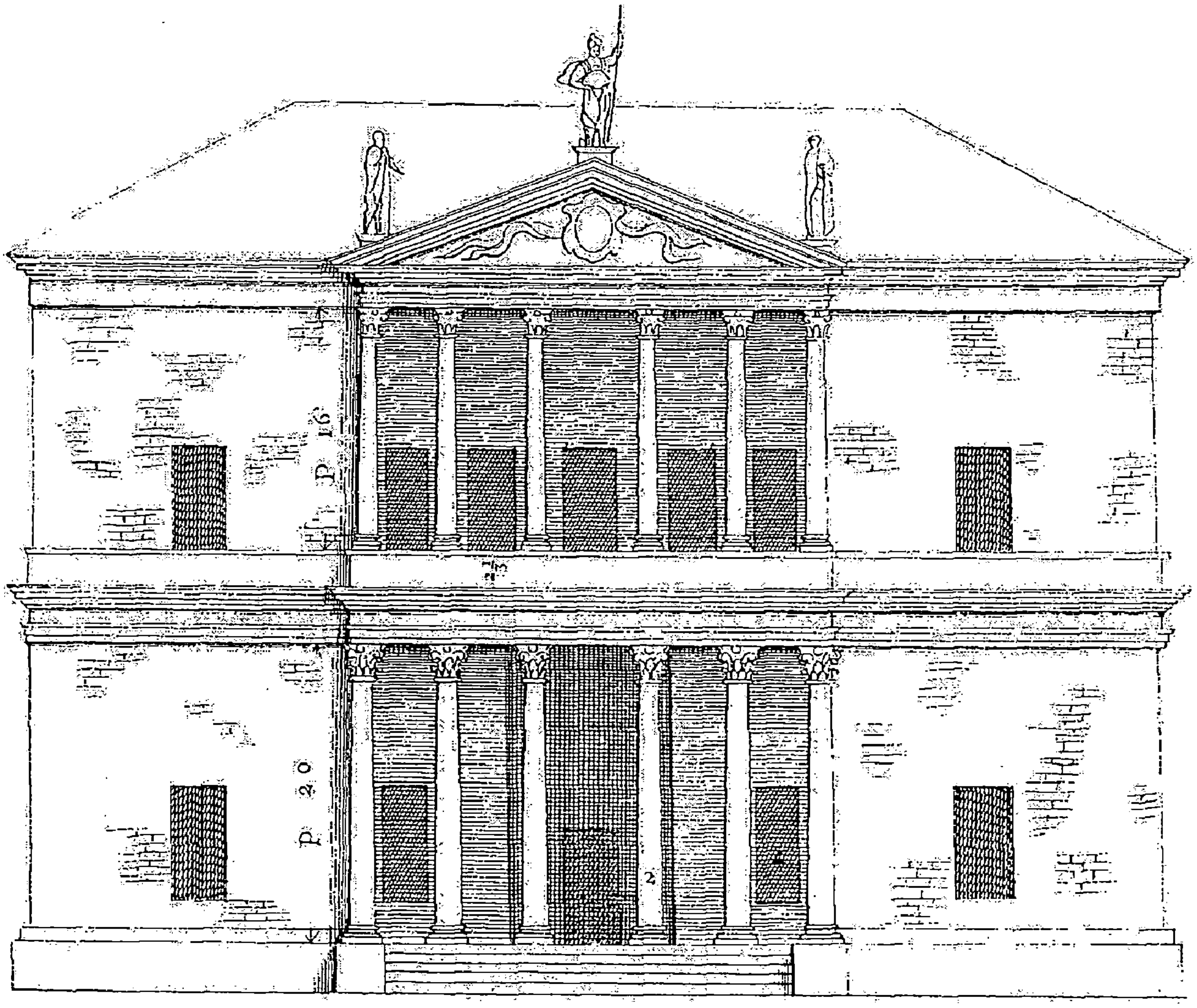


Figure 4.184 Plan of Gio Battista Gazadore in Vicenza, developed on the basis of schematic analysis

Scale 1" = 16'



Source: Plate 57 A project of Palazzo for Gio. Battista Garzadore
in Vicenza in elevation

Figure 4.185 Elevation of Palazzo for Gio. Battista Garzadore in Vicenza

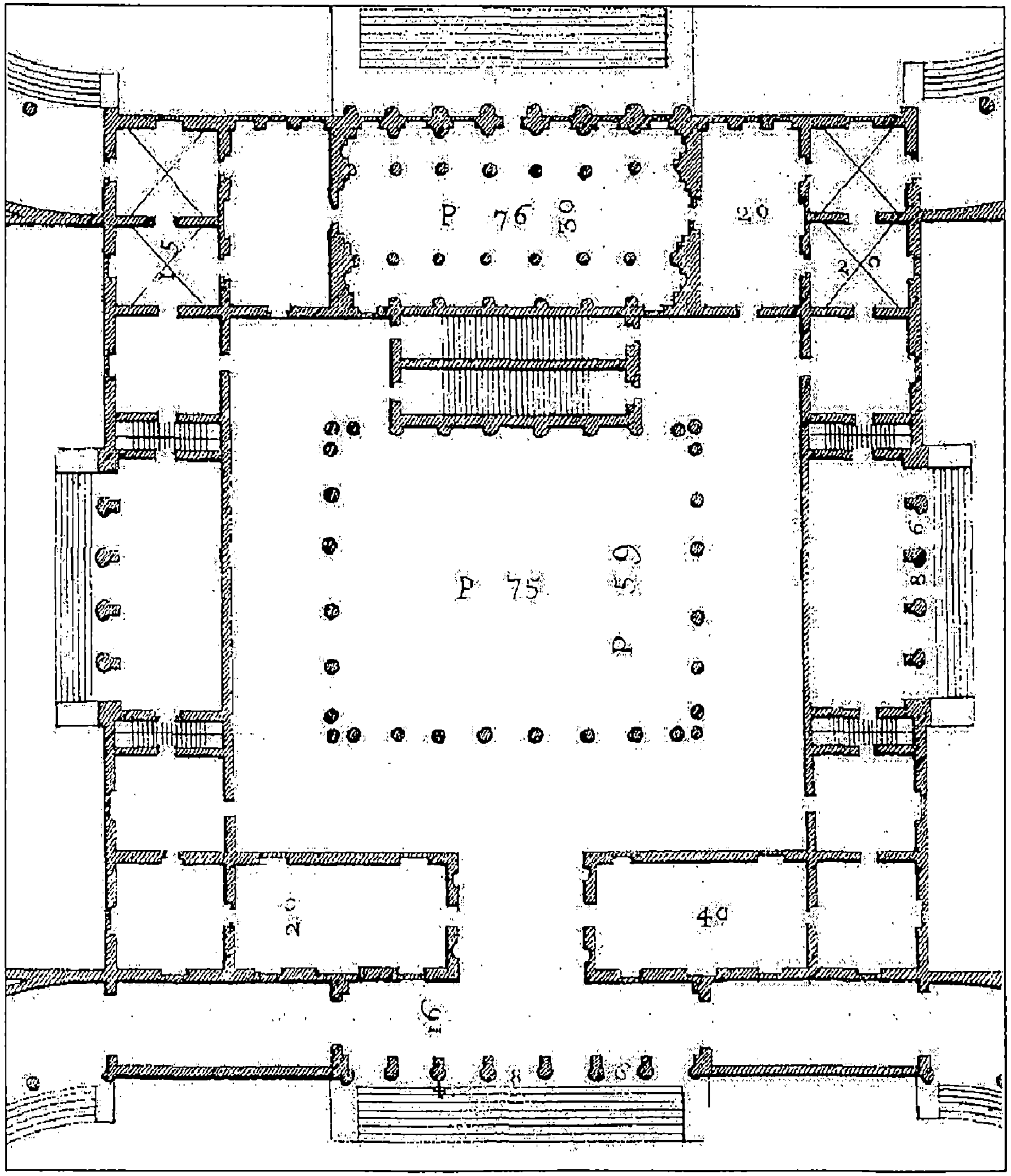


Figure 4.186 Plan Of Leonardo Mocenico at Brenta Scanned From Plate 058,
'I Quattro Libri Dell' Architecttura', Book-2

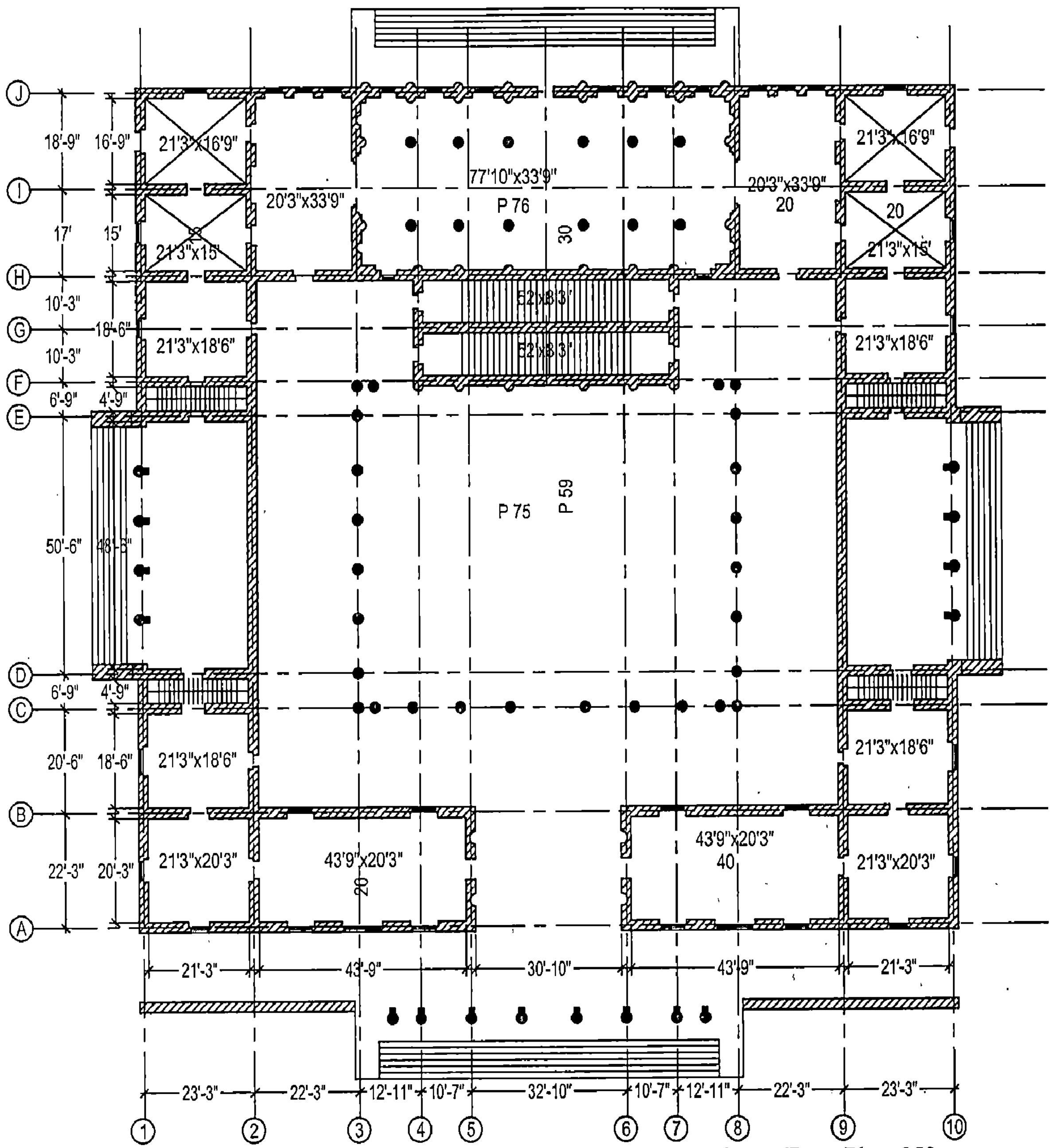


Figure 4.187 Plan Of Leonardo Mocenico at Brenta Redrawn From Plate 058, 'I Quattro Libri Dell' Architecttura', Book-2

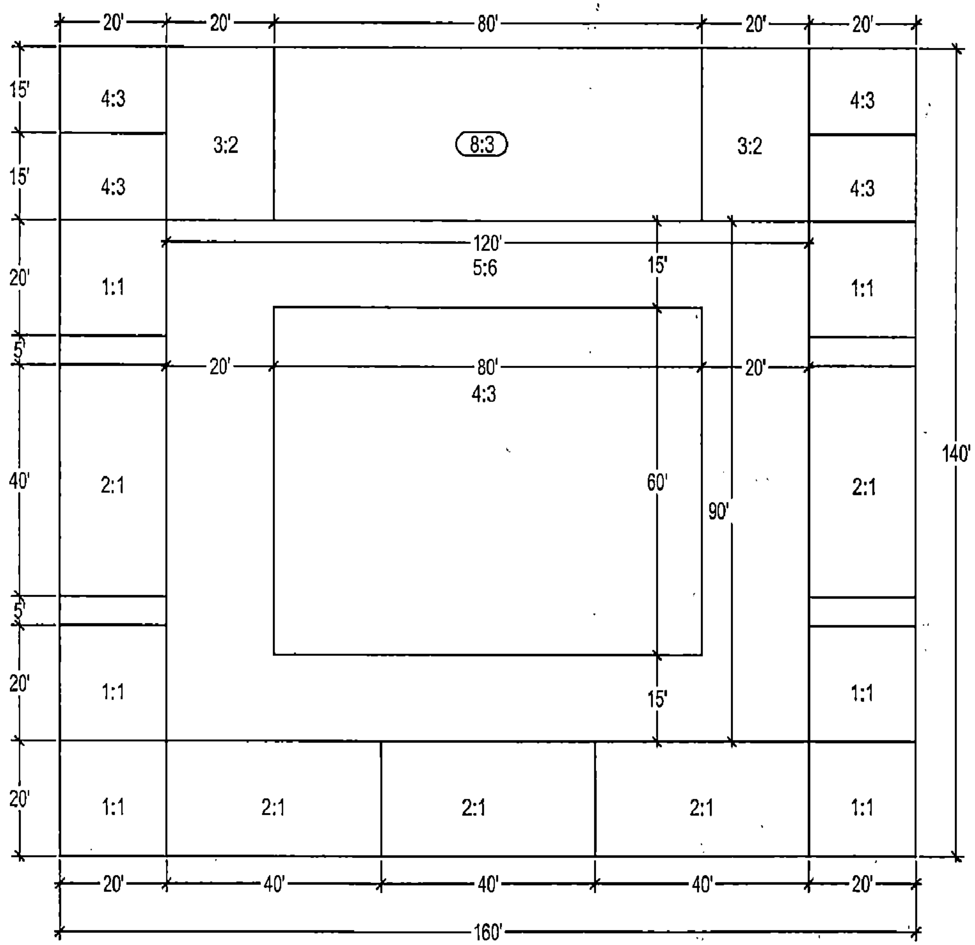


Figure 4.188 Schematic Analysis Leonardo Mocenico at Brenta, Plate 058,
'I Quattro Libri Dell' Architecttura', Book-2

PLATE 58, A PROJECT OF VILLA FOR LEONARDO MOCENICO IN BRENTA

We can infer the following from schematic line diagram analysis:

- The main building whole is 160'x 140' which is 8:7.
- The central court yard is 80'X 60' which is 4:3.
- The colonnade surrounding the central court is 120'X 90' which is 4:3
- The 160' front is symmetrically divided in to 20':40':40':40':20' which is 1:2:2:2:1.
- The 140' side is asymmetrically divided in to 20':20':5':40':5' 20':15':15' which is 4:4:1:4:3:3.
- Main room sizes and ratios observed are 20'X15', 20'X20', 30'X20' and 40'X20' which could be interpreted as 4:3, 1:1, 3:2 and 2:1.
- Non standard room ratios like 8:3 is identified.

  8:3 could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

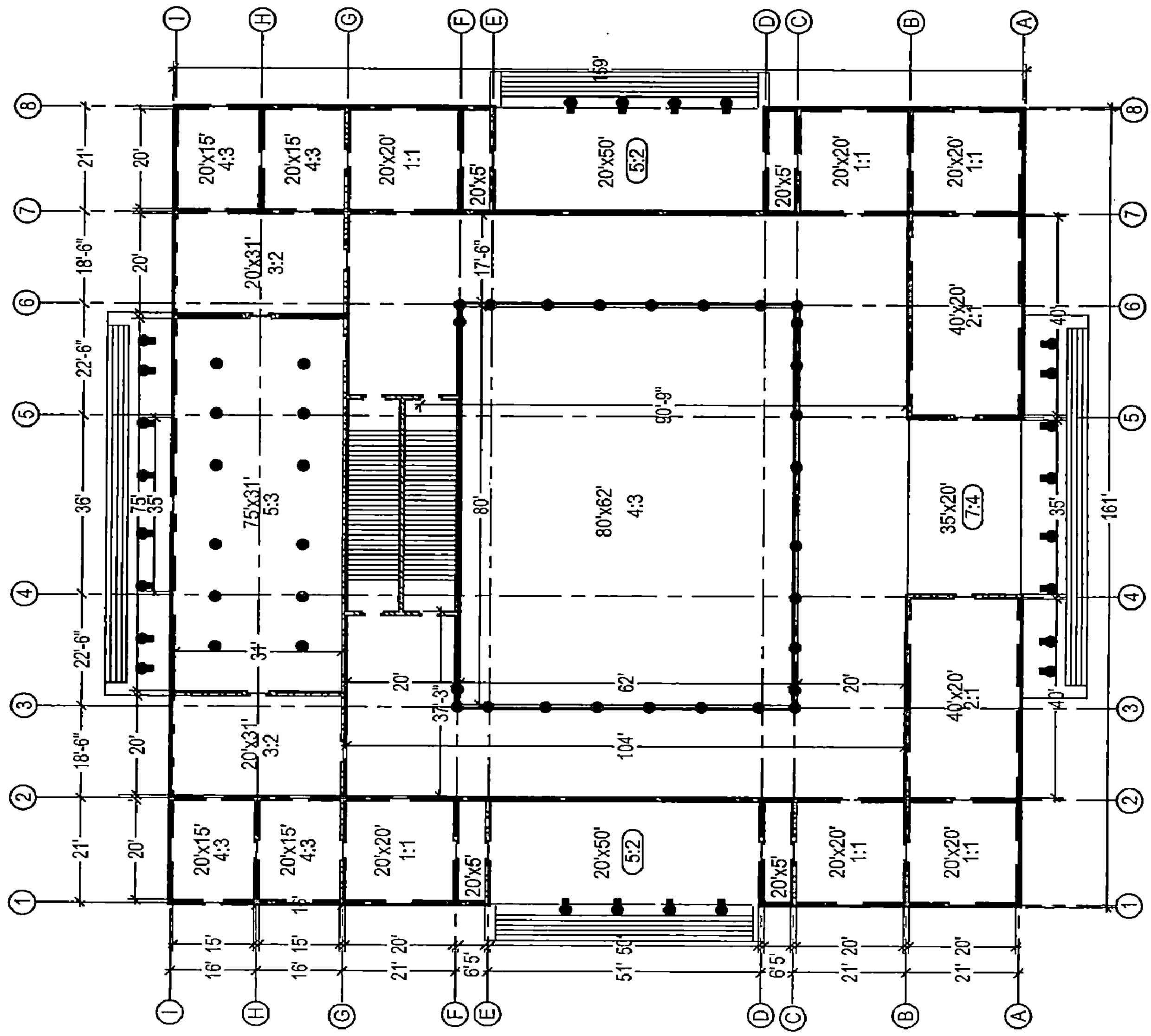
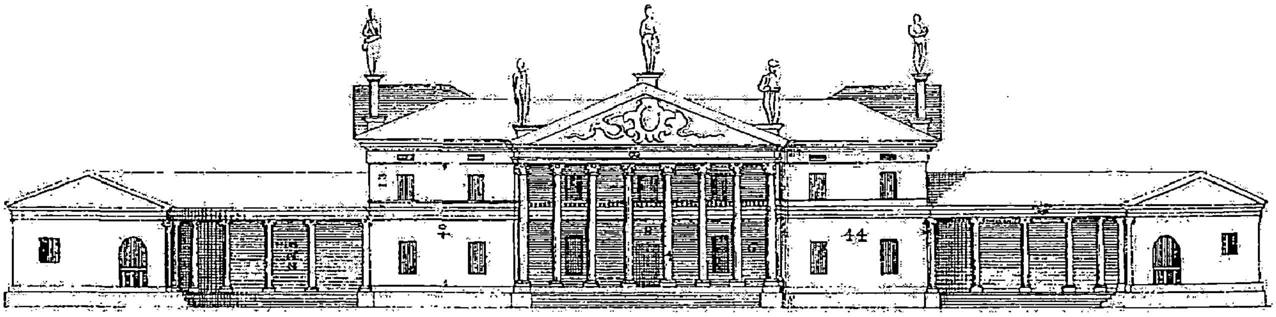


Figure 4.189 Plan of Leonardo Mocenico at Brenta, developed on the basis of schematic analysis



Source: Plate 58 A project of Villa for Leonardo Mocenico in Brenta in elevation

Figure 4.190 Elevation of Villa for Leonardo Mocenico in Brenta

4.7 CONCLUDING NOTE ON ANALYSIS OF PALLADIAN VILLA PLANS

Having studied the villa plans, the ratios observed in each villa are classified into three categories with room ratios as per sizes from Palladian plates, room dimension derived through schematic analysis and room dimension derived from plan developed on basis of schematic analysis. The room ratios are put in tabular format differentiating them as P, D and N. They are classified as Prescribed room ratio (i.e. Palladio's preferred seven room ratios), Derived room ratios (i.e. ratios that could be derived from the theories of Palladio's predecessors and other relevant theories as explained in previous chapters) and Non theoretical room ratios (i.e. the ratios that neither could be related to Palladio's preferred ratios nor could be derived from the theories of Palladio's predecessors). These room dimensions from Palladian villa plans (from book 2 of *I Quattro Libri Dell' Architettura*) are tabulated with longer side first with descending order of room size, i.e. longer side of longest room first followed by long side of second largest room and so on.

The tabular format (with table 4.9); lists the Derived and Non standard ratios as observed through 'Rectified Room ratio as per schematic Analysis' and hints at their possible derivations. This understanding is developed on basis of various theories of proportions and methods of deriving proportions as studied earlier in the research. These ratios for interpretive understanding are selected from the column of schematic analysis, as through the process of its derivation and construction of proportional plans; it eliminates non-Palladian states and hints at more probable Palladian ratios in constitution of its planning. Thus it gives better understanding of proportional planning grammar. Ratios are tabulated with higher integer first followed by its descending order, i.e. higher value ratio first followed by ratios with smaller integers.

It has been observed that the room dimensions on the plan do not necessarily take into account the physical dimension of walls. For example Villa Valmarana (plate 42) has two rooms 15' (15'*15, i.e. 1:1) and 12' (12'*15', i.e. 5:3) long respectively, flanking a larger room 27' (27'*17') long, which leaves no allowance for wall thickness if we were to read that as 27'*25'6" (3:2) or 17'*28'3" (5:3). In doing so the room ratio of secondary spaces (12'*15') are compromised to preserve the proportions of primary space (27'*17'). Moreover the drawings at times did not represent the actual building with all its structural requirements considered. At times one notices logical lack of consideration of varied wall thickness for different loads on it by virtue of different room heights. For example Villa Poiana (plate 41) had series of rooms each with slightly different ceiling type and heights (as seen in elevation in plate 41 of appendix), leading to postulation that it had different wall thickness considering a basic structural requirement for load bearing structure. This would mean that Palladio's prescribed room ratios were not preserved but the room dimensions were slightly adjusted one way or the other to accommodate structure. Palladio dealt with the inter relationship of general room shapes and not the interrelationship of wall thickness and room dimensions. To accommodate for this deficiencies the dimensions in the study are altered as explained earlier in the study.

4.8-Table of ratios from analyzed plates

Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
Palazzo (or	Plate-1	32 X 28	8 : 7	D	32 X 28	8 : 7	D	32 X 28	8 : 7	D
Palagio) Antonini at		32 X 13.5	32 : 13 .5	N	32 X 12	8 : 3	D	32 X 12	8 : 3	D
Udine		28 X 17	28 : 17	N	28 X 16	7 : 4	D	28 X 16	7 : 4	D
		24 X 17	24 : 17	N	24 X 16	3 : 2	P	24 X 16	3 : 2	P
		17 X 12	17 : 12	N	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		12.25 X 12.5	12.25 : 12.5	N	16 X 12	4 : 3	P	12 X 12	1 : 1	P
		12.25 X 8	12.25 : 8	N	12 X 8	3 : 2	P	12 X 9	4 : 3	P
Palazzo Chierirati	Plate-2	54 X 15.5	54 : 15.5	N	60 X 15	4 : 1	D	60 X 19.5	60 : 20	N
at Vincenza		54 X 16	27 : 8	N	60 X 18	10 : 3	D	60 X 18	10 : 3	D
		30 X 18	5 : 3	P	30 X 18	5 : 3	P	30 X 18	5 : 3	P
		30 X 13	30 : 13	N	30 X 12	5 : 2	D	30 X 12	5 : 2	D
		25 X 12	25 : 12	N	24 X 12	2 : 1	P	23 X 11.5	2 : 1	P
		24 X 11.25	24 : 11.25	N	36 X 12	3 : 1	D	36 X 12	3 : 1	D
		18 X 18	1 : 1	P	18 X 18	1 : 1	P	18 X 18	1 : 1	P
		18 X 12	3 : 2	P	18 X 12	3 : 2	P	18 X 12	3 : 2	P
		10 X 10	1 : 1	P	12 X 12	1 : 1	P	12 X 12	1 : 1	P
Palazzo Iseppo de'	Plate-4	30 X 30	1 : 1	P	30 X 30	1 : 1	P	30 X 30	1 : 1	P
Porti at Vicenza		30 X 20	3 : 2	P	30 X 20	3 : 2	P	30 X 20	3 : 2	P
		30 X 10	3 : 1	D	30 X 10	3 : 1	D	30 X 10	3 : 1	D
		20 X 20	1 : 1	P	20 X 20	1 : 1	P	20 X 20	1 : 1	P

4.8-Table of ratios from analyzed plates

Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		20 X 9	5 : 4.5	N	20 X 10	2 : 1	P	20 X 9	20 : 9	N
		9 X 7	9 : 7	D	10 X 10	1 : 1	P	9 X 9	1 : 1	P
Palazzo Giovanni Battista Della Torre at Verona	Plate-7	50 X 34	25 : 17	N	50 X 30	5 : 3	P	52 X 30	52 : 30	N
		30 X 19	30 : 19	N	30 X 20	3 : 2	P	30 X 20	3 : 2	P
		22.5 X 18	22.5 : 18	N	24 X 18	4 : 3	P	24 X 18	4 : 3	P
		19 X 19	1 : 1	P	20 X 20	1 : 1	P	20 X 20	1 : 1	P
		19 X 17	19 : 17	N	20 X 20	1 : 1	P	20 X 16	5 : 4	D
		19 X 15	19 : 15	N	20 X 15	4 : 3	P	20 X 15	4 : 3	P
		19 X 11	19 : 11	N	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		19 X 10	19 : 10	N	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		19 X 10	19 : 10	N	20 X 10	2 : 1	P	20 X 8	5 : 2	D
		18 X 12	3 : 2	P	20 X 12	5 : 3	P	20 X 12	5 : 3	P
Palazzo Ottavio de' Thiene at Vicenza	Plate-8	102 X 102	1 : 1	P	96 X 96	1 : 1	P	100 X 98	50 : 49	N
		56 X 20	14 : 5	N	48 X 24	2 : 1	P	48 X 24	2 : 1	P
		55 X 39	55 : 19	N	60 X 36	5 : 3	P	60 X 36	5 : 3	P
		34.5 X 20	34.5 : 20	N	36 X 24	3 : 2	P	36 X 24	3 : 2	P
		30 X 20	3 : 2	P	30 X 24	5 : 4	D	30 X 24	5 : 4	D
		20 X 20	1 : 1	P	24 X 24	1 : 1	P	24 X 24	1 : 1	P
		20 X 20	1 : 1	P	24 X 18	4 : 3	P	24 X 18	4 : 3	P
		20 X 10	2 : 1	P	24 X 12	2 : 1	P	24 X 12	2 : 1	P

4.8-Table of ratios from analyzed plates

Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
Palazzo Valmarana at Vicenza	Plate-11	120 X 60	2 : 1	P	120 X 60	2 : 1	P	126 X 60	63 : 30	N
		87 X 44.5	87 : 44.5	N	80 X 50	8 : 5	D	82 X 52	41 : 26	N
		55 X 14	25.5 : 7	N	48 X 16	3 : 1	D	48 X 16	3 : 1	D
		38 X 19	38 : 19	N	40 X 20	2 : 1	P	40 X 20	2 : 1	P
		36 X 18	2 : 1	P	36 X 18	2 : 1	P	36 X 18	2 : 1	P
		24 X 10.25	24 : 10.25	N	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		20.5 X 17.5	27.5 : 17.5	N	20 X 20	1 : 1	P	42 X 21	2 : 1	P
		19 X 12	19 : 12	N	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		18 X 15	6 : 5	D	20 X 20	1 : 1	P	20 X 20	1 : 1	P
		16 X 8	2 : 1	P	15 X 15	1 : 1	P	20 X 15	4 : 3	P
		12.75 X 8.5	12.75 : 8.5	N	10 X 10	1 : 1	P	20 X 10	2 : 1	P
Villa Paolo Almerico near Vicenza	Plate-13	30 X 30	1 : 1	P	30 X 30	1 : 1	P	30 X 30	1 : 1	P
		29 X 11.25	29 : 11.25	N	30 X 10	3 : 1	D	30 X 12	5 : 2	D
		26 X 15	26 : 15	N	25 X 15	5 : 3	P	25 X 15	5 : 3	P
		15 X 11	15 : 11	N	15 X 12	5 : 4	D	15 X 12	5 : 4	D
		15 X 6	5 : 2	D	15 X 6	5 : 2	D	15 X 4	15 : 4	N
		15 X 7	15 : 7	N	15 X 10	3 : 2	P	15 X 10	3 : 2	P
Palazzo Giulio Capra at Vicenza	Plate-14	32 X 32	1 : 1	P	36 X 27	4 : 3	P	36 X 27	4 : 3	P
		27 X 17	27 : 17	N	27 X 18	3 : 2	P	27 X 18	3 : 2	P

4.8-Table of ratios from analyzed plates

Villa	Plate no.	Room size in plate			Room ratio as per size in plate			P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis			Rectified Room ratio as Per schematic Analysis			P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis			Rectified room ratio as per developed plan on the basis of schematic Analysis			P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		27	X	10	27	:	10	N	27	X	9	3	:	1	D	27	X	9	3	:	1	D
		18	X	13	18	:	13	N	21	X	12	7	:	4	D	21	X	12	7	:	4	D
		13	X	13	1	:	1	P	12	X	12	1	:	1	P	12	X	12	1	:	1	P
Palazzo Montano Barbarano at Vicenza	Plate-15	41.5	X	25	41.25	:	25	N	40	X	24	5	:	3	P	41	X	24	41	:	24	N
		33	X	25	33	:	25	N	32	X	24	4	:	3	P	32	X	24	4	:	3	P
		25	X	11	25	:	11	N	24	X	12	2	:	1	P	24	X	12	2	:	1	P
		24	X	19	24	:	19	N	24	X	16	3	:	2	P	24	X	16	3	:	2	P
		24	X	16	3	:	2	P	24	X	16	3	:	2	P	24	X	16	3	:	2	P
		23	X	16	23	:	16	N	24	X	16	3	:	2	P	24	X	16	3	:	2	P
		19	X	16	19	:	16	N	16	X	16	1	:	1	P	16	X	16	1	:	1	P
		16	X	16	1	:	1	P	16	X	16	1	:	1	P	16	X	16	1	:	1	P
		16	X	12	4	:	3	P	16	X	12	4	:	3	P	16	X	12	4	:	3	P
		16	X	11	16	:	11	N	16	X	12	4	:	3	P	16	X	12	4	:	3	P
		12	X	7	12	:	7	N	12	X	8	3	:	2	P	12	X	6	2	:	1	P
		9	X	9	1	:	1	P	8	X	8	1	:	1	P	7	X	7	1	:	1	P
		9	X	5.5	9	:	5.5	N	8	X	8	1	:	1	P	7	X	5	7	:	5	P
Villa Marco and Daniele de Pisani at Begnolo	Plate-30	46.5	X	16	46.5	:	16	N	48	X	16	3	:	1	D	50	X	16	12.5	:	4	N
		36	X	9	4	:	1	D	36	X	9	4	:	1	D	36	X	9	4	:	1	D
		30	X	18	5	:	3	P	30	X	18	5	:	3	P	30	X	18	5	:	3	P
		29	X	24	29	:	24	N	32	X	12	8	:	3	D	32	X	24	4	:	3	P

4.8-Table of ratios from analyzed plates

Villa	Plate no.	Room size in plate			Room ratio as per size in plate			P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis			Rectified Room ratio as Per schematic Analysis			P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis			Rectified room ratio as per developed plan on the basis of schematic Analysis			P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		24	X	16	3	:	2	P	24	X	16	3	:	2	P	24	X	16	3	:	2	P
		18	X	18	1	:	1	P	20	X	18	10	:	9	N	22	X	18	11	:	9	N
		16	X	16	1	:	1	P	16	X	16	1	:	1	P	16	X	16	1	:	1	P
		12	X	8	3	:	2	P	12	X	8	3	:	2	P	12	X	8	3	:	2	P
		10	X	8	5	:	4	D	12	X	8	3	:	2	P	11	X	8	11	:	8	N
Villa Francesco Badoero	Plate-31	32	X	16	2	:	1	P	32	X	16	2	:	1	P	33	X	16	33	:	16	N
		34	X	12	8	:	3	D	32	X	12	8	:	3	D	34	X	11	34	:	11	N
		26.5	X	16	26.5	:	16	N	28	X	16	7	:	4	D	28	X	16	7	:	4	P
		16	X	16	1	:	1	P	16	X	16	1	:	1	P	16	X	16	1	:	1	P
		16	X	8	2	:	1	P	16	X	8	2	:	1	P	16	X	8	2	:	1	P
Villa Marco Zeno	Plate-32	30	X	14	15	:	7	N	28	X	14	2	:	1	P	30	X	12	5	:	2	D
		29	X	12	29	:	12	N	28	X	14	2	:	1	P	28	X	14	2	:	1	P
		21.5	X	14	21.5	:	14	N	21	X	14	3	:	2	P	22	X	15	22	:	15	N
		14	X	14	1	:	1	P	14	X	14	1	:	1	P	14	X	14	1	:	1	P
		14	X	12	7	:	6	D	14	X	14	1	:	1	P	14	X	14	1	:	1	P
		14	X	5.5	14	:	5.5	N	14	X	7	2	:	1	P	14	X	7	2	:	1	P
Villa Nicolo and Luigi Foscari	Plate-33	46.5	X	17.25	46.5	:	17.25	N	44	X	16	11	:	4	N	46	X	16	23	:	8	N
		36	X	12	3	:	1	D	36	X	12	3	:	1	D	36	X	12	3	:	1	D
		24	X	16	3	:	2	P	24	X	16	3	:	2	P	25	X	16	25	:	16	N

4.8-Table of ratios from analyzed plates

Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	16 X 16	1 : 1	P
		16 X 12	4 : 3	P	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		12 X 7	12 : 7	N	12 X 8	3 : 2	P	12 X 8	3 : 2	P
Villa Elettlo De Aquileia and Marc' Antonio De Barbari	Plate-34	152 X 60	38 : 15	N	136 X 68	2 : 1	P	140 X 70	2 : 1	P
		46 X 20	23 : 10	N	44 X 22	2 : 1	P	46 X 23	2 : 1	P
		32 X 16	2 : 1	P	32 X 16	2 : 1	P	32 X 16	2 : 1	P
		32 X 12	8 : 3	D	32 X 12	8 : 3	D	32 X 12	8 : 3	D
		20 X 20	1 : 1	P	20 X 20	1 : 1	P	20 X 20	1 : 1	P
		20 X 12	5 : 3	P	20 X 12	5 : 3	P	20 X 10	2 : 1	P
		20 X 9	10 : 4.5	N	20 X 9	10 : 4.5	N	20 X 10	2 : 1	P
		20 X 10	2 : 1	P	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		18 X 18	1 : 1	P	20 X 18	10 : 9	D	20 X 12	5 : 3	P
		14 X 12	7 : 6	D	12 X 14	7 : 6	D	11 X 8	11 : 8	N
		12 X 6	2 : 1	P	12 X 6	2 : 1	P	10 X 10	1 : 1	P
			:			:			:	
Villa Francesco Pisani	Plate-35	28 X 28	1 : 1	P	28 X 28	1 : 1	P	28 X 28	1 : 1	P
		28 X 11.25	28 : 11.25	N	28 X 12	7 : 3	D	28 X 12	7 : 3	D
		28 X 16	7 : 4	D	28 X 16	7 : 4	D	28 X 16	7 : 4	D
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	16 X 16	1 : 1	P
		16 X 8.5	16 : 8.5	N	16 X 8	2 : 1	P	16 X 8	2 : 1	P
		11.25 X 16	11.25 : 16	N	16 X 12	4 : 3	P	16 X 12	4 : 3	P

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Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		6.75 X 6.75	1 : 1	P	7 X 7	1 : 1	P	6 X 6	1 : 1	P
Villa Giorgio Cornaro	Plate-36	32 X 27.25	32 : 27.25	N	32 X 28	8 : 7	D	32 X 29	32 : 29	N
		32 X 14.5	31 : 14.5	N	32 X 12	8 : 3	D	32 X 12	8 : 3	D
		32 X 11	32 : 11	N	32 X 12	8 : 3	D	32 X 12	8 : 3	D
		26.5 X 16	26.5 : 16	N	28 X 16	7 : 4	D	28 X 16	7 : 4	D
		24 X 16	3 : 2	P	24 X 16	3 : 2	P	24 X 16	3 : 2	P
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	16 X 16	1 : 1	P
		16 X 11	16 : 11	N	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		16 X 10	8 : 5	D	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		16 X 10	8 : 5	D	16 X 8	2 : 1	P	16 X 8	2 : 1	P
Villa Leonardo Mocenico	Plate-37	32 X 32	1 : 1	P	32 X 32	1 : 1	P	31 X 30	1 : 1	P
		32 X 20	8 : 5	D	32 X 20	8 : 5	D	30 X 20	3 : 2	P
		32 X 7.5	32 : 7.5	N	32 X 12	8 : 3	D	30 X 10	3 : 1	D
		26 X 16	13 : 8	D	26 X 16	13 : 8	D	25 X 15	5 : 3	P
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	15 X 15	1 : 1	P
		16 X 10	8 : 5	D	16 X 10	8 : 5	D	15 X 9	5 : 3	P
Villa Leonardo Emo (or Erno)	Plate-38	27 X 27	1 : 1	P	28 X 28	1 : 1	P	28 X 28	1 : 1	P
		27 X 16	27 : 16	N	28 X 16	7 : 4	D	28 X 16	7 : 4	D
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	16 X 16	1 : 1	P

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Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		16 X 12	4 : 3	P	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		12 X 8.5	12 : 8.5	N	12 X 6	2 : 1	P	12 X 9	4 : 3	P
Villa Biagio	Plate-39	28 X 12	7 : 3	D	28 X 12	7 : 3	D	30 X 12	5 : 2	D
		28 X 16	7 : 4	D	28 X 16	7 : 4	D	30 X 15	2 : 1	P
		26.5 X 16	26.5 : 16	N	28 X 16	7 : 4	D	28 X 16	7 : 4	D
		16 X 12	4 : 3	P	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		12 X 12	1 : 1	P	12 X 12	1 : 1	P	12 X 12	1 : 1	P
		12 X 5.5	12 : 5.5	N	12 X 8	3 : 2	P	12 X 8	3 : 2	P
Villa Gioralmo	Plate-40	21.25 X 17	21.25 : 17	N	21 X 15	7 : 5	P	21 X 15	7 : 5	P
		22.5 X 15	22.5 : 15	N	21 X 15	7 : 5	P	21 X 15	7 : 5	P
		18 X 11.5	18 : 11.5	N	18 X 9	2 : 1	P	18 X 9	2 : 1	P
		17.5 X 18	17.5 : 18	N	18 X 18	1 : 1	P	18 X 18	1 : 1	P
		15 X 12	5 : 4	D	15 X 12	5 : 4	D	15 X 12	5 : 4	D
Villa Cavalier Pogliana (or Poiana)	Plate-41	36 X 10	18 : 5	N	36 X 12	3 : 1	D	38.5 X 11	38.5 : 11	N
		34 X 18	17 : 9	N	36 X 18	2 : 1	P	37 X 18.5	37 : 19	N
		30 X 30	1 : 1	P	30 X 30	1 : 1	P	30 X 30	1 : 1	P
		30 X 18	5 : 3	P	30 X 18	5 : 3	P	30 X 18	5 : 3	P
		30 X 17	30 : 17	N	30 X 18	5 : 3	P	30 X 18	5 : 3	P
		18 X 18	1 : 1	P	18 X 18	1 : 1	P	18 X 18	1 : 1	P

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Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		18 X 8	9 : 4	D	18 X 9	2 : 1	P	18 X 9	2 : 1	P
		13.5 X 8	13.5 : 8	N	18 X 9	2 : 1	P	18 X 9	2 : 1	P
Villa Francesco Valmarana	Plate-42	45 X 12	15 : 4	N	40 X 12	10 : 3	D	40 X 12	10 : 3	D
		32.5 X 25	32.5 : 25	N	32 X 24	4 : 3	P	32 X 24	4 : 3	P
		27 X 17	27 : 17	N	28 X 16	7 : 4	D	29 X 15	29 : 15	N
		16 X 12	4 : 3	P	16 X 12	4 : 3	P	16 X 12	4 : 3	P
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	16 X 16	1 : 1	P
		12 X 12	1 : 1	P	12 X 12	1 : 1	P	12 X 12	1 : 1	P
		12 X 5	12 : 5	N	12 X 8	3 : 2	P	12 X 8	3 : 2	P
Villa Francesco and Lodovico De Trissini	Plate-43	30 X 19.25	39 : 19.25	N	30 X 18	5 : 3	P	30 X 18	5 : 3	P
		18 X 14	9 : 7	D	18 X 14	9 : 7	D	18 X 14	9 : 7	D
		18 X 12	3 : 2	P	18 X 12	3 : 2	P	18 X 12	3 : 2	P
		36 X 36	1 : 1	P	36 X 36	1 : 1	P	36 X 36	1 : 1	P
		36 X 14	18 : 7	N	36 X 14	18 : 7	N	36 X 14	18 : 7	N
Villa Mario Repeta	Plate 44	105.8 X 20	5.29 : 1	N	100 X 20	5 : 1	D	99 X 19	99 : 19	N
		59.25 X 20	59.25 : 20	N	50 X 20	5 : 2	D	49 X 19	49 : 19	N
		39.25 X 20	39.25 : 20	N	40 X 20	2 : 1	P	39 X 19	39 : 19	N
		20 X 20	1 : 1	P	25 X 20	5 : 4	D	24 X 19	24 : 19	N
		20 X 20	1 : 1	P	20 X 20	1 : 1	P	19 X 19	1 : 1	P

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		20 X 8.5	20 : 8.5	N	20 X 10	2 : 1	P	19 X 9	19 : 9	N
Villa Odoardo (Oleardo) and Theodoro De Thiene	Plate 45	36 X 36	1 : 1	P	36 X 36	1 : 1	P	36 X 36	1 : 1	P
		36 X 18	2 : 1	P	36 X 18	2 : 1	P	36 X 18	2 : 1	P
		21.25 X 12	21.25 : 12	N	18 X 12	3 : 2	P	18 X 12	3 : 2	P
		18 X 18	1 : 1	P	18 X 18	1 : 1	P	18 X 18	1 : 1	P
Villa Giacomo Angarano	Plate 46	41.5 X 20	41.5 : 20	N	35 X 20	7 : 4	D	34 X 20	17 : 10	N
		36 X 18	2 : 1	P	36 X 18	2 : 1	P	37 X 18	37 : 18	N
		33 X 20	33 : 20	N	30 X 20	3 : 2	P	29.75 X 20	29.8 : 20	N
		22 X 18	11 : 9	D	24 X 18	4 : 3	P	24 X 18	4 : 3	P
		18 X 15.25	18 : 15.25	N	18 X 12	3 : 2	P	18 X 12	3 : 2	P
		18 X 13	18 : 13	N	18 X 15	6 : 5	D	18 X 15	6 : 5	D
		20 X 10	2 : 1	P	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		20 X 13	20 : 13	N	20 X 15	4 : 3	P	20 X 16	5 : 4	D
Villa Ottavio (Ottavie) Thiene	Plate 47	56 X 34.25	56 : 34.25	N	60 X 30	2 : 1	P	62 X 34	31 : 17	N
		44 X 21	44 : 21	N	40 X 20	2 : 1	P	40 X 20	2 : 1	P
		33.5 X 20	33.5 : 20	N	30 X 20	3 : 2	P	30 X 20	3 : 2	P
		23.75 X 20	23.75 : 20	N	25 X 20	5 : 4	D	25 X 20	12.5 : 10	N
		23.75 X 12.75	23.75 : 12.75	N	25 X 10	5 : 2	D	25 X 10	5 : 2	D
		22.5 X 21	22.5 : 21	N	20 X 20	1 : 1	P	20 X 20	1 : 1	P

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Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		21.5 X 20	21.2 : 20	N	20 X 20	1 : 1	P	20 X 20	1 : 1	P
		21.5 X 12.25	21.2 : 12.25	N	20 X 10	2 : 1	P	20 X 10	2 : 1	P
Villa Girolama De Godi	Plate 48	36 X 24	3 : 2	P	36 X 24	3 : 2	P	36 X 24	3 : 2	P
		24 X 16	3 : 2	P	24 X 16	3 : 2	P	24 X 16	3 : 2	P
e	Plate 49	36 X 20	9 : 5	D	36 X 20	9 : 5	D	35 X 19	35 : 19	N
		24 X 24	1 : 1	P	24 X 24	1 : 1	P	23 X 23	1 : 1	P
		24 X 19.25	24 : 19.25	N	24 X 20	6 : 5	D	23 X 19	23 : 19	N
		24 X 18	4 : 3	P	24 X 18	4 : 3	P	23 X 17	23 : 17	N
		24 X 10	12 : 5	D	24 X 10	12 : 5	D	23 X 10	23 : 10	N
Villa Anibale	Plate 50	40 X 20	2 : 1	P	40 X 20	2 : 1	P	42 X 21	2 : 1	P
		27 X 16	27 : 16	N	28 X 16	7 : 4	D	28 X 16	7 : 4	D
		24 X 9	8 : 3	D	24 X 10	12 : 5	D	24 X 10	12 : 5	D
		16 X 16	1 : 1	P	16 X 16	1 : 1	P	16 X 16	1 : 1	P
		16 X 12	4 : 3	P	16 X 12	4 : 3	P	16 X 12	4 : 3	P
Villa of the Ancients	Plate 51	60 X 60	1 : 1	P	60 X 60	1 : 1	P	60 X 60	1 : 1	P
		56.5 X 19	56.5 : 19	N	50 X 20	5 : 2	D	49 X 19	49 : 19	N
		44.5 X 44.5	44.5 : 44.5	N	45 X 45	1 : 1	P	44 X 44	1 : 1	P
		40 X 16	5 : 2	D	40 X 20	2 : 1	P	39 X 19	39 : 19	N

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Villa	Plate no.	Room size in plate	Room ratio as per size in plate	P = prescribed room ratio, D=derived room ratio, N=non theoretical ratio	Rectified room size as per schematic Analysis	Rectified Room ratio as Per schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio	Rectified room size as per developed plan on the basis of schematic Analysis	Rectified room ratio as per developed plan on the basis of schematic Analysis	P = prescribed room ratio. D = derived room ratio, N = non theoretical ratio
		40 X 40	1 : 1	P	40 X 40	1 : 1	P	40 X 40	1 : 1	P
		31.5 X 16	31.5 : 16	N	35 X 15	7 : 3	D	34 X 14	34 : 14	N
		24.75 X 19	24.75 : 19	N	30 X 20	3 : 2	P	29 X 19	29 : 19	N
		27 X 19	27 : 19	N	30 X 20	3 : 2	P	29 X 19	29 : 19	N
		25.25 X 16.5	25.25 : 16.5	N	25 X 15	4 : 3	P	24 X 14	12 : 7	N
		19 X 19	1 : 1	P	20 X 20	1 : 1	P	19 X 19	1 : 1	P
		19 X 11	19 : 11	N	20 X 10	2 : 1	P	19 X 11.5	19 : 12	N
		19 X 14	19 : 14	N	20 X 15	4 : 3	P	19 X 9	19 : 9	N
		16.5 X 16.5	1 : 1	P	15 X 15	1 : 1	P	14 X 14	1 : 1	P
A project for a palazzo	Plate 52	30 X 12	5 : 2	D	30 X 12	5 : 2	D	30 X 12	5 : 2	D
		30 X 30	1 : 1	P	30 X 30	1 : 1	P	30 X 30	1 : 1	P
		30 X 18	5 : 3	P	30 X 18	5 : 3	P	30 X 18	5 : 3	P
		27 X 18	3 : 2	P	27 X 18	3 : 2	P	27 X 18	3 : 2	P
		18 X 12	3 : 2	P	18 X 12	3 : 2	P	18 X 12	3 : 2	P
		14 X 7	2 : 1	P	14 X 7	2 : 1	P	14 X 7	2 : 1	P
A project for a palazzo	Plate 53	45 X 37.5	45 : 34.75	N	40 X 35	8 : 7	D	40 X 35	8 : 7	D
		34.5 X 20	34.75 : 19	N	35 X 20	7 : 4	D	35 X 20	7 : 4	D
		30 X 24	5 : 4	D	30 X 25	6 : 5	D	30 X 25	6 : 5	D
		30 X 20	3 : 2	P	30 X 20	3 : 2	P	30 X 20	3 : 2	P
		20 X 20	1 : 1	P	20 X 20	1 : 1	P	20 X 20	1 : 1	P

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		20	X	16	5	:	4	D	20	X	15	4	:	3	P	20	X	15	4	:	3	P
		20	X	8	5	:	2	D	20	X	10	2	:	1	P	20	X	9	20	:	9	N
		10	X	5	2	:	1	P	10	X	5	2	:	1	P	9	X	4.5	2	:	1	P
A project for a palazzo for Francesco	Plate 54	40	X	20	2	:	1	P	40	X	20	2	:	1	P	42	X	18	7	:	3	D
		40	X	34	20	:	17	N	40	X	40	1	:	1	P	42	X	42	1	:	1	P
		23	X	20	23	:	20	N	25	X	20	5	:	4	D	25	X	20	5	:	4	D
		20	X	18	10	:	9	N	20	X	20	1	:	1	P	20	X	20	1	:	1	P
		20	X	15	4	:	3	N	20	X	15	4	:	3	P	20	X	15	4	:	3	P
		14	X	8	7	:	4	D	15	X	10	3	:	2	P	15	X	10	3	:	2	P
		12.75	X	10	12.75	:	10	N	15	X	10	3	:	2	P	15	X	10	3	:	2	P
A project of Palazzo for Giacomo Angarano	Plate 55	53	X	53	1	:	1	P	50	X	50	1	:	1	P	52	X	50	26	:	25	N
		50	X	29.5	50	:	29.5	N	50	X	30	5	:	3	P	52	X	32	13	:	8	N
		50	X	30	5	:	3	P	50	X	30	5	:	3	P	52	X	30	26	:	15	N
		30	X	18	5	:	3	P	30	X	20	3	:	2	P	30	X	20	2	:	1	P
		18	X	18	1	:	1	P	20	X	20	1	:	1	P	20	X	20	1	:	1	P
		18	X	12	3	:	2	P	20	X	10	2	:	1	P	20	X	10	2	:	1	P
A project of Palazzo	Plate 56	40	X	40	1	:	1	P	40	X	40	1	:	1	P	42	X	40	21	:	20	N
		40	X	20	2	:	1	P	40	X	20	2	:	1	P	40	X	20	2	:	1	P
		36	X	20	9	:	5	D	35	X	20	7	:	4	D	36	X	20	9	:	5	D

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		27.83 X 15.83	27.83 15.83	N	25 X 15	5 : 3	P	25 X 15	5 : 3	P
		20 X 20	1 : 1	P	20 X 20	1 : 1	P	20 X 20	1 : 1	P
		20 X 15	4 : 3	P	20 X 15	4 : 3	P	20 X 15	4 : 3	P
		20 X 10.83	20 : 10.83	N	20 X 10	2 : 1	P	20 X 10	2 : 1	P
		14.75 X 6.75	14.75 : 6.75	N	15 X 8	2 : 1	P	15 X 7.5	2 : 1	P
A project of Palazzo for Gio. Battista Garzadore	Plate 57	28 X 18.5	28 : 18.5	N	28 X 20	7 : 5	P	28 X 20	7 : 5	P
		28 X 13	28 : 13	N	28 X 12	7 : 3	D	28 X 12	7 : 3	D
		18.5 X 16	18.5 : 16	N	20 X 16	5 : 4	D	20 X 16	5 : 4	D
		18.5 X 12	18.5 : 12	N	20 X 12	5 : 3	P	20 X 12	5 : 3	P
		16 X 16.5	16 : 16.5	N	20 X 16	5 : 4	D	20 X 16	5 : 4	D
A project of Villa for Leonardo Mocenico	Plate 58	76 X 30	38 : 15	N	80 X 30	8 : 3	D	75 X 31	75 : 31	N
		75 X 59	75 : 59	N	80 X 60	4 : 3	P	80 X 62	40 : 31	N
		40 X 20	2 : 1	P	40 X 20	2 : 1	P	40 X 20	2 : 1	P
		32 X 20	8 : 5	D	30 X 20	3 : 2	P	31 X 20	31 : 20	N
		20 X 20	1 : 1	P	20 X 20	1 : 1	P	20 X 20	1 : 1	P
		20 X 15	4 : 3	P	20 X 15	4 : 3	P	20 X 15	4 : 3	P
			P	101	37.83%	P	195	73.03%	P 169	63.30%
			D	35	13.11%	D	68	25.47%	D 46	17.23%
			N	131	49.06%	N	4	1.50%	N 52	19.48%
			P+D	136	50.94%	P+D	263	98.50%	P+D 215	80.52%

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
Plate 01 Palazzo (or Palagio) Antonini at Udine.	8:7	It could be understood as square and one seventh.
	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)
	7:4	It could be interpreted as rational convergent of square root three or square and three quarters.
Plate 02 Palazzo Chierirati at Vincenza	10:3	It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 2:1 = 10:3 (a:b x c:d = ac:bd)
	5:2	It could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
	4:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 2:1 = 4:1 (a:b x c:d = ac:bd)
	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).
Plate 04 Palazzo Iseppo de' Porti at Vicenza	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).
Plate 07 Palazzo Giovanni Battista Della Torre at Verona		No non standard room ratios are identified
Plate 08 Palazzo Ottavio de' Thiene at Vicenza ground	5:4	It could be understood as square and a fourth. It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
Plate 11 Palazzo Valmarana at Vicenza	8:5	It could be understood as square and three fifths. It is minor sixth as musical note.
	4:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 2:1 = 4:1 (a:b x c:d = ac:bd)

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).
Plate 13 Villa Paolo Almerico near Vicenza in plan and half-elevation half-section	5:4	It could be understood as square and a fourth. It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
	5:2	It could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).
Plate 14 Palazzo Giulio Capra at Vicenza	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).
Plate 15 Palazzo Montano Barbarano at Vicenza		No non standard room ratios are identified
Plate 30 Villa Vittore Marco and Daniele Pisani at Bagnolo near Lonigo	10:9	It could be interpreted as ratio formed from division of basic ratio 5:3 / 3:2 = 10:9 (a:b / c:d = bc:ad)
	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)
	4:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 2:1 = 4:1 (a:b x c:d = ac:bd)
	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
Plate 31 Villa Francesco Badoero at Polesine	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)
	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
Plate 32 Villa Marco Zeno at Cesalto		No non standard room ratios are identified
Plate 33 Villa Nicolo and Luigi Foscari at Brenta	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd)
Plate 34 Villa Elettlo De Aquileia and Marc' Antonio De Barbari at Maser	10:9	It could be interpreted as ratio formed from division of basic ratio 5:3 / 3:2 = 10:9 (a:b / c:d = bc:ad)
	10:4.5	Close to 10:5, which is 2:1
	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)
	7:6	It could be understood as square and one sixth.
Plate 35 Villa Francesco Pisani at Montagnana	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
	7:3	It could be interpreted as rational convergent of square root five. It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 7:5 = 7:3 (a:b x c:d = ac:bd)
Plate 36 Villa Giorgio Cornaro at Piombino	8:7	It could be understood as square and one seventh.
	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
Plate 37 Villa Leonardo Mocenico at Marocco	13:8	It could be understood as square and five eights
	8:5	It could be understood as square and three fifths. It is minor sixth as musical note.
	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)
Plate 38 Villa Leonardo Emo (or Erno) at Fanzolo	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
Plate 39 Villa Biagio Sarraceno at Finale	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
	7:3	It could be interpreted as rational convergent of square root five. It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 7:5 = 7:3 (a:b x c:d = ac:bd)
Plate 40 Villa Gioralmo Ragona at Ghizzole	5:4	It could be understood as square and a fourth.It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
Plate 41 Villa Cavalier Pogliana (or Poiana) at Pogliana	3:1	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratios 2:1 x 3:2 = 3:1 (a:b x c:d = ac:bd).
Plate 42 Villa Francesco Valmarana at Lisiera	10:3	It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 2:1 = 10:3 (a:b x c:d = ac:bd)
	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
Plate 43 Villa Francesco and Lodovico De Trissini at	18:7	It is close to rational convergent of square root six, 17:7

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
	9:7	It could be understood as square and two sevenths.
Plate 44 Villa Mario Repeta at Campiglia	5:4	It could be understood as square and a fourth.It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
	5:2	It could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
	5:1	It could be referred to Alberti's theory of long room ratios.
Plate 45 Villa Odoardo (Oleardo) and Theodoro De Thiene at Cicogna		No non standard room ratios are identified
Plate 46 Villa Giacomo Angarano at Angarano	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
	6:5	It could be understood as square and one fifth.It is minor third as musical note. It could be interpreted as ratio formed from division of basic ratio 2:1 / 5:3 = 6:5 (a:b / c:d = bc:ad)
Plate 47 Villa Ottavio (Ottavie) Thiene at Quinto	5:4	It could be understood as square and a fourth.It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
	5:2	It could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
Plate 48 Villa Girolama De Godi at Lonedo		No non standard room ratios are identified
Plate 49 Villa Marc' Antonio Sarego at Santa Sofia in plan and sectional elevation	12:5	It is close to rational convergent of square root five, 11:5
	9:5	It could be understood as square and four fifths.

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
	6:5	It could be understood as square and one fifth.It is minor third as musical note. It could be interpreted as ratio formed from division of basic ratio 2:1 / 5:3 = 6:5 (a:b / c:d = bc:ad)
Plate 50 Villa Anibale Sarego at La Miega	12:5	It is close to rational convergent of square root five, 11:5
	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
Plate 51 Villa of the Ancients	7:3	It could be interpreted as rational convergent of square root five. It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 7:5 = 7:3 (a:b x c:d = ac:bd)
	5:2	It could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
Plate 52 A project for a palazzo on a triangular site	5:2	It could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd).
Plate 53 A project for a palazzo on a site in Venice	8:7	It could be understood as square and one seventh.
	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
	6:5	It could be understood as square and one fifth.It is minor third as musical note. It could be interpreted as ratio formed from division of basic ratio 2:1 / 5:3 = 8:3 (a:b / c:d = bc:ad)
Plate 54 A project for a palazzo for Francesco and Lodovico Trissino in Vicenza	5:4	It could be understood as square and a fourth.It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
Plate 55 A project of Palazzo for Giacomo Angarano in Vicenza		No non standard room ratios are identified

4.9-Table of non standard ratio from analyzed plates		
Plate	**Non standard ratio**	**Its interpretation**
Plate 56 A project of Palazzo for Gio. Battista Della Torre in Verona	7:4	It could be understood as square and three quarters. It could be interpreted as rational convergent of square root three.
Plate 57 A project of Palazzo for Gio. Battista Garzadore in Vicenza	7:3	It could be interpreted as rational convergent of square root five. It could be interpreted as ratio formed from multiplication of basic ratios 5:3 x 7:5 = 7:3 (a:b x c:d = ac:bd)
	5:4	It could be understood as square and a fourth.It could be interpreted as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad)
Plate 58 A project of Villa for Leonardo Mocenico in Brenta	8:3	It could be referred to Alberti's theory of long room ratios. It could be interpreted as ratio formed from multiplication of basic ratio 2:1 x 4:3 = 8:3 (a:b x c:d = ac:bd)

Figure 4.191 Analytical Understanding Of Non Standard Room Ratios

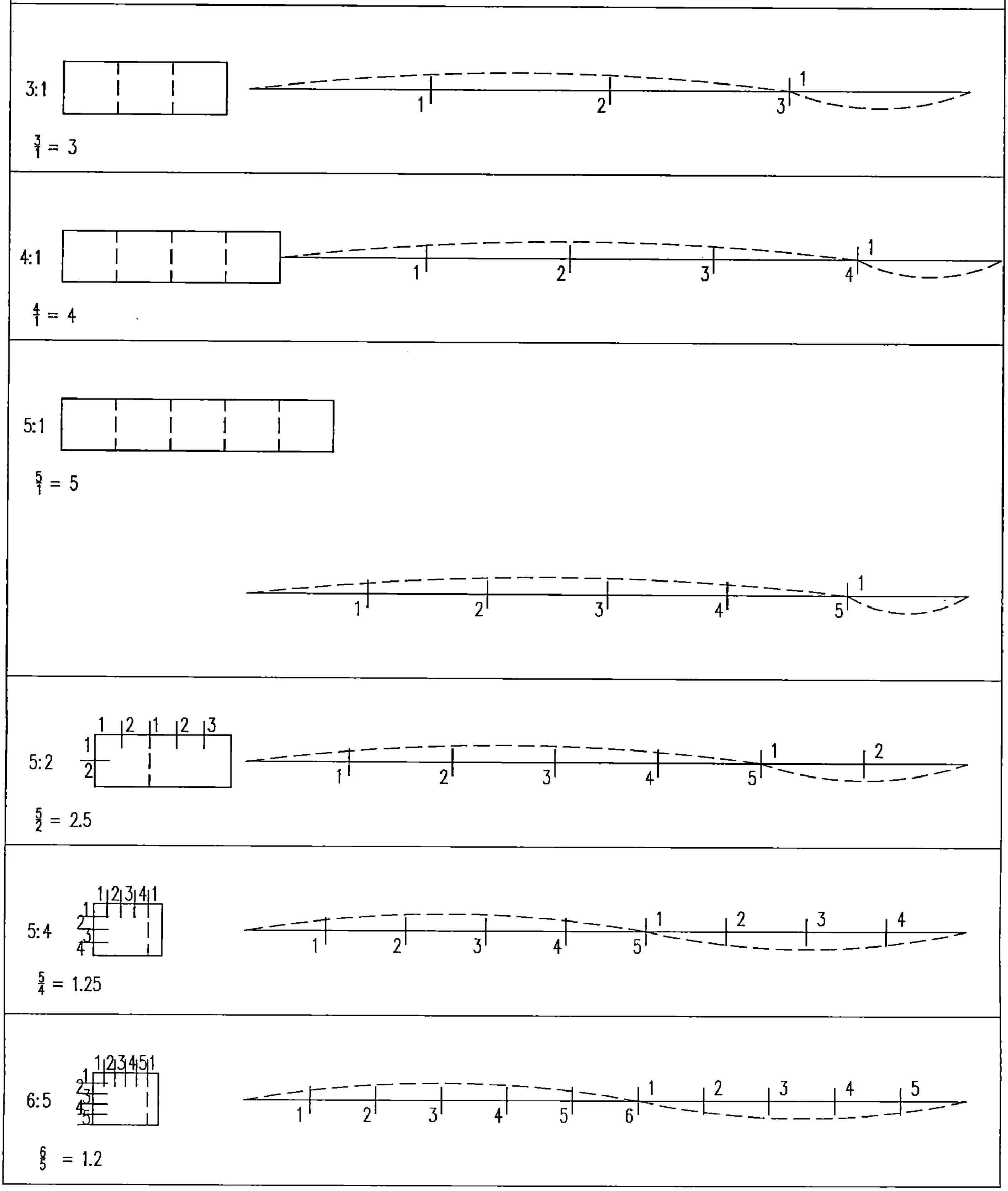


Figure 4.192 Analytical Understanding Of Non Standard Room Ratios

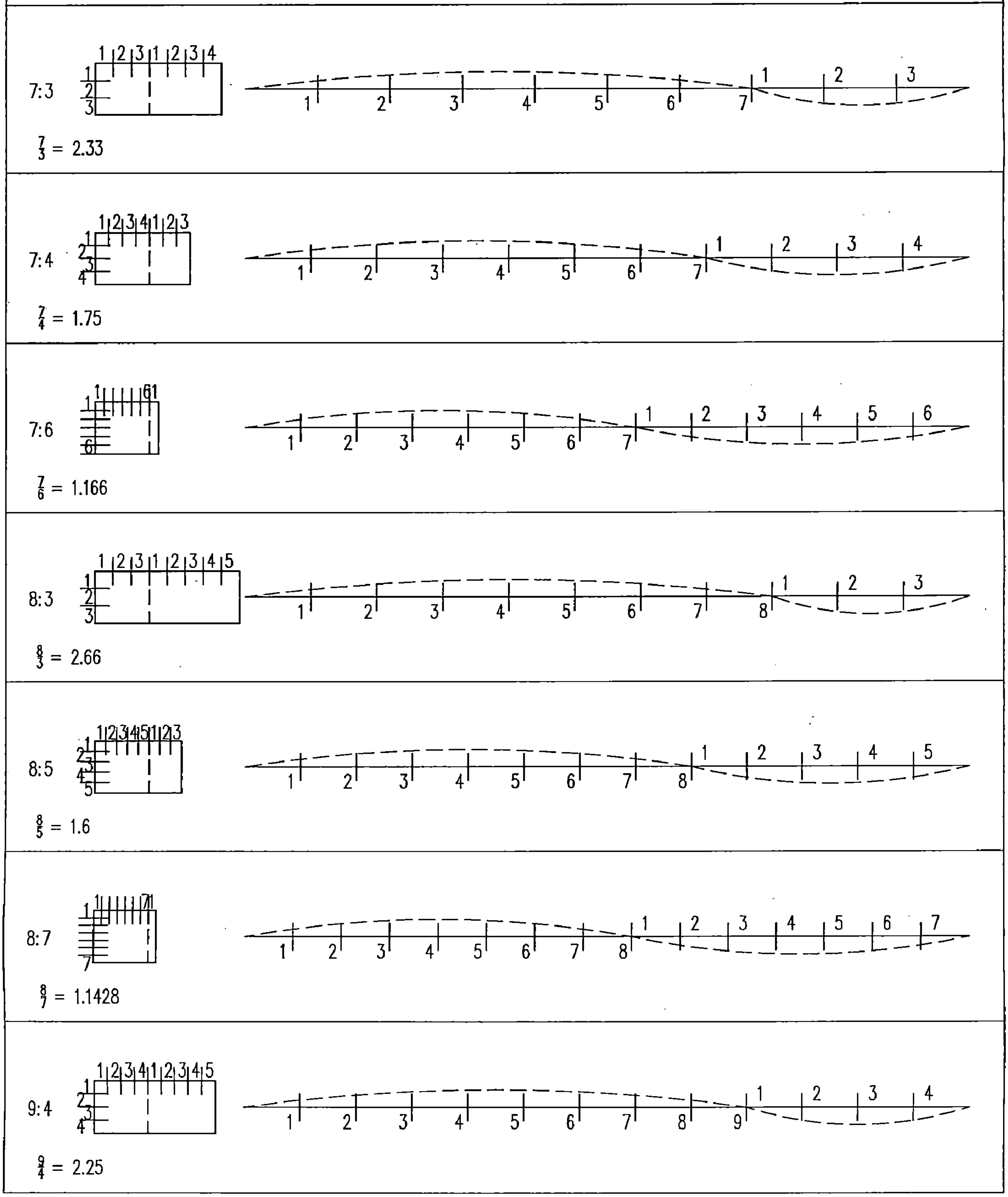
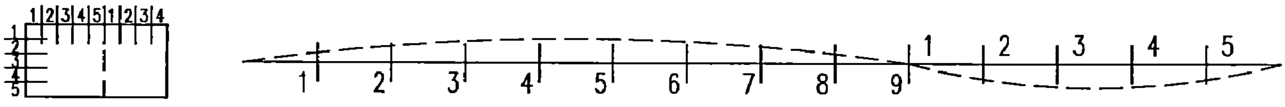


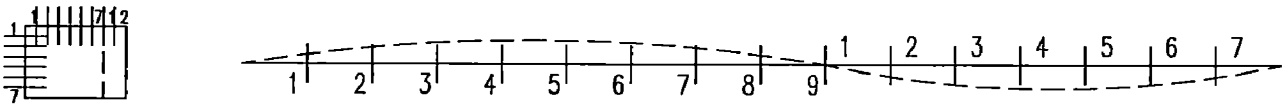
Figure 4.193 Analytical Understanding Of Non Standard Room Ratios

9:5



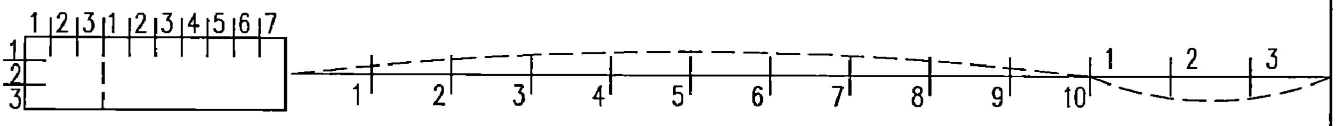
$\frac{9}{5} = 1.8$

9:7



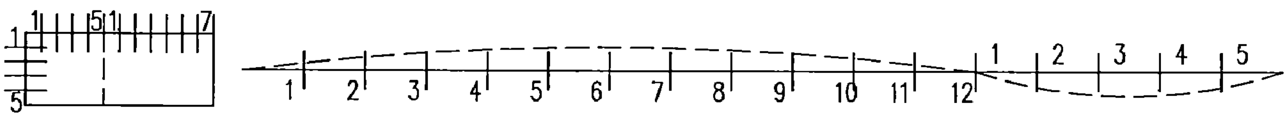
$\frac{9}{7} = 1.285$

10:3



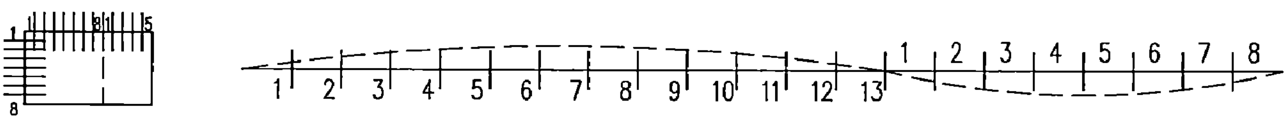
$\frac{10}{3} = 3.33$

12:5



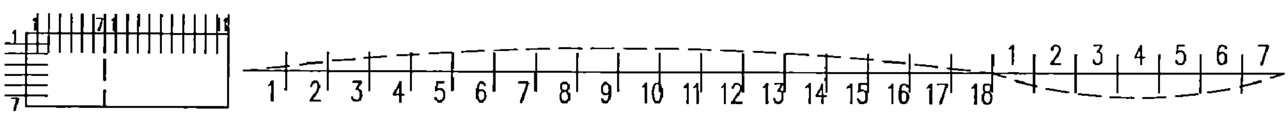
$\frac{12}{5} = 2.4$

13:8



$\frac{13}{8} = 1.625$

18:7



$\frac{18}{7} = 2.571$

4.10 CONCLUSION BASED ON TABLE OF RATIOS FROM ANALYZED PLATES

On the basis of close observation of Palladian plates it could be concluded that Palladio's average room size is 27.43' x 17.5'. It is observed that the average room size from rectified room sizes as per schematic analysis is 27.47' x 17.70'. This is 0.04' x 0.2' deviation from datum of average of Palladian room sizes. From this it is calculated that there is average 1.5 inch (0.04'+0.2'/2= 0.12', which is approximately equal to 1.44 inches) variation in room dimension from the datum. Similarly it is observed that average room size for 'rectified room sizes as per developed plan on the basis of schematic analysis' is 27.66' x 17.60'. This is 0.23' x 0.1' deviation from datum. From this it is concluded that there is average 2 inch (0.23'+ 0.1'/2 = 0.165', which is approximately equal to 1.98 inches) variation in room dimension from the datum.

Over all it could be concluded that with such minor modifications in room sizes of Palladian plans, proportionally a better plans could be evolved. It is also observed that through such modifications in room sizes, Palladian Villa plans that are proportionally stable to great extend and could be regenerated and reincarnated using modern construction parameters.

Through study of non standard ratios and their possible derivations (in following table 4.2) it could be deduced that Palladio did infer to theories of his predecessors. It also reinforces a belief to great extent that Palladio did adopt to different the methods to derive various proportions; for example multiplication, division of basic ratios and ratios evolved through calculations of rational convergent of numbers.

CHAPTER FIVE: TEST APPLICATION

To study implementation of Palladio's theory into contemporary practice and to understand similarity of Palladio's theory of proportion with one modern and one ancient theory, the test applications are divided into three categories

1) Applications of Palladio's seven room ratios in contemporary residential planning.
2) Study of application of Le Corbusier's 'Modulor' theory of proportions in modern residential planning as comparative to Palladian theory.
3) Study of ancient Indian proportioning system of Vastu Shastra and derive similarities with Palladian theory of proportion.

5.1 CONTEMPORARY APPLICATION IN PLANNING GRAMMAR

This section is to render supportive information on prime subject of research by demonstrating implementation of Palladian theory of seven room ratios in to contemporary professional practice. This section does not stand at the core of study. These test applications are not to endorse a holistic and idealistic implementation and adaptation in to practice as it is dependent on many factors such as scope, requirements, design brief, budget, time limit, liking and life style of client, construction method etc. related to a project. With this it is hoped that it initiates a thought of theory's adaptation in contemporary residential planning. This is for reader to have flavor of what could be done from this point on in architectural planning theory by adopting Palladian theory of seven room ratios in to practice and eventually; if possible and required, modify and propose new aspects of theory. This is to observe adoptability of Palladio's proportional theory in contemporary design thought and construction. It is to share an idea how probable plans could be developed on the basis of Palladian theory of proportion of seven room ratios by interweaving it with contemporary life style and construction methods as used these days in Ahmedabad.

5.1.1 SELECTION OF CASE STUDY

Having studied Palladian theory of proportions, the study delves to show application of Palladian theory of proportions in contemporary practice through four test applications that are developed adapting to seven room ratios prescribed by Palladio. Thereby the aim of test application is not to analyze various buildings having different proportioning system or Palladio's theoretical application. Having studied and analyzed Palladio's villa plans; the purpose of test application is to show how it can be implemented in today's context relevant to construction practices employed in major part of urban Indian subcontinent. As stated under 'Limitations' in chapter one, all test applications are located in City of Ahmedabad, Gujarat state, India. All are RCC (Reinforced Cement Concrete) frame structures with 9" thick brick wall construction.

First house was designed in 2002 which is ground plus one upper storey. With limitation of construction methods and practical usage of structure; the height of all the rooms were constant implying that theory was primarily adopted at planning level. Second house; designed in 2005 was modest attempt to overcome setback of the first design with adaptation on single storey structure for different room heights but not to the perfection of theory. This was intentionally done to economize on construction and theoretical calculations for room height would have resulted in big volumes which may not be favorable for air-conditioning which is necessity for comfort in hot and arid climatic zone. RCC too is also not disposable as Ahmedabad falls in grade three of seismic zone of India. Third house was designed in 2007. It was observed in first two attempts that final finished constructed room sizes achieved did vary by plaster thickness. In third project it was conquered by putting a margin of 1.5 thick cement plasters on all internal walls which led to desired results, practically. Part four of bygone analysis adopts such configuration. The fourth house is under construction. This project saw incorporation of irregular room shape. This room was structured on basic room shape that was based on ratio prescribed by Palladio.

External views of built structures or three dimensional views of computer generated model for under construction structure are shown (which is in line of presentation in analysis of Palladian plates) to have comparative idea of elevational grammar emerging from use of same planning grammar adopted in different period of history of mankind, primarily hinting and manifesting at variation in construction methods, materials and aspirations of life.

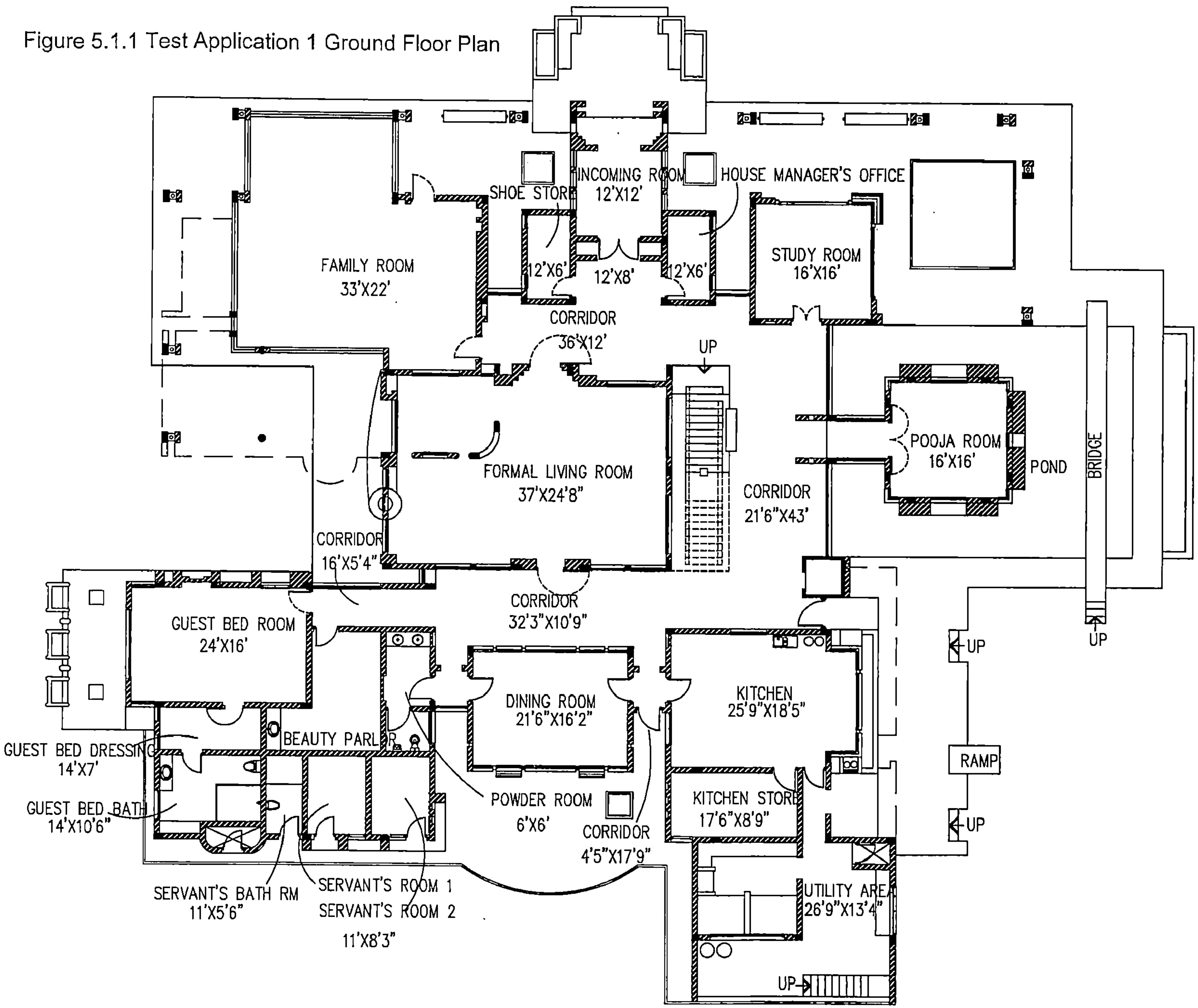
5.1.2 METHODOLOGY FOR ANALYSIS

As all examples of test application are RCC frame structures with 9” thick brick wall construction analysis of all plans is set to line diagrams of room dimension, method adopted in part 4 of analysis of Palladian plates, that is not to compensate for wall and plaster thickness and consider internal room dimensions.

5.1.3 ANALYSIS AND UNDERSTANDING OF TEST APPLICATION PLANS

Diagrammatic analysis of all four test applications in Ahmedabad is presented in following pages. Plates are analyzed on the basis of method as described above to develop understanding of adaptation of Palladian theory of seven room ratios in contemporary residential planning grammar.

Figure 5.1.1 Test Application 1 Ground Floor Plan



Test Application -1

Ground Floor Plan

North

Source: Author

Figure 5.1.2 Test Application 1 Ground Floor Plan Schematic Analysis

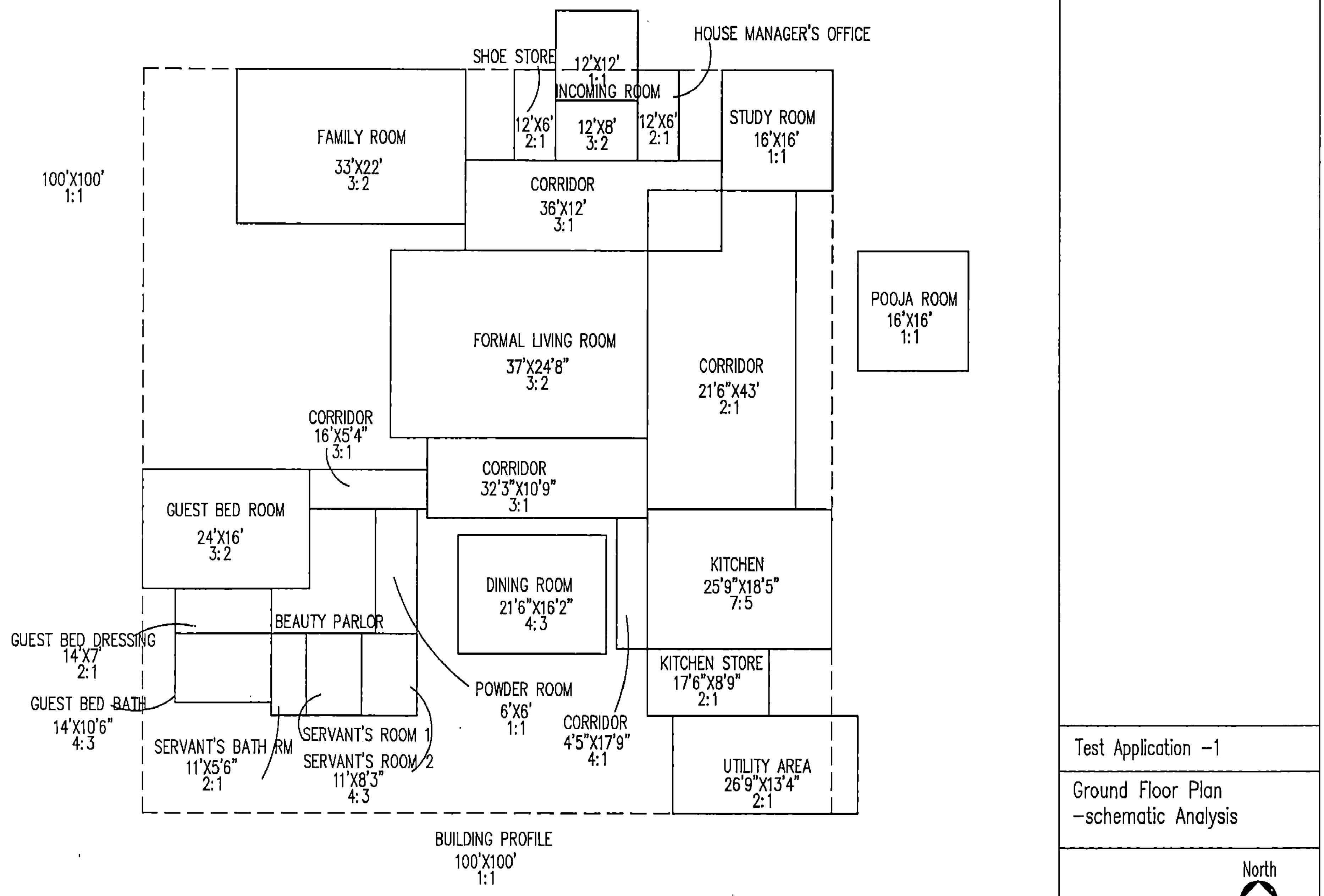
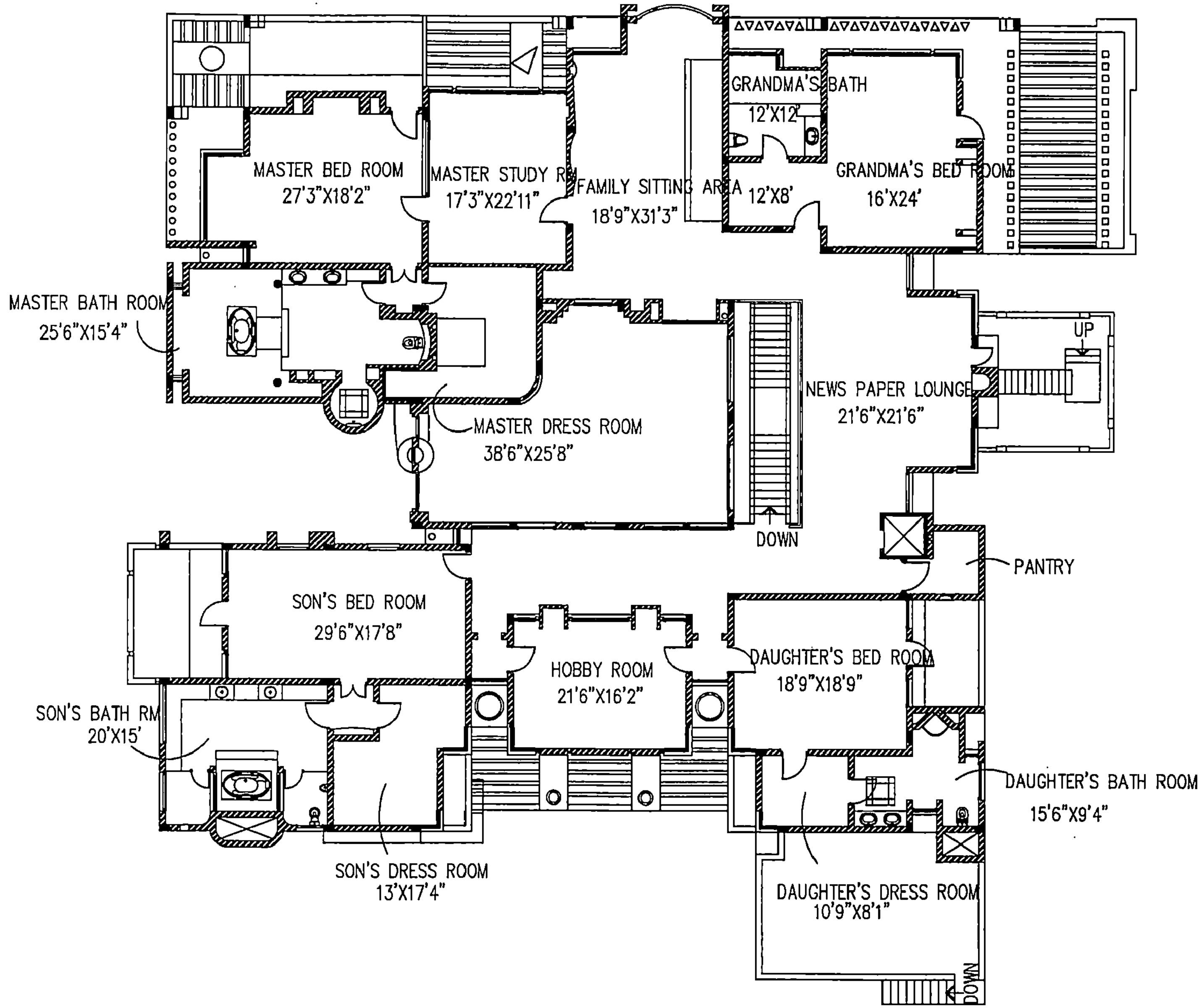
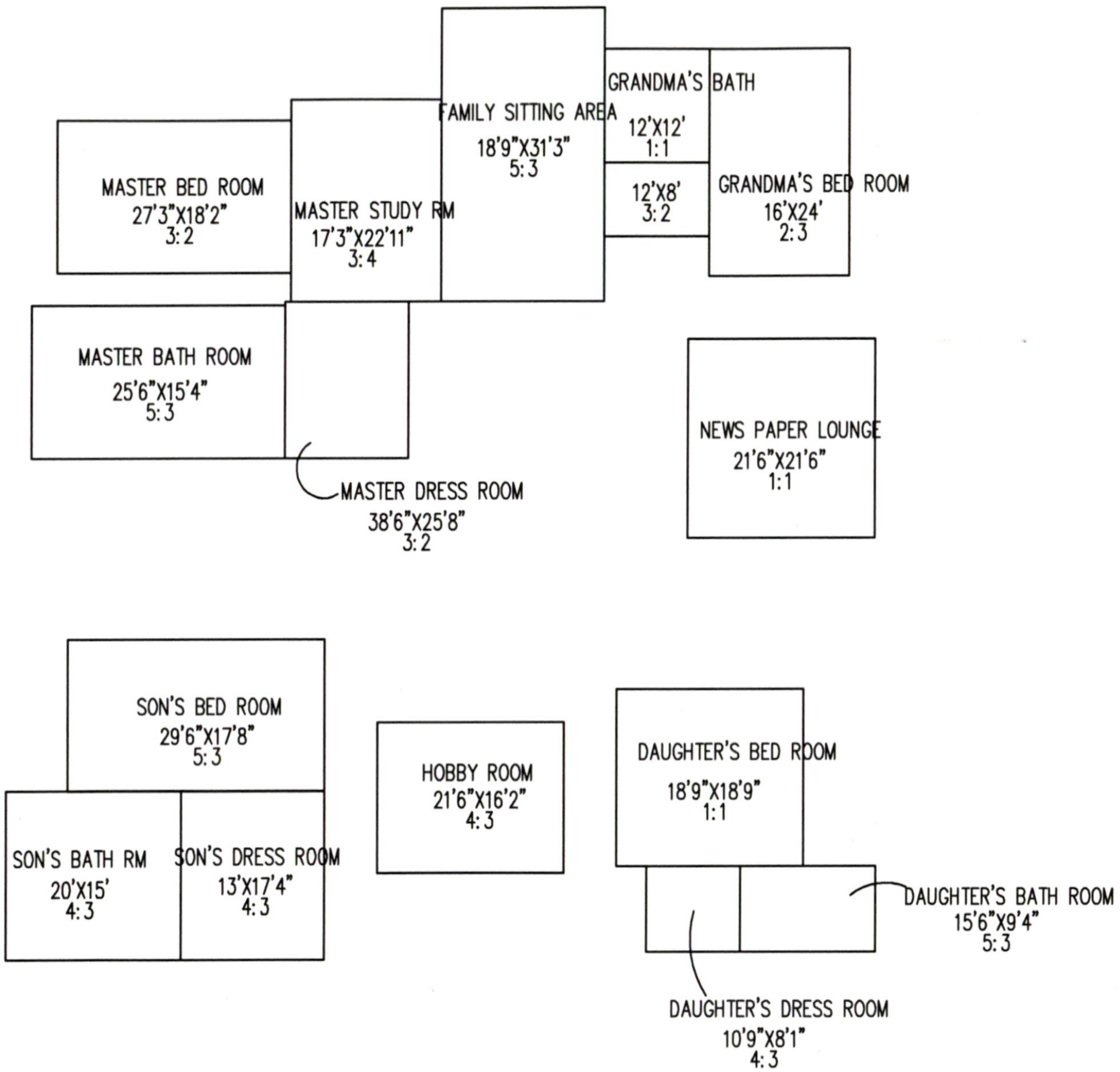


Figure 5.1.3 Test Application 1 First Floor Plan



Test Application -1
First Floor Plan
North
Source: Author

Figure 5.1.4 Test Application 1 First Floor Plan Schematic Analysis



Test Application –1

First Floor Plan –schematic Analysis

North

Figure 5.1.5 Test Application 1 On Site
Photograph, Side View

Test Application –1

On Site Photograph

Source: Author

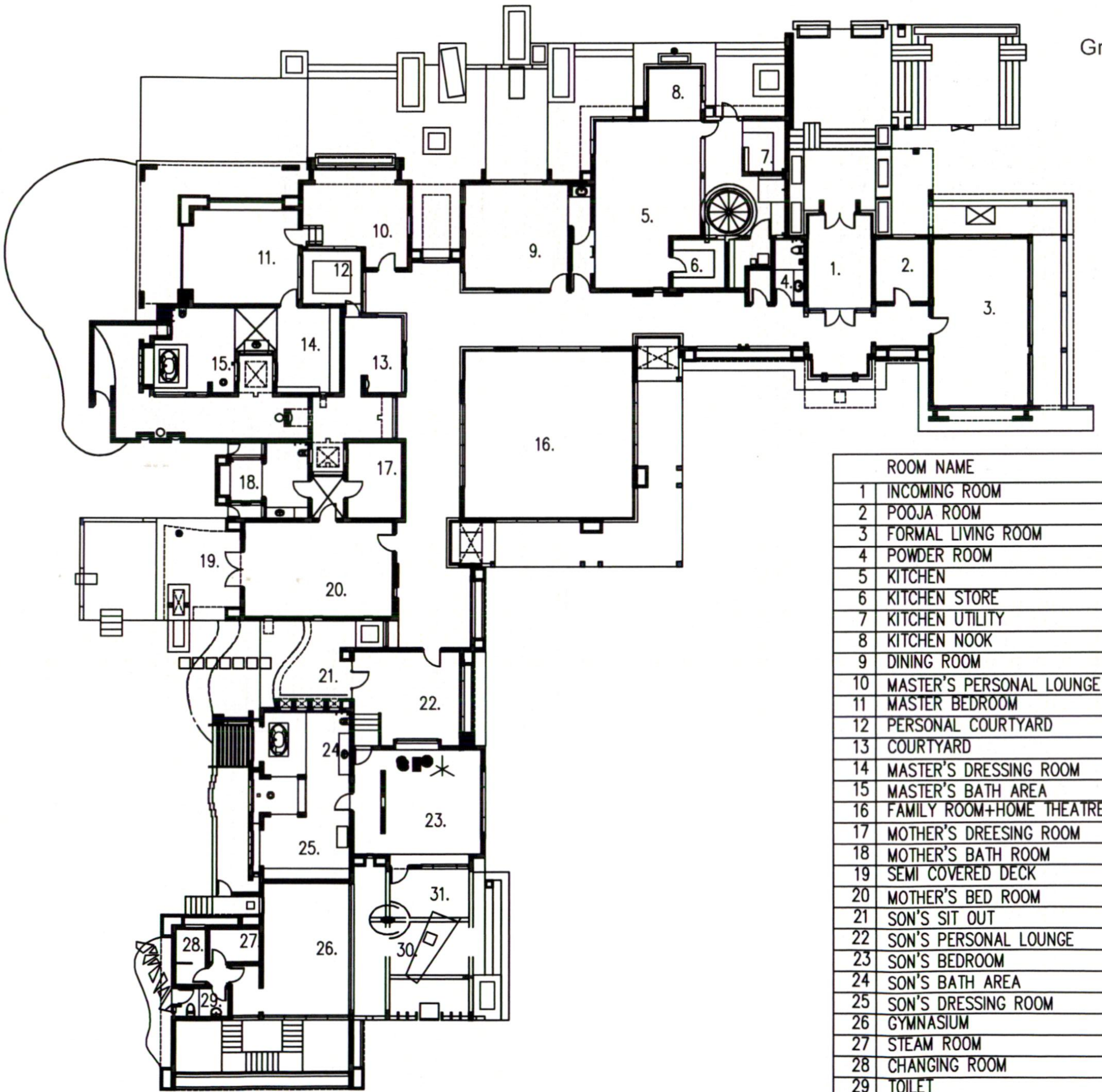
Figure 5.1.6 Test Application 1 On Site Photograph, Side View

Test Application –1

On Site Photograph

Source: Author

Figure 5.1.7
Test Application 2
Ground Floor Plan House-1



	ROOM NAME	ROOM SIZE
1	INCOMING ROOM	12'5"X17'8.5"
2	POOJA ROOM	11'X11'9.75"
3	FORMAL LIVING ROOM	18'7" X 31'6"
4	POWDER ROOM	11'x11'
5	KITCHEN	21'x31'6"
6	KITCHEN STORE	13'5.5"X9'1.25"
7	KITCHEN UTILITY	15'4"X21'6"
8	KITCHEN NOOK	9'9.75"X9'9.75"
9	DINING ROOM	19'4.5"x19'4.5"
10	MASTER'S PERSONAL LOUNGE	19'8.25"x14'6.75"
11	MASTER BEDROOM	18' x 18'
12	PERSONAL COURTYARD	11'X11'
13	COURTYARD	10'9.5X14'3"
14	MASTER'S DRESSING ROOM	12'X16'
15	MASTER'S BATH AREA	16'X16'
16	FAMILY ROOM+HOME THEATRE	31'6"x31'6"
17	MOTHER'S DREESING ROOM	10'1"X14'2"
18	MOTHER'S BATH ROOM	14'3"X14'3"
19	SEMI COVERED DECK	17'x17'
20	MOTHER'S BED ROOM	27'4.5"X18'3"
21	SON'S SIT OUT	15' X 15'
22	SON'S PERSONAL LOUNGE	18'x18'
23	SON'S BEDROOM	22'X22'
24	SON'S BATH AREA	16'x12'
25	SON'S DRESSING ROOM	16'x12'
26	GYMNASIUM	16'x24'
27	STEAM ROOM	9'3"X6'2"
28	CHANGING ROOM	5'6"X11'
29	TOILET	9'9"X5'10"
30	PLANTER	14'8.25"X10'5"
31	SEMI COVERED DECK	25'6"x25'6"

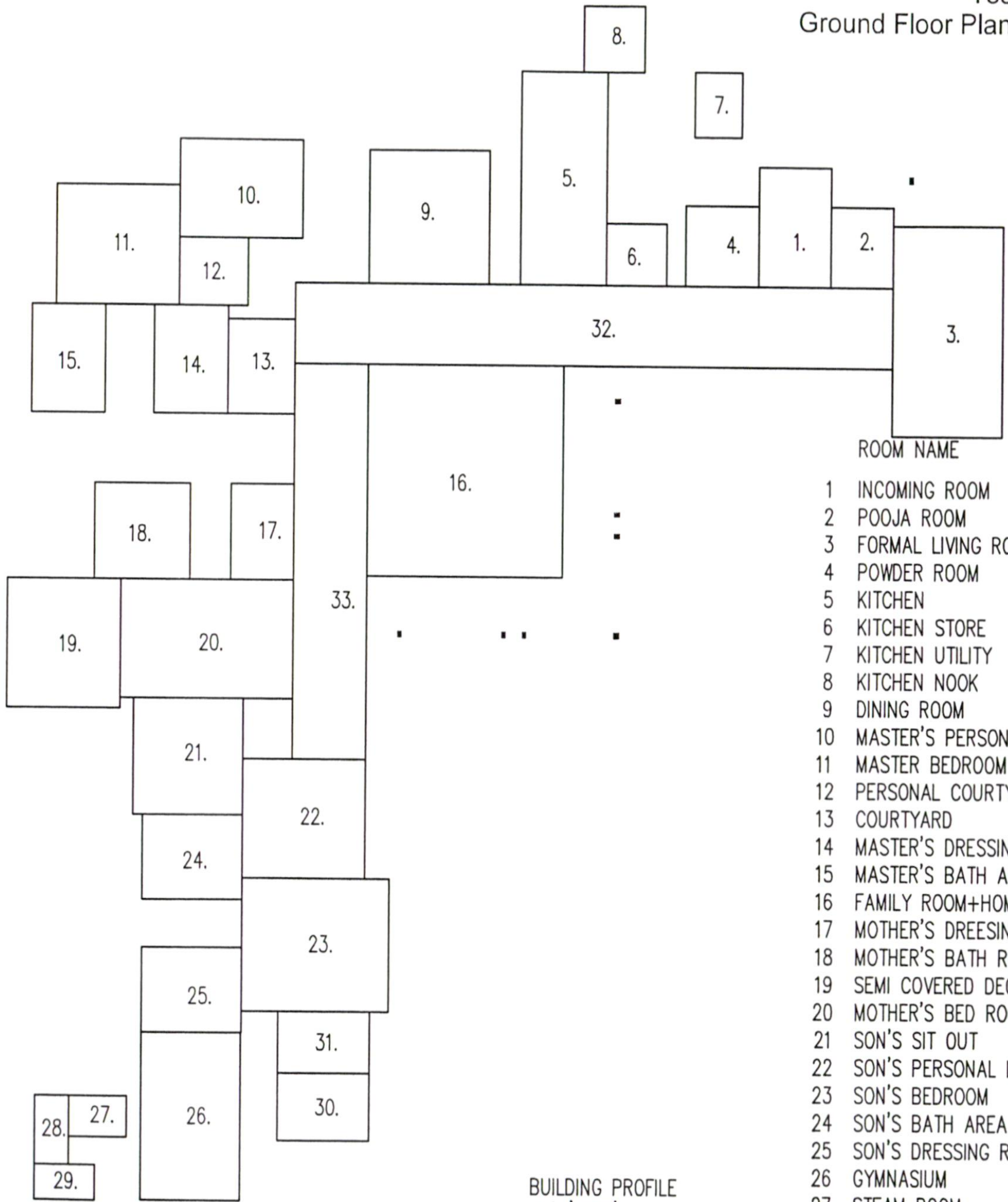
Test Application -2

Ground Floor Plan -house-1

North

Source: Author

Figure 5.1.8
Test Application 2
Ground Floor Plan Schematic Analysis House-1



	ROOM NAME	ROOM SIZE	ROOM RATIO
1	INCOMING ROOM	12'5"X17'8.5"	7:5
2	POOJA ROOM	11'X11'9.75"	1:1
3	FORMAL LIVING ROOM	18'7" X 31'6"	5:3
4	POWDER ROOM	11'x11'	1:1
5	KITCHEN	21'x31'6"	3:2
6	KITCHEN STORE	13'5.5"X9'1.25"	3:2
7	KITCHEN UTILITY	15'4"X21'6"	5:7
8	KITCHEN NOOK	9'9.75"X9'9.75"	1:1
9	DINING ROOM	19'4.5"x19'4.5"	1:1
10	MASTER'S PERSONAL LOUNGE	19'8.25"x14'6.75"	4:3
11	MASTER BEDROOM	18' x 18'	1:1
12	PERSONAL COURTYARD	11'X11'	1:1
13	COURTYARD	10'9.5X14'3"	4:3
14	MASTER'S DRESSING ROOM	12'X16'	4:3
15	MASTER'S BATH AREA	16'X16'	1:1
16	FAMILY ROOM+HOME THEATRE	31'6"x31'6"	1:1
17	MOTHER'S DREESING ROOM	10'1"X14'2"	5:7
18	MOTHER'S BATH ROOM	14'3"X14'3"	1:1
19	SEMI COVERED DECK	17'x17'	1:1
20	MOTHER'S BED ROOM	27'4.5"X18'3"	2:3
21	SON'S SIT OUT	15' X 15'	1:1
22	SON'S PERSONAL LOUNGE	18'x18'	1:1
23	SON'S BEDROOM	22'X22'	1:1
24	SON'S BATH AREA	16'x12'	4:3
25	SON'S DRESSING ROOM	16'x12'	4:3
26	GYMNASIUM	16'x24'	2:3
27	STEAM ROOM	9'3"X6'2"	3:2
28	CHANGING ROOM	5'6"X11'	1:2
29	TOILET	9'9"X5'10"	5:3
30	PLANTER	14'8.25"X10'5"	7:5
31	SEMI COVERED DECK	25'6"x25'6"	1:1
32	CORRIDOR	96'X12'	8:1
33	CORRIDOR	11'9"x58'9"	5:1

BUILDING PROFILE
189'X189'
1:1

Test Application -2

Ground Floor Plan
House-1-schematic Analysis

North

	ROOM NAME	ROOM SIZE
1	INCOMING ROOM	11'9.75"X17'8.5"
2	FORMAL LIVING ROOM	17'8.25" X 31'6"
3	POOJA ROOM	11'9.75"X11'9.75"
4	KITCHEN STORE	9'1.5"X7'
5	KITCHEN UTILITY	21'8"X15'5"
6	KITCHEN	31'6"x18'10"
7	DINING ROOM	19'6"x19'6"
8	FAMILY ROOM+HOME THEATRE	31'6"x31'6"
9	SON'S PERSONAL LOUNGE	18'x18'
10	SON'S BEDROOM	21'7.5"X21'7.5"
11	SEMI COVERED DECK	9'X18'
12	SON'S BATHROOM	18'x18'
13	SON'S DRESSING ROOM	12'x18'
14	SON'S SIT OUT	22' X22'
15	MOTHER'S BED ROOM	18'4"X27'6"
16	MOTHER'S DREESING ROOM	14'3"X10'2"
17	MOTHER'S BATH ROOM	14'3"X9'6"
18	MASTER'S BATH AREA	16'X12'
19	MASTER'S DRESSING ROOM	16'X12'
20	COURTYARD	14'3"x10'8"
21	PERSONAL COURTYARD	10'x10'
22	MASTER BEDROOM	21'8.25"x21'8.25"
23	MASTER'S PERSONAL LOUNGE	20'x20'
24	MASTER'S PERSONAL LAWN	22'6" X 22'6"
25	POWDER ROOM	11'9"x11'9"
26	ENTRANCE VESTIBLUE	11'9" X 11'9"
27	SON BED LOUNGE STAIR WELL	17'9" X 13'4"
28	KITCHEN NOOK	9'9" X 9'9"
29	CORRIDOR	70'9" X 10'1"

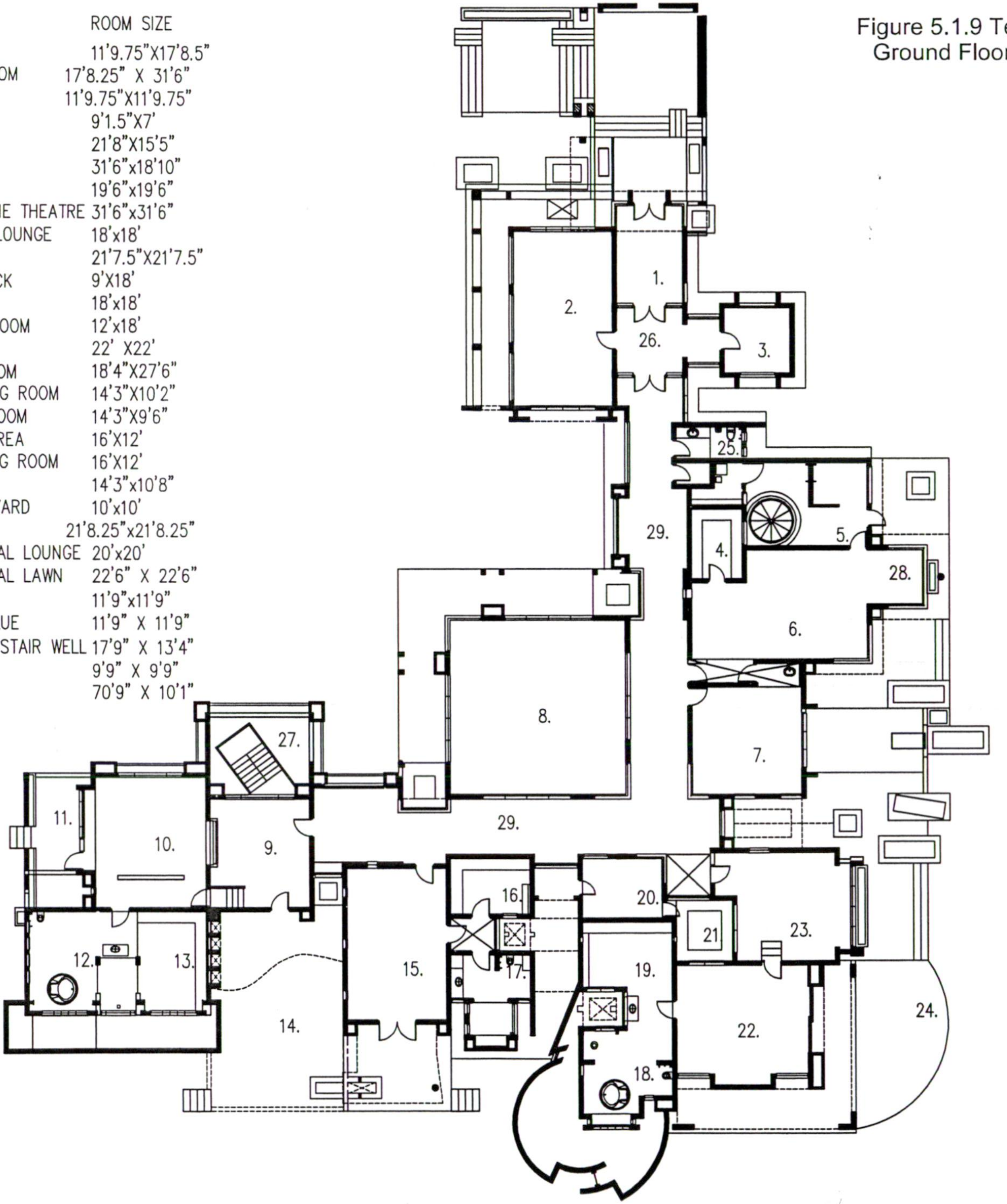


Figure 5.1.9 Test Application 2
Ground Floor Plan House-2

Test Application -2

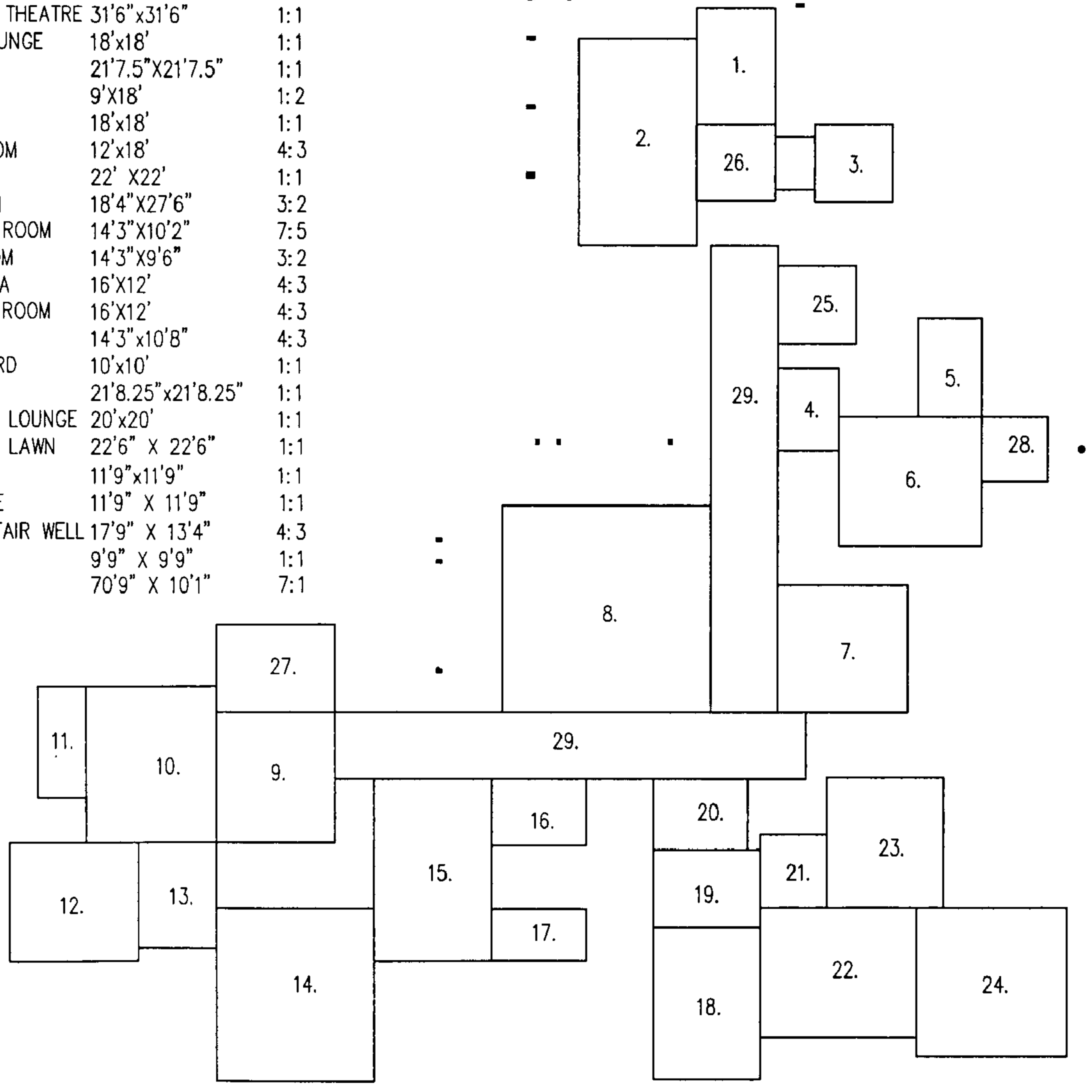
Ground Floor Plan -house-2

North

Source: Author

	ROOM NAME	ROOM SIZE	ROOM RATIO
1	INCOMING ROOM	11'9.75"X17'8.5"	2:3
2	FORMAL LIVING ROOM	17'8.25" X 31'6"	5:3
3	POOJA ROOM	11'9.75"X11'9.75"	1:1
4	KITCHEN STORE	9'1.5"X7'	4:3
5	KITCHEN UTILITY	21'8"X15'5"	7:5
6	KITCHEN	31'6"x18'10"	5:3
7	DINING ROOM	19'6"x19'6"	1:1
8	FAMILY ROOM+HOME THEATRE	31'6"x31'6"	1:1
9	SON'S PERSONAL LOUNGE	18'x18'	1:1
10	SON'S BEDROOM	21'7.5"X21'7.5"	1:1
11	SEMI COVERED DECK	9'X18'	1:2
12	SON'S BATHROOM	18'x18'	1:1
13	SON'S DRESSING ROOM	12'x18'	4:3
14	SON'S SIT OUT	22' X22'	1:1
15	MOTHER'S BED ROOM	18'4"X27'6"	3:2
16	MOTHER'S DREESING ROOM	14'3"X10'2"	7:5
17	MOTHER'S BATH ROOM	14'3"X9'6"	3:2
18	MASTER'S BATH AREA	16'X12'	4:3
19	MASTER'S DRESSING ROOM	16'X12'	4:3
20	COURTYARD	14'3"x10'8"	4:3
21	PERSONAL COURTYARD	10'x10'	1:1
22	MASTER BEDROOM	21'8.25"x21'8.25"	1:1
23	MASTER'S PERSONAL LOUNGE	20'x20'	1:1
24	MASTER'S PERSONAL LAWN	22'6" X 22'6"	1:1
25	POWDER ROOM	11'9"x11'9"	1:1
26	ENTRANCE VESTIBLUE	11'9" X 11'9"	1:1
27	SON BED LOUNGE STAIR WELL	17'9" X 13'4"	4:3
28	KITCHEN NOOK	9'9" X 9'9"	1:1
29	CORRIDOR	70'9" X 10'1"	7:1

Figure 5.1.10 Test Application 2
Ground Floor Plan Schematic Analysis House-2



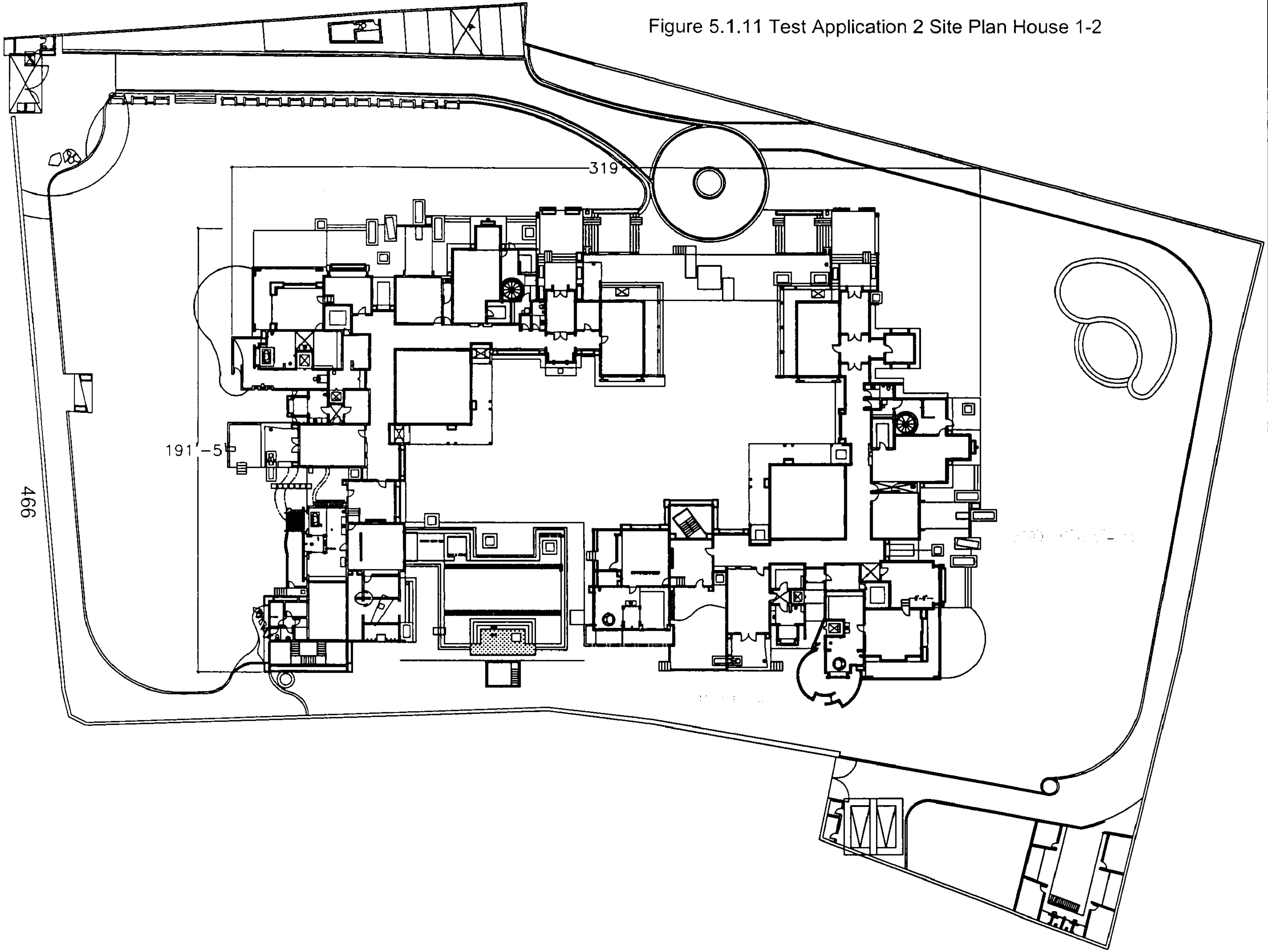
BUILDING PROFILE
168'X168'
1:1

Test Application -2

Ground Floor Plan
House-2-schematic Analysis

North

Figure 5.1.11 Test Application 2 Site Plan House 1-2



Test Application -2

site Plan house 1 & 2

Source: Author

Figure 5.1.12 Test Application 2 3d Model Site View

Test Application -2

3d model site view (house1-2)

Source: Author

Figure 5.1.13 Test Application 2 3d Model Site View

Test Application -2

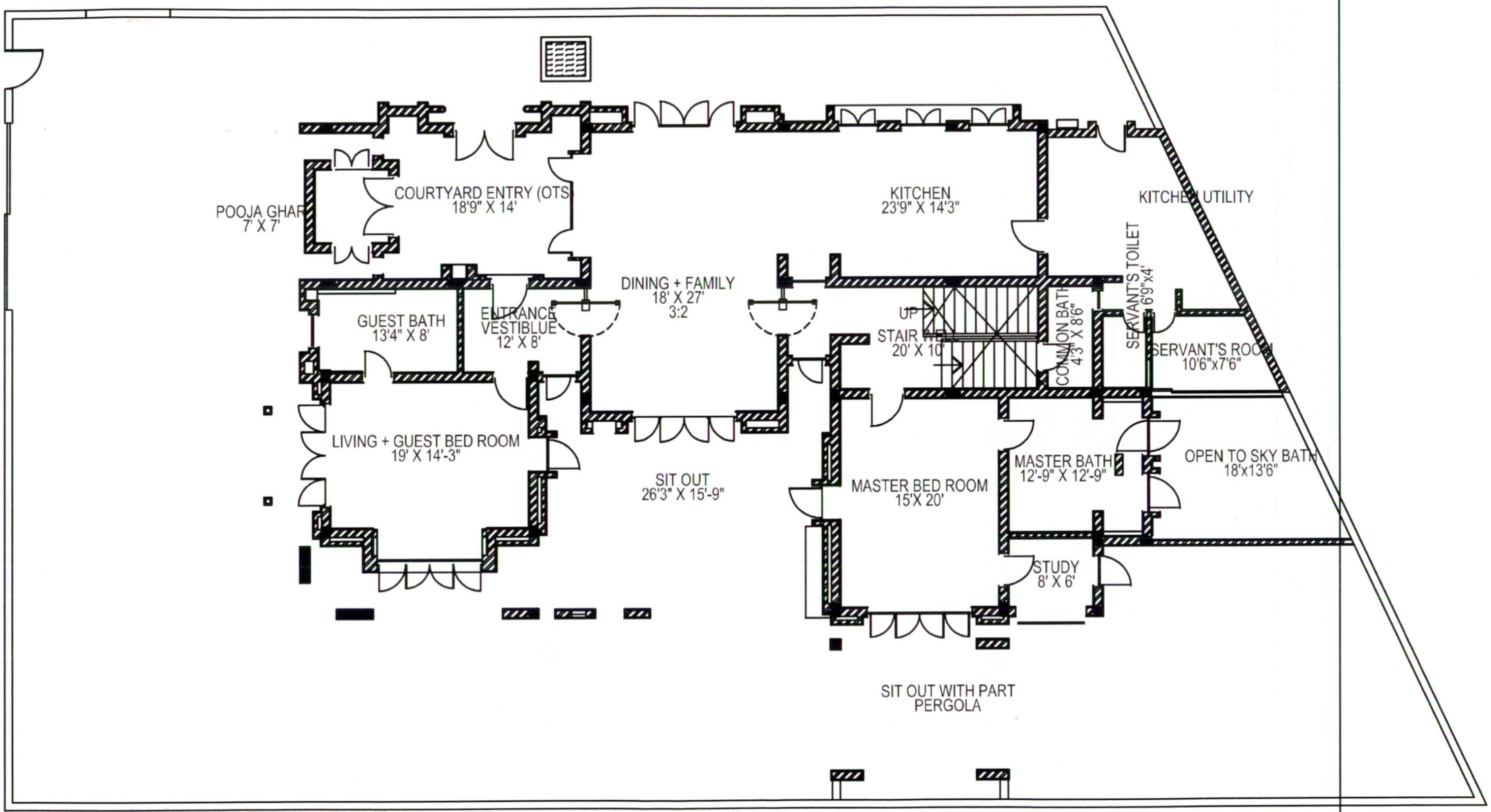
On Site Photograph (house -2)

Source: Author

Figure 5.1.14 Test Application 2 3d Model Site View

Test Application -2
On Site Photograph (house -1)
Source: Author

Figure 5.1.15 Test Application 3 Ground Floor Plan



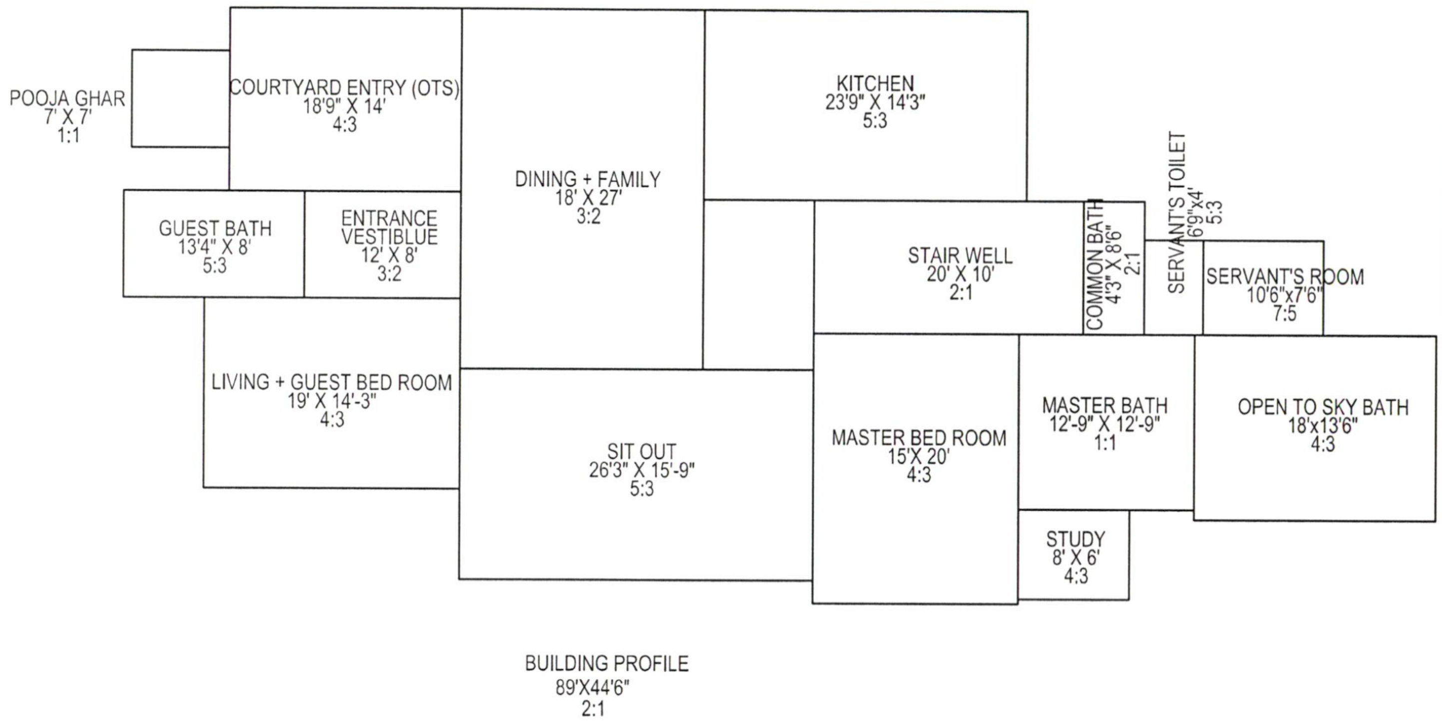
Test Application -3

Ground Floor Plan

North

Source: Author

Figure 5.1.16 Test Application 3 Ground Floor Plan Schematic Analysis



Test Application -3

Ground Floor Plan
Schematic Analysis

North

Figure 5.1.17 Test Application 3 First Floor Plan

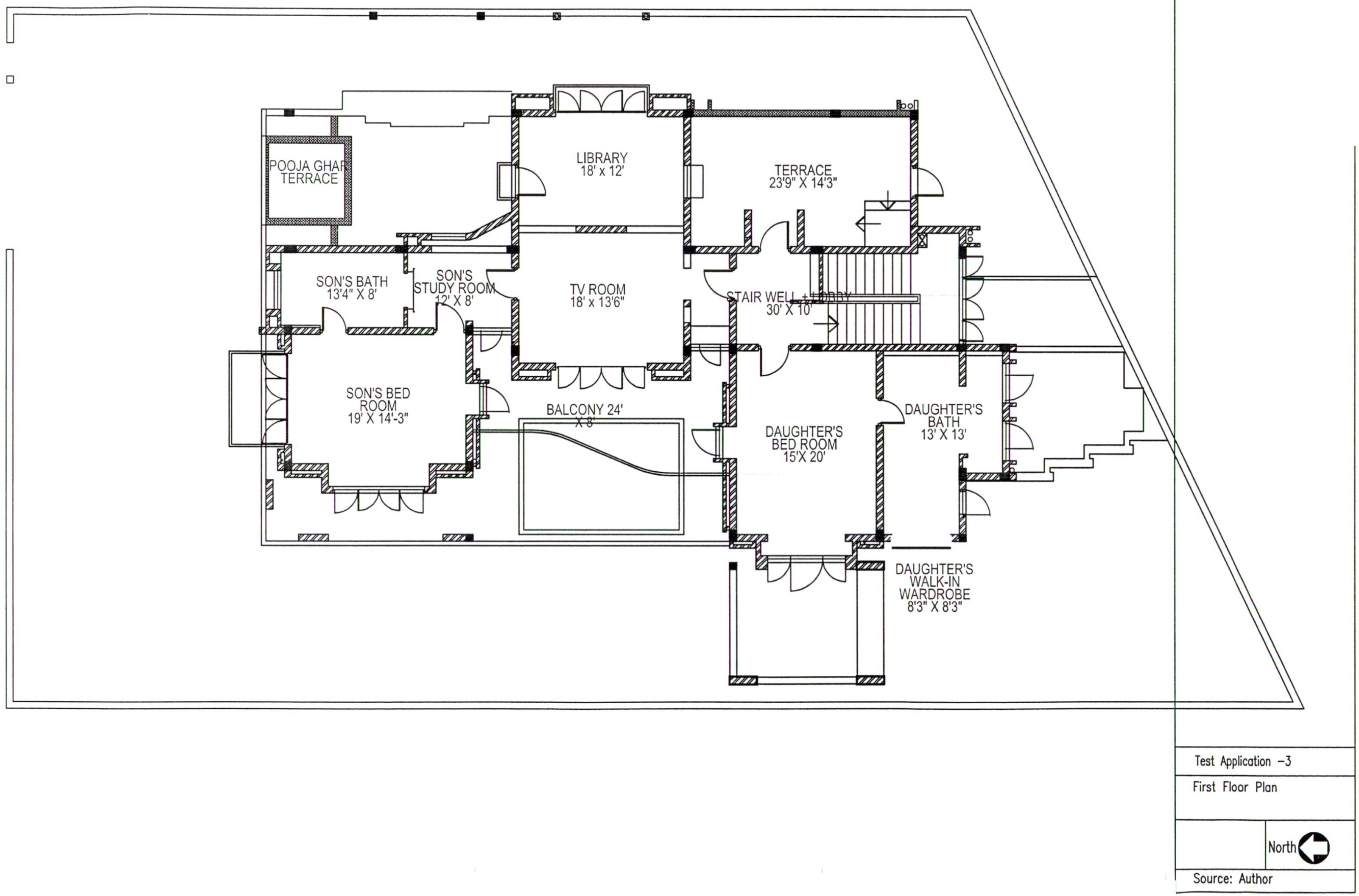
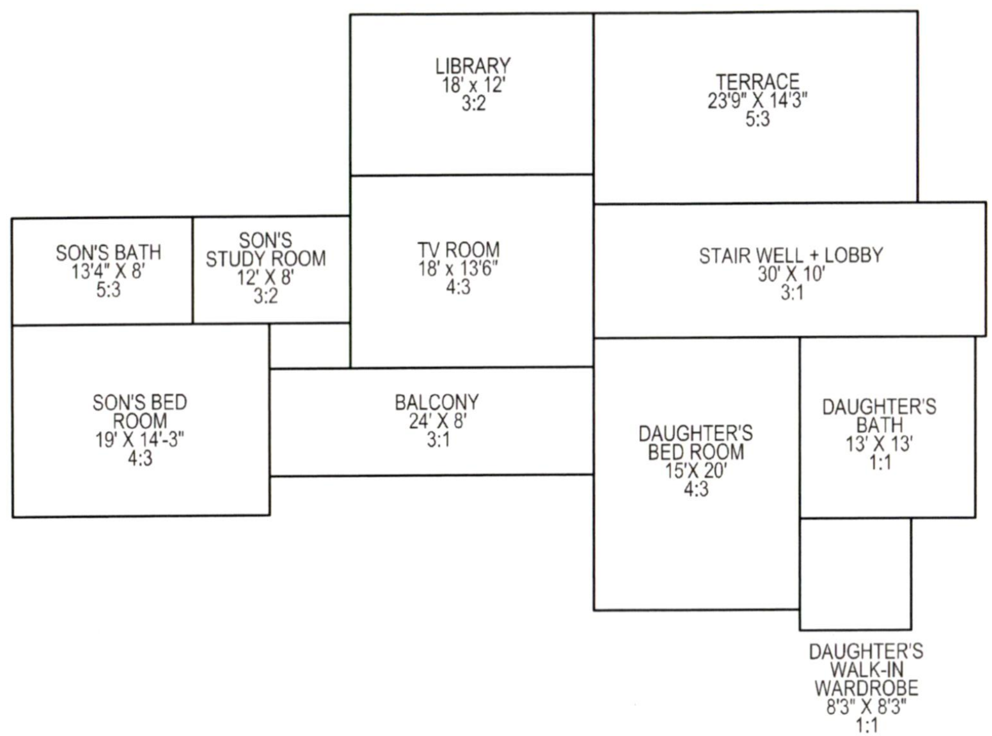


Figure 5.1.18 Test Application 3 First Floor Plan Schematic Analysis



Test Application –3

First Floor Plan
Schematic Analysis

North

Figure 5.1.19 Test Application 3 West Side View

Test Application –3

on site photograph

Source: Author

Figure 5.1.20 Test Application 3 South West Side View

Test Application –3	
on site photograph	
Source: Author	

Figure 5.1.21 Test Application 3 North East Side View

Test Application –3

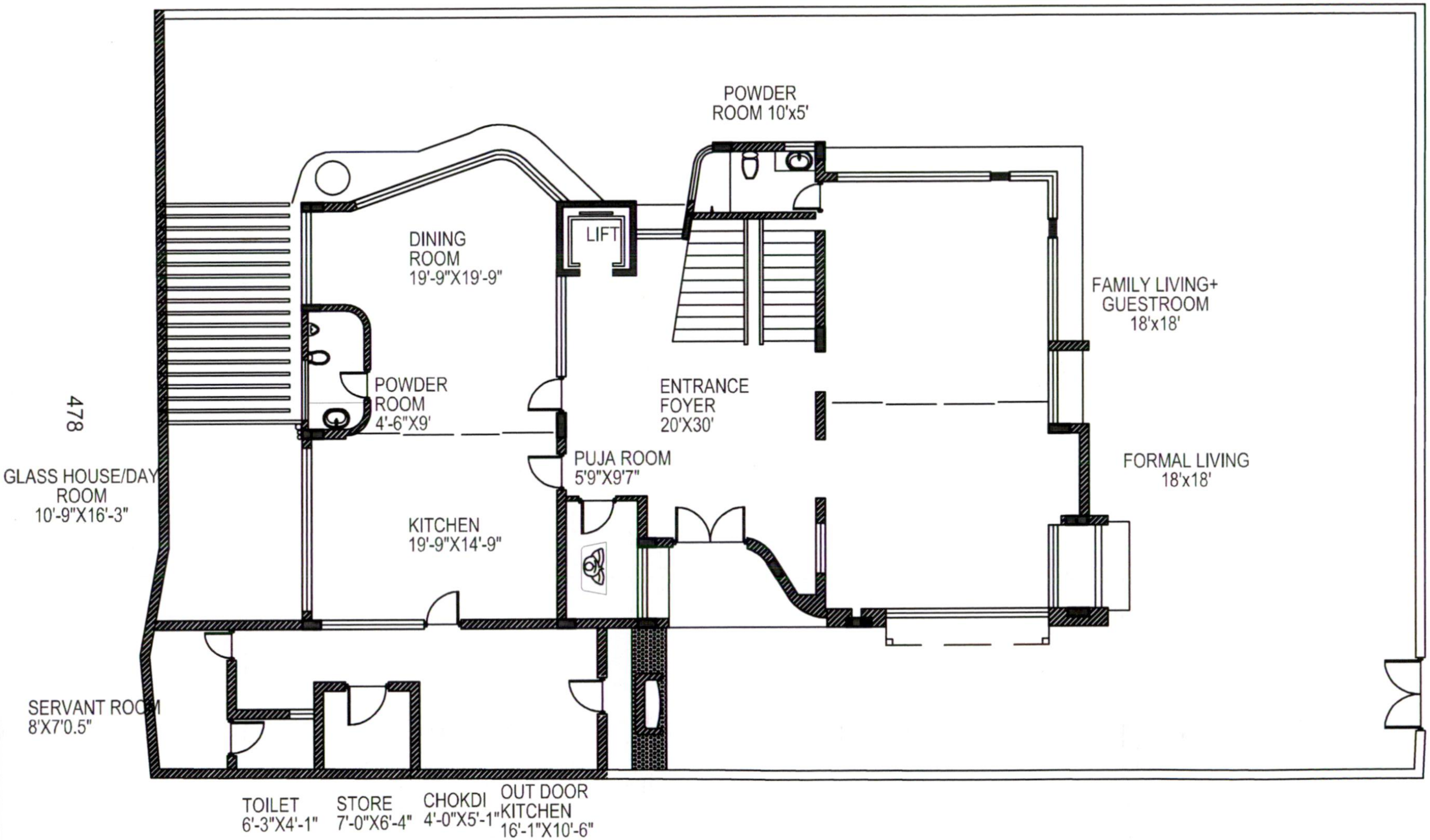
on site photograph

Source: Author

Figure 5.1.22 Test Application 3 East Side View

Test Application –3
on site photograph
Source: Author

Figure 5.1.23 Test Application 4 Ground Floor Plan



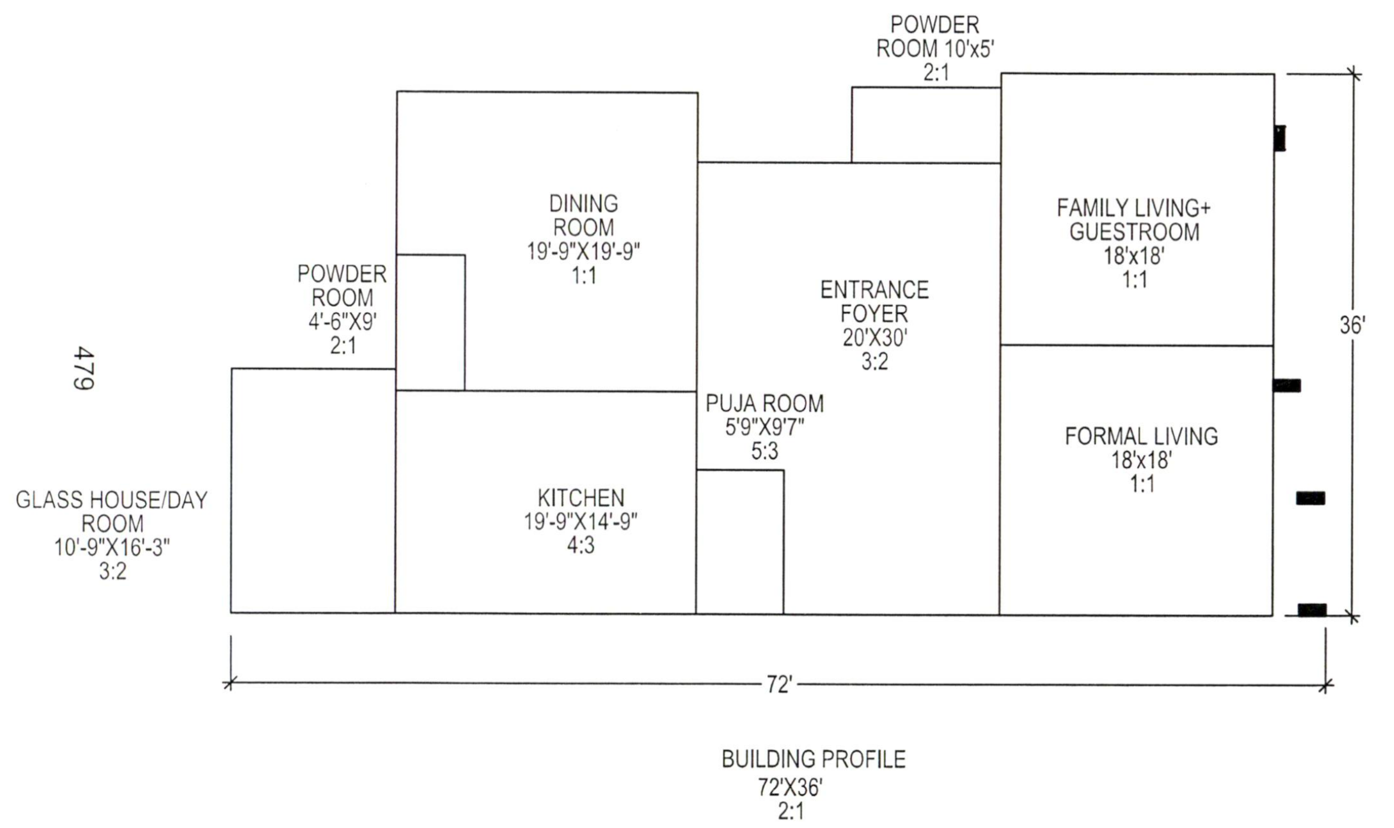
Test Application –4

Ground Floor Plan

North

Source: Author

Figure 5.1.24 Test Application 4 Ground Floor Plan Schematic Analysis

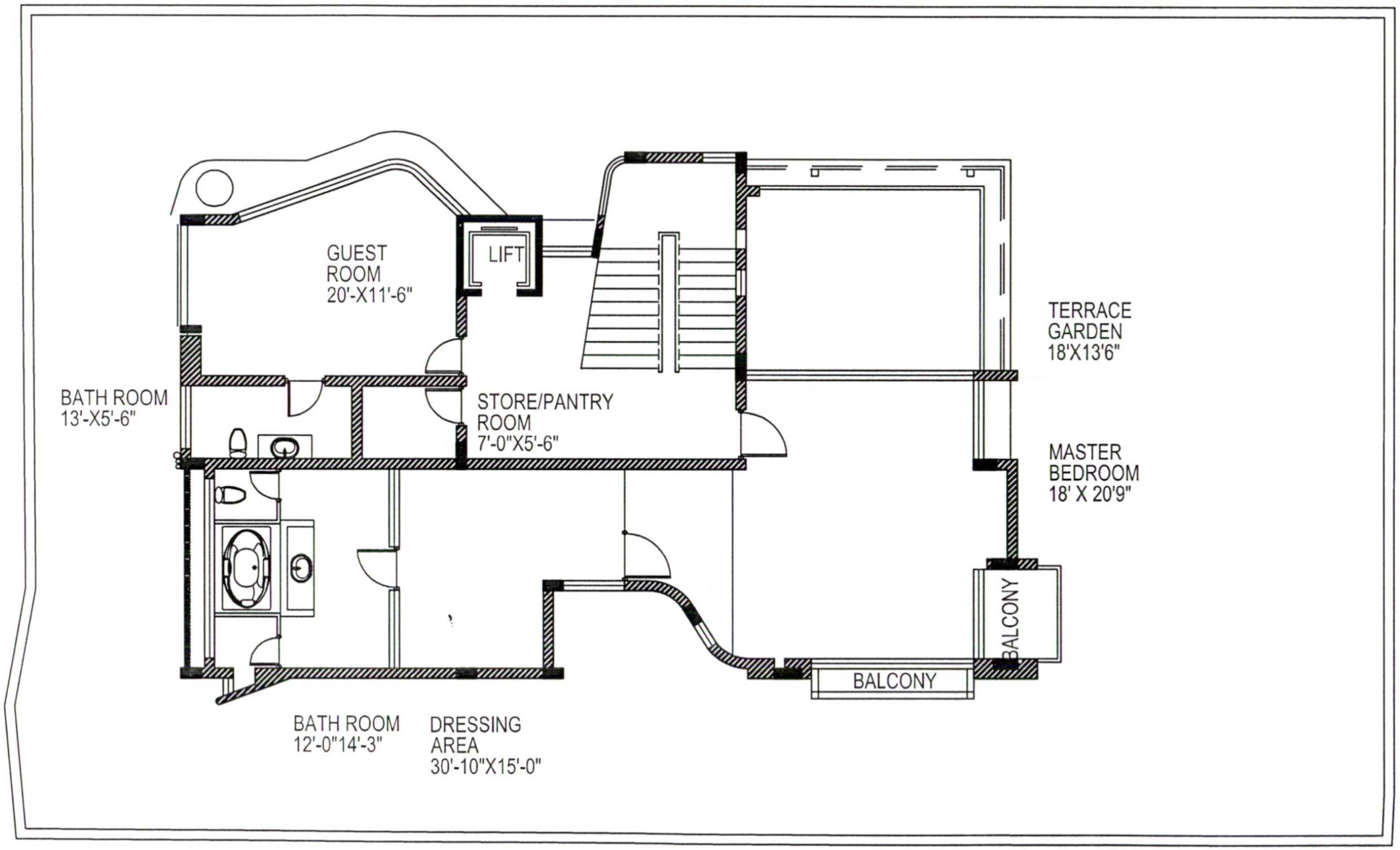


Test Application –4

Ground Floor Plan
Schematic Analysis

North

Figure 5.1.25 Test Application 4 First Floor Plan



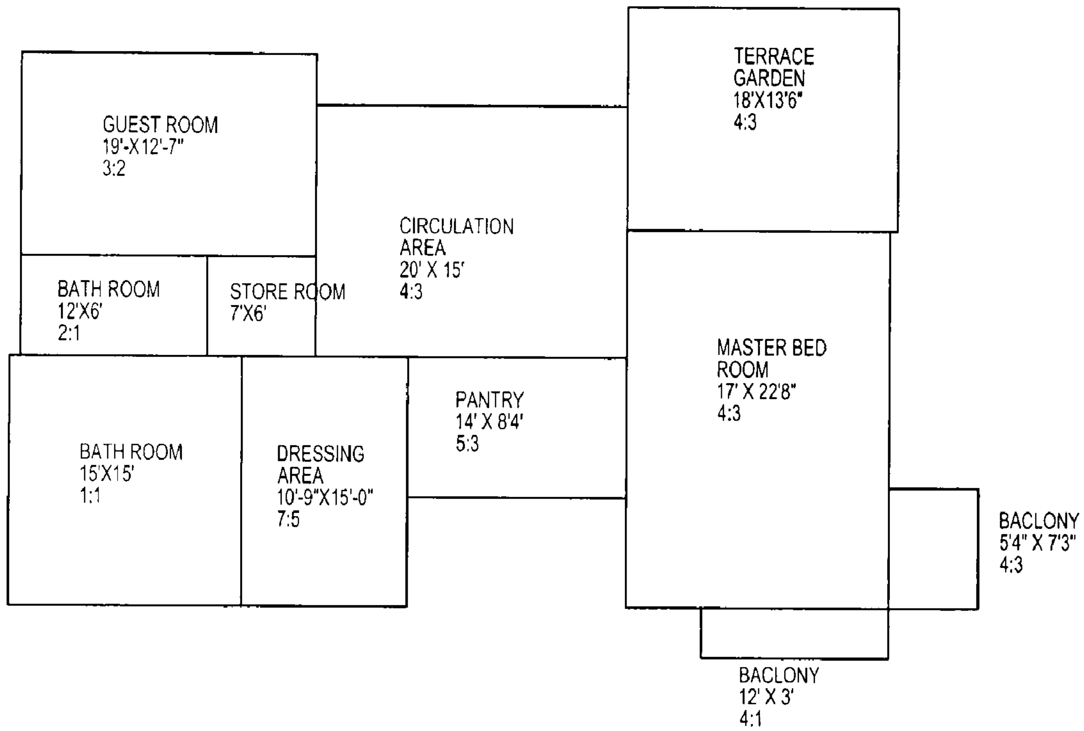
Test Application –4

First Floor Plan

North

Source: Author

Figure 5.1.26 Test Application 4 First Floor Plan Schematic Analysis



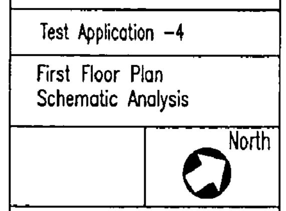
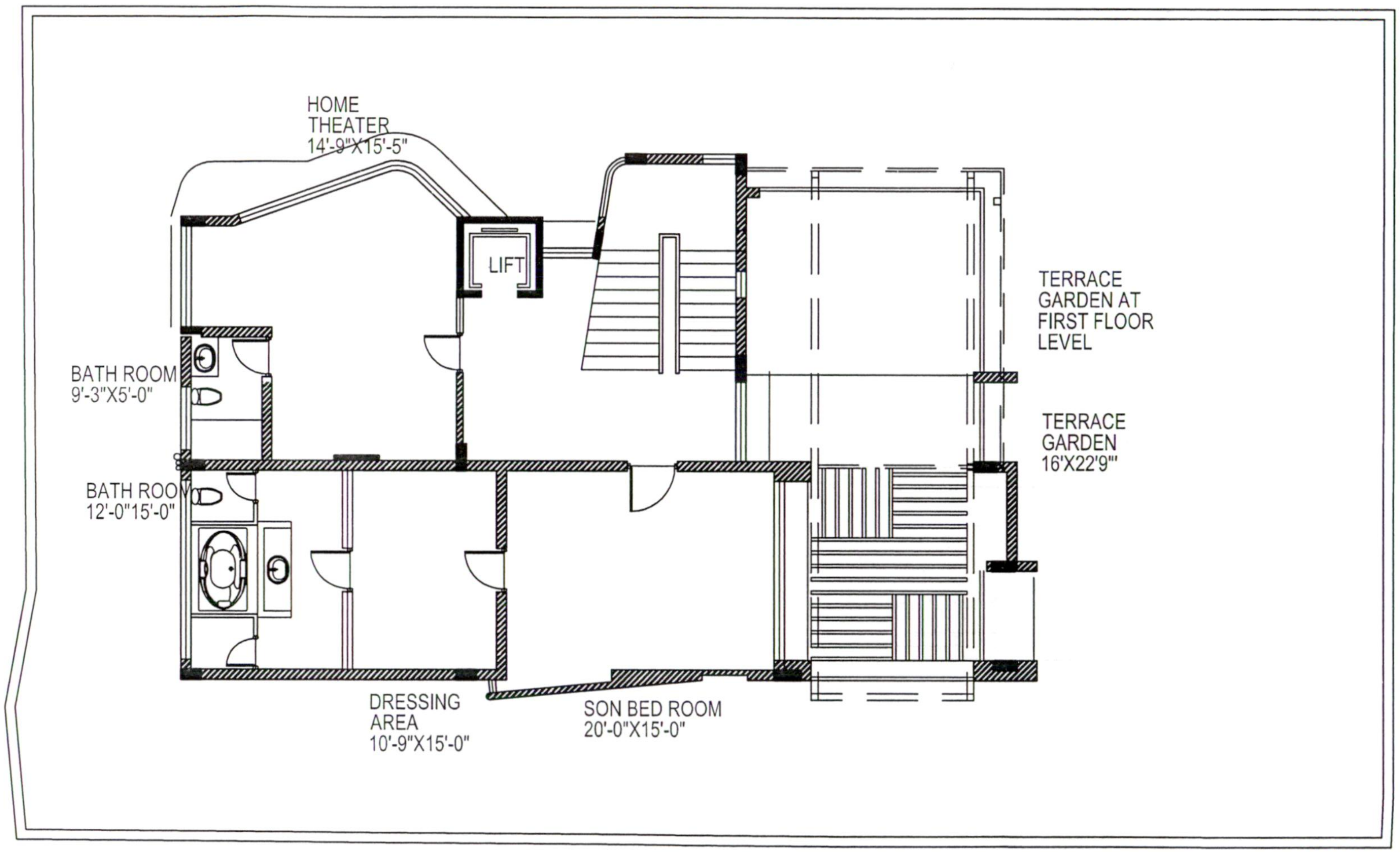
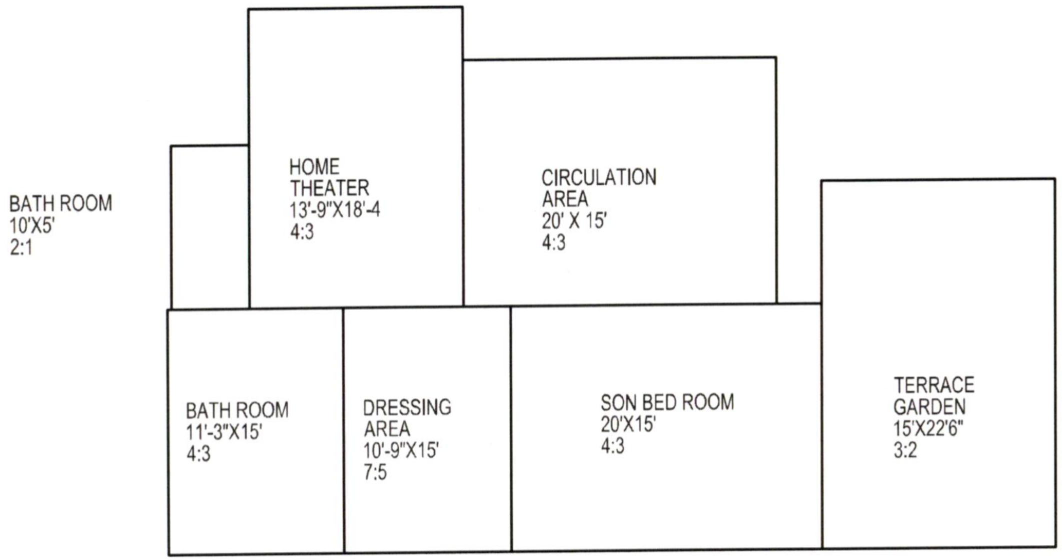


Figure 5.1.27 Test Application 4 Second Floor Plan



Test Application -4
Second Floor Plan
North
Source: Author

Figure 5.1.28 Test Application 4 Second Floor Plan Schematic Analysis



Test Application –4

Second Floor Plan
Schematic Analysis

North

Figure 5.1.29 Test Application 4 3d View, Front View

Test Application –4

3d Model View

Source: Author

Figure 5.1.30 Test Application 4 3d View, Side View

Test Application –4

3d Model View

Source: Author

Figure 5.1.31 Test Application 4 3d View Side View

Test Application -4

3d Model View

Source: Author

5.1.4 CONCLUDING NOTE

In reference to the aim of test application, that is to demonstrate adaptation of Palladian theory of seven room ratios in contemporary context using modern construction method and material, through analysis of test applications, it can be deduced that it is possible to adopt to Palladio theory in modern planning grammar that is not framed within geometry of regular polygon, alike as observed in constitution of villa plans by Palladio. As mentioned earlier; different case studies demonstrate adaptation of Palladian theory of seven room ratios with varied steps of modification for practical adoptability; for example, single storey structure helped to adopt Palladian theory of room height, while enlarging room size by 3" to accommodate for 1.5" plaster on walls gave proportionally perfect room sizes on completion of construction. All these experiments validate practical use, implementation and adoptability of Palladian theory of seven room ratios in contemporary residential planning context of Ahmedabad (and to an extent; assumingly of urban India in general).

5.2 COMPARATIVE STUDY OF PLANNING GRAMMAR

To have a comparative overview of similarities between Palladio's theory of proportion and other related theories of proportions, the thesis studies 'Modulor' by Le Corbusier and Vastu Shastra. One can deduce parallel between residential planning grammar of one modern and one ancient theory of proportions with respect to Palladio's theory of planning proportion to set an example that could be presided and enhanced through future extension of this research.

This adds to the range of test applications to get an idea of use of mix of standard and non standard ratios, through the study of residential buildings which have consumed rich and different variety of ratios. The plan analysis these residential structures designed on basis of non Palladian theory of proportion; by different architect; in different age; exhibits the relationship of different parts with each other and with the whole. These two points; thus affirms the validation of the test applications and analysis of Palladio's villa plan plates.

5.2.1 MODERN THEORY OF PROPORTIONS: COMPARATIVE STUDY OF LE CORBUSIER'S 'MODULOR' AND PALLADIAN THEORY OF PROPORTION

This part of study is an effort to synoptically bring out understanding of underlying similarity, if any, between planning grammar of residential unit based on modern theory of proportion namely 'Modulor' by modern French architect Le Corbusier (Charles Edouard Jeanneret, 06 October 1887 – 27 August 1965 AD) and Palladian theory of seven room ratios. It is an exercise to draw parallel between residential works (from Ahmedabad) of modern architect based on modern theory of proportions and Palladio's theory of proportion by superimposing later on former. This may lead to realization of wider spectrum of ratios based on similarity between different theories to set an example and at the same time generate idea of variety of probable ratios employed in modern theory that deviate from Palladio's theory. This is done to have understanding of variety of ratios and diversity in exploring a plan formulated on different theory of proportion.

5.2.1.1 SELECTION OF MODULOR FOR STUDY

"Plato's philosophy, being more mathematical, has had the more direct impact on architectural proportions. He is a pivotal figure in this story, connecting Pythagoras with Alberti and Palladio, and indeed with Le Corbusier." (Padovan, Richard, Proportion: Science, Philosophy, Architecture, pg. 99). From this one can infer that the theories of Plato, Pythagoras, Alberti, Palladio and Le Corbusier's 'Modulor' are interlinked or have something in common. As universal fact, it is observed that Modulor is based on proportions of human anatomy as it is with theories of some of Palladio's predecessors. This relationship and presence of residential works by Le Corbusier in Ahmedabad has initiated this study to bring out any similarity between the two proportioning theories.

5.2.1.2 THE MODULOR- SYNOPTIC OVERVIEW

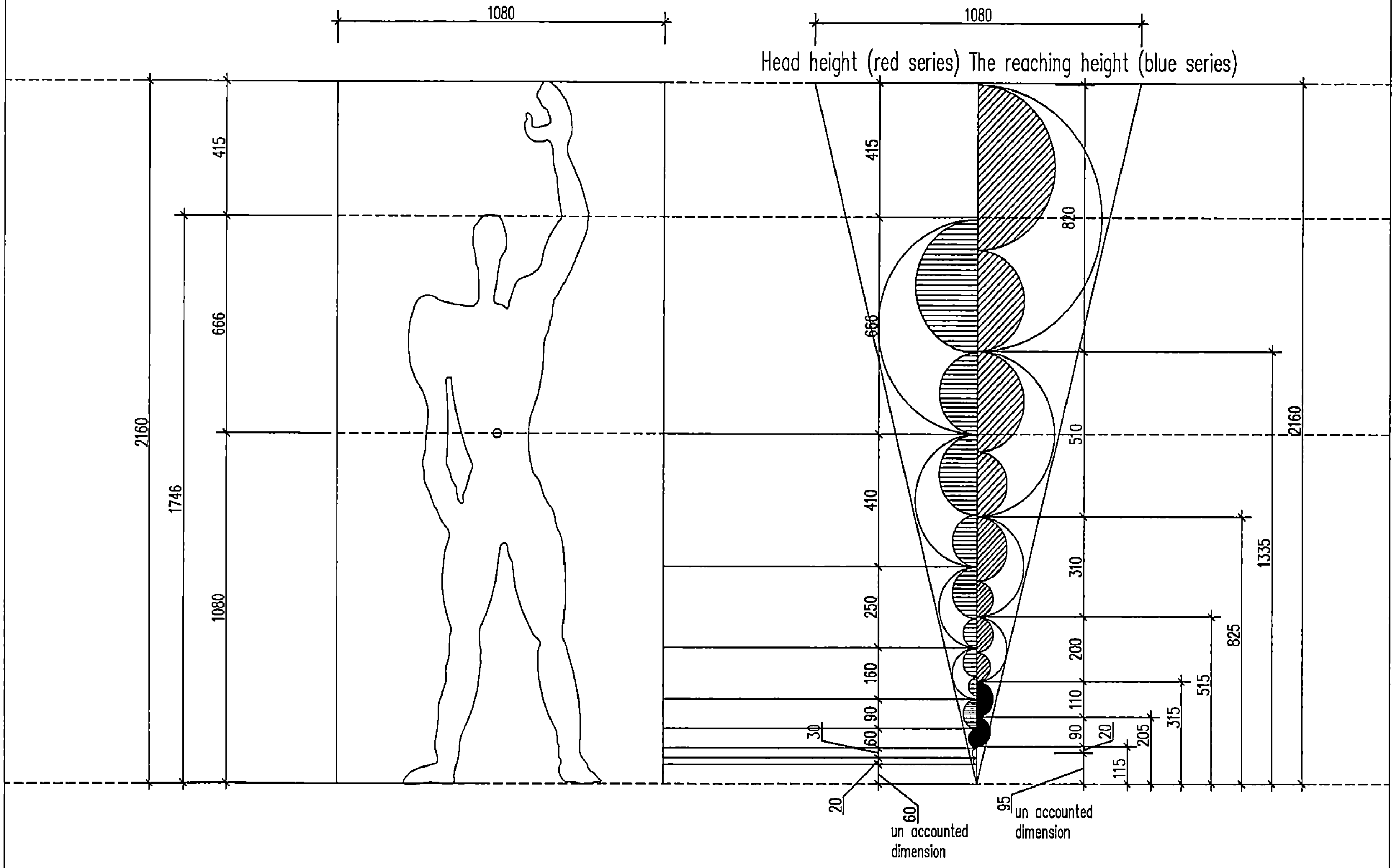
Between 1942 and 1955, Le Corbusier founded the Modular, his own scale of measurement of architecture, which measured the standard human height to be 1745 millimeters. The 'Modulor' represents an attempt to combine the English measuring system, which is based on the foot, with the metric decimal system and at the same time to establish relationships with human anatomical stature. The 'Modulor' is based on the Golden section and the proportions of the human body. Le Corbusier explicitly used the Golden ratio in his Modulor system for the scale of architectural proportion. He saw this system as a continuation of the long tradition of Vitruvius, Leonardo da Vinci's "Vitruvian Man", the work of Leon Battista Alberti and others who used the proportions of the human body to enhance the appearance and function of architecture. He sectioned his model human body's height at the navel with the two sections in Golden ratio, then subdivided those sections in golden ratio at the knees and throat; he used these golden ratio proportions in the Modulor system. The Modular Man is 1745 mm tall and with left arm raised, reaches a height of 2160 mm. His head height, if partitioned as per Golden Section or the height of his navel, is 1080 mm, which, curiously enough, is half the height of the raised arm. Two series of measurements have been derived: the reaching height (blue series) and the head height (red series); each divided into diminishing proportions based on the Golden Section ratio.

The study has observed two version of basic height of human figure on which 'Modulor' has been developed, 1745 mm (from Le Corbusier's book 'Modulor') (figure 5.2.1) and 1828 mm (from Dhabuwala; Jagdish, 'Study of scale and proportion and use of the Modulor in the works of Le Corbusier') (figure 5.2.2). The study has redrawn both versions and recalculated its dimensions to two decimal places to verify and identify missing measurements.

These measurements are presented in tabular format (table 5.1) to have comparative overview of 'Modulor' developed on basis of such two basic measurements of human body. To establish consistency of proportion between dimensions of 'Modulor', these dimensions are recalculated on basis of golden ratio, these too are added to table to have clear picture of prescribed and derived ratios of red and blue series of 'Modulor'.

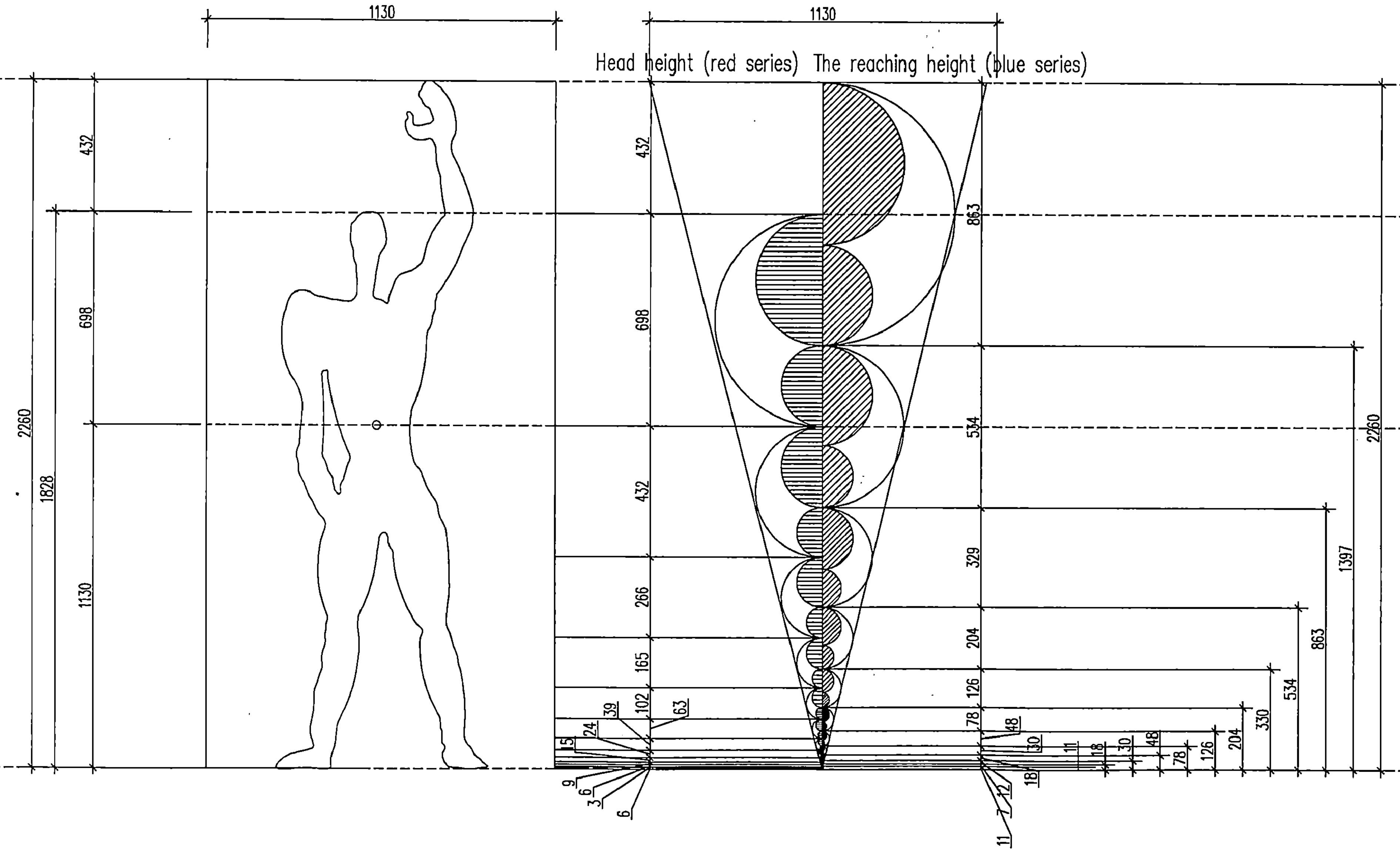
Le Corbusier placed systems of harmony and proportion at the centre of his design philosophy, and his faith in the mathematical order of the universe was closely bound to the golden section and the Fibonacci series.

Figure 5.2.1 Graphics Understanding Of Le Corbusier's 'modular' With Human Height Of 1745 Mm



Redrawn From Source: Le Corbusier, Modulor 1 And 2, Page 51

Figure 5.2.2 Graphics Understanding Of Le Corbusier's 'modular' with human height of 1828 mm



Redrawn From Source: Dhabuwala; Jagdish,
Study Of Scale And Proportion And Use Of The Modulor In The Works Of Le Corbusier, Page 89

Figure 5.2.3 Restructured Modulor On The Basis Of Golden Ratio

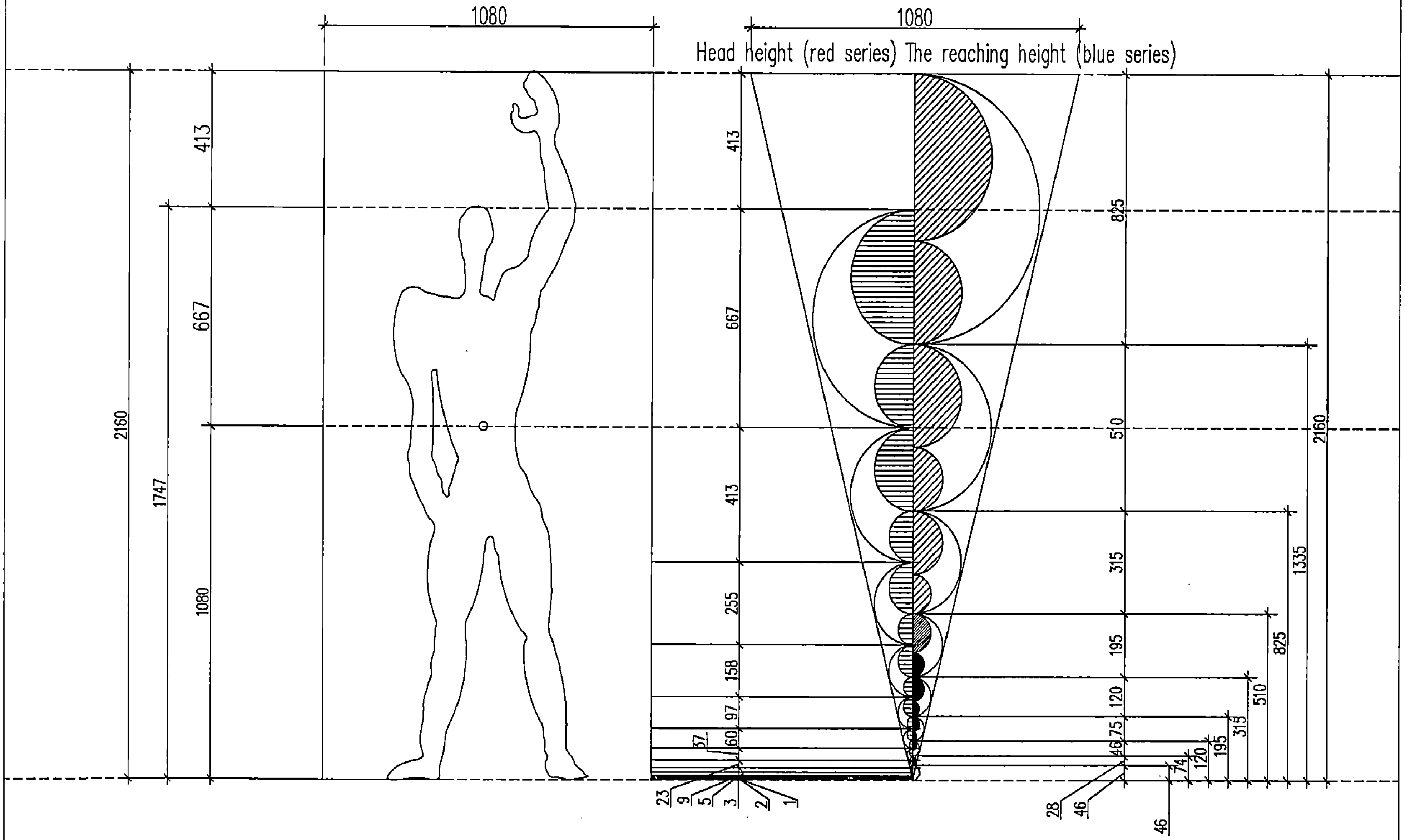


Figure 5.2.4 Comparitive Overview Of Human Proporation By Vitruvias, Leonardo Da Vinci's And Le Corbusier

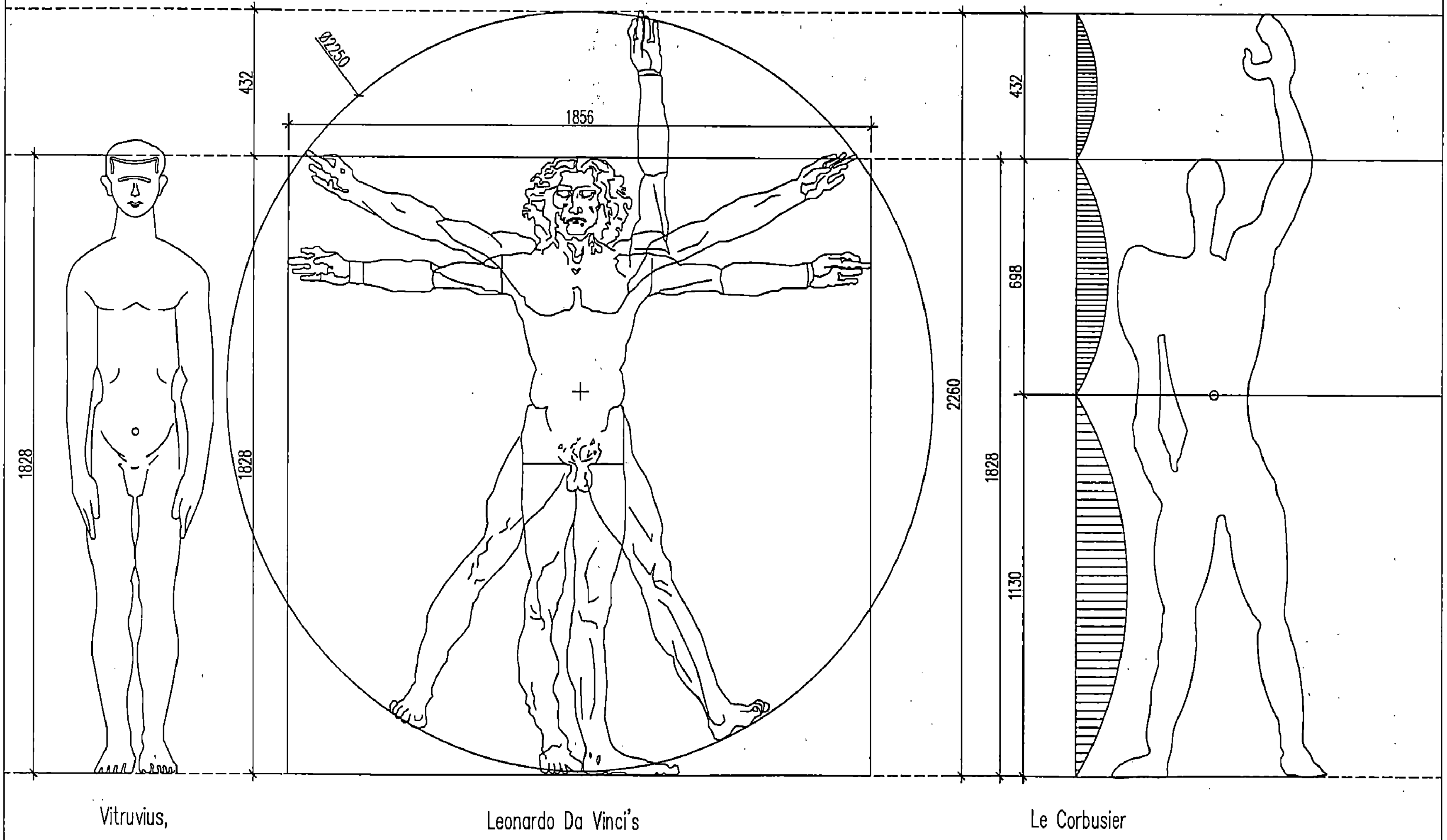


Table 5.1 Derivation of ratios from blue & red series of Le Courbusier's 'modular'on basis of golden ratio

modular on basis of human ht 1745mm as Prescribed by LeCourbusier	
left	right
red series	blue series
20	20
30	90
60	110
90	200
160	310
250	510
410	820
660	1330
1080	2160

modular dimension as per golden ratio(1:1.61803399)	
human ht 1745 mm	
red series correct upto two decimal places	blue series correct upto two decimal places
1.28	2.56
2.07	4.15
3.35	6.71
5.43	10.85
8.78	17.56
14.21	28.42
22.99	45.98
37.20	74.39
60.19	120.37
97.38	194.77
157.57	315.14
254.95	509.91
412.52	825.05
667.48	1334.95
1080.00	2160.00
1747.48	3494.95

modular on basis of human ht 1828mm	
left	right
red series	blue series
6	11
9	18
15	30
24	48
39	78
63	126
102	204
165	330
267	534
432	863
698	1397
1130	2260

modular dimension as per golden ratio(1:1.61803399)	
human ht 1828 mm	
red series correct upto two decimal places	blue series correct upto two decimal places
3.51	7.02
5.68	11.36
9.19	18.38
14.87	29.73
24.05	48.11
38.92	77.84
62.97	125.95
101.89	203.78
164.86	329.73
266.76	533.51
431.62	863.24
698.38	1396.76
1130.00	2260.00

5.2.1.3 SELECTION OF CASE STUDY

As the domain of work is residential buildings and region of test application is Ahmedabad, following residential structures designed by Le Corbusier in Ahmedabad (that is same seismic and climatic zone as it is for test application with same construction material available locally that may affect planning parameters and grammar) have been selected, namely Villa Shodhan and Sarabhai house, both constructed between 1951 and 1956 AD. Shodhan villa and Sarabhai House are the only two residential structures designed by him in Ahmedabad and thus are best suited for analysis of residential work based on another (modern) system of proportions.

5.2.1.4 METHODOLOGY FOR ANALYSIS

Plans are redrawn from source to verify dimensions and identify missing dimension; making the understanding of composition clear. As these structures adopt to modern day construction methods, the plans have not been reduce to single line diagrams. The plans have been analyzed on the basis of method adopted in part 4 of analysis of Palladian plates, which is not to compensate for wall and plaster thickness and consider internal room dimensions.

Observations derived through analysis are tabulated at end of the analysis (table5.2). It tabulates room dimensions observed from redrawn plans of case studies as shown by Le Corbusier. It is followed by its room ratio. Next column tabulates modified room dimensions. Rectified room dimensions are obtained by keeping one dimension of room from Le Corbusier's plan constant and vary only one dimension up or down to achieve nearest falling Palladian room ratio. Thus derived room ratios are related to Palladio's theory of proportions and are tabulated in next column. Next column gives an idea of difference (in room size) in one dimension that has been deliberately revised to derive at Palladian room ratio. Thus the table gives an overview of modifications required in one room dimension to have proportionally better plan and marks the difference in dimensions prescribed in both Palladio's theory and 'Modulor". This gives an idea that if room dimensions are modified acutely; it could result in proportionally better space.

Dimensions mentioned in analysis of both case studies are in cm. (centimetre).

5.2.1.5 ANALYSIS AND UNDERSTANDING OF TEST APPLICATION PLANS

Diagrammatic analysis of both the villas designed by Le Corbusier in Ahmedabad is presented in following pages. Plates are analyzed to bring out understanding of similarity between 'Modulor' and Palladian theory of seven room ratios.

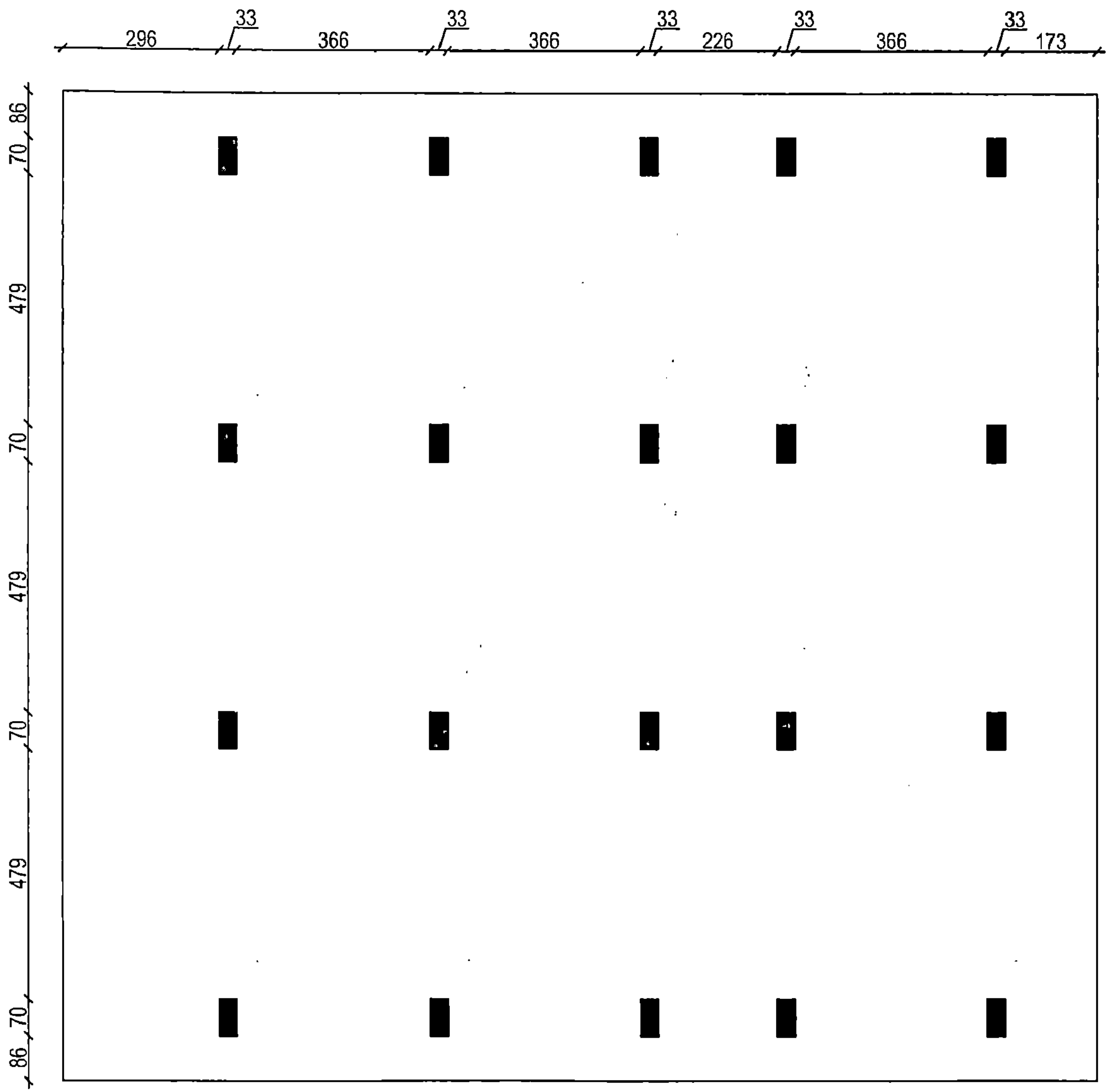


Figure 5.2.5 Shodhan Villa, Structural System Plan

DIMS. IN CM.

SHODHAN VILLA

Structural System Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 42.

North

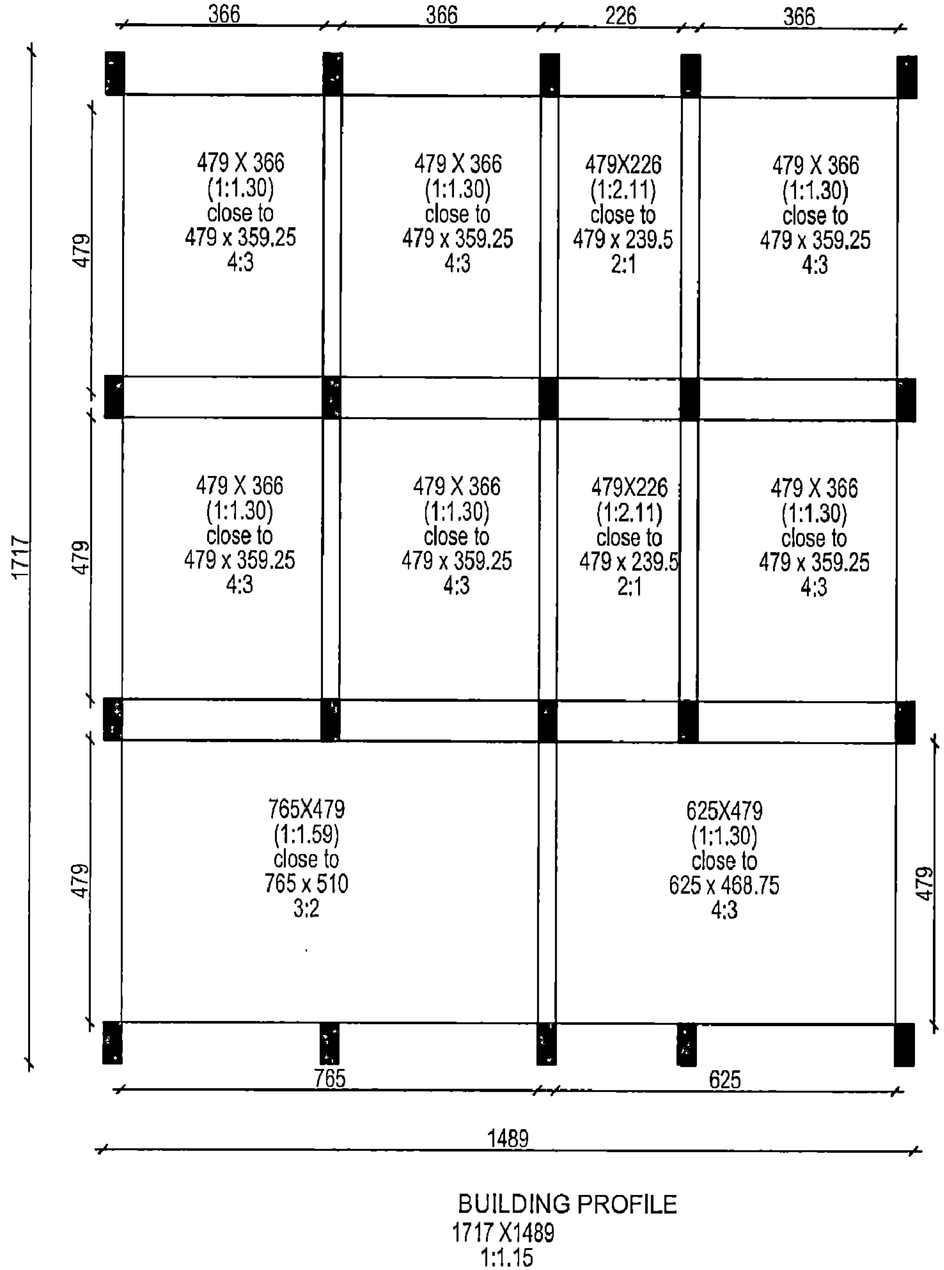


Figure 5.2.6 Shodhan Villa, Schematic Analysis Of Structural System Plan

SHODHAN VILLA

Structural System Plan

Schematic Analysis

North

Dims in cm

DIMS. IN CM.

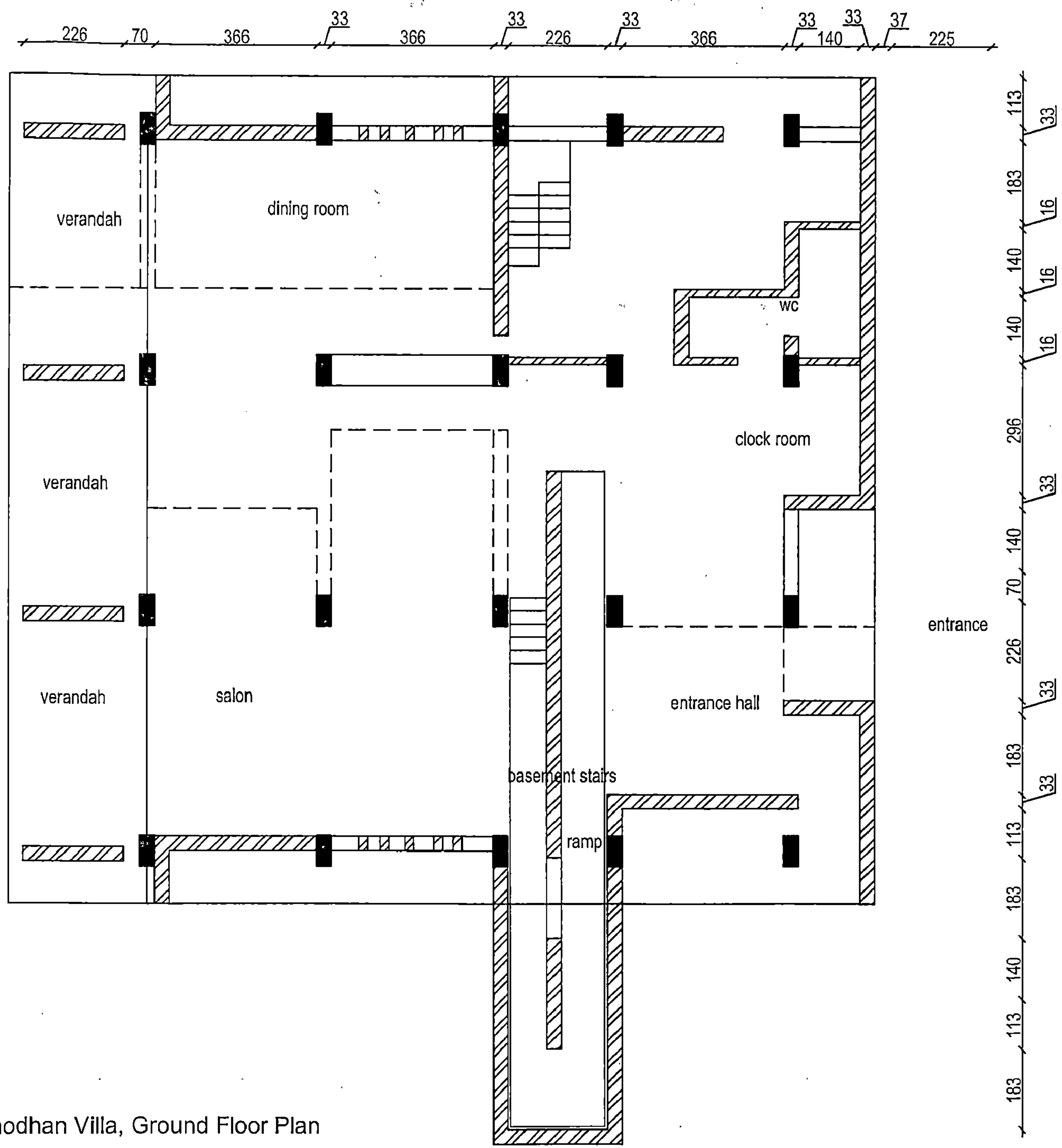


Figure 5.2.7 Shodhan Villa, Ground Floor Plan

SHODHAN VILLA

Ground Floor Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 43.

North

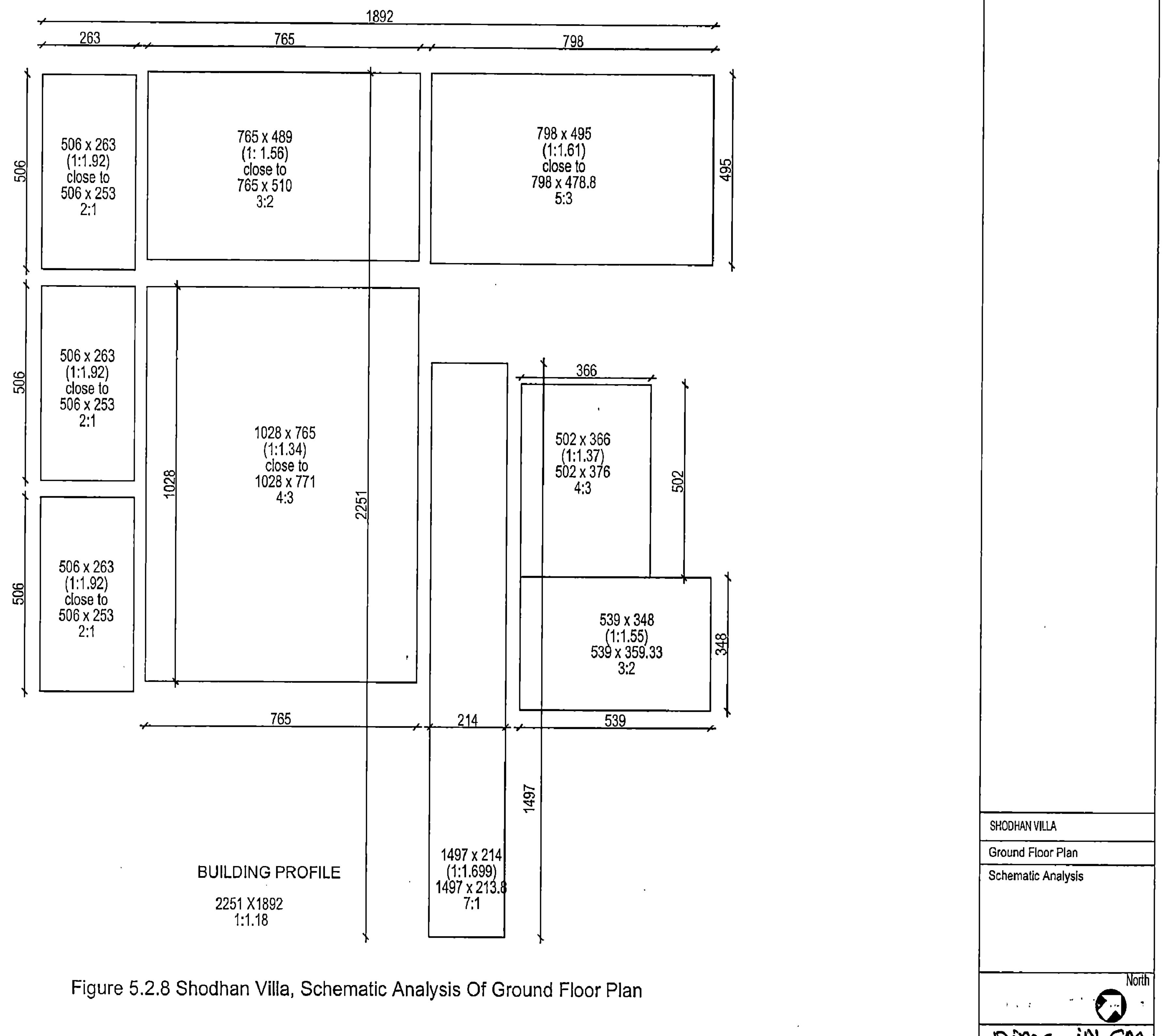


Figure 5.2.8 Shodhan Villa, Schematic Analysis Of Ground Floor Plan

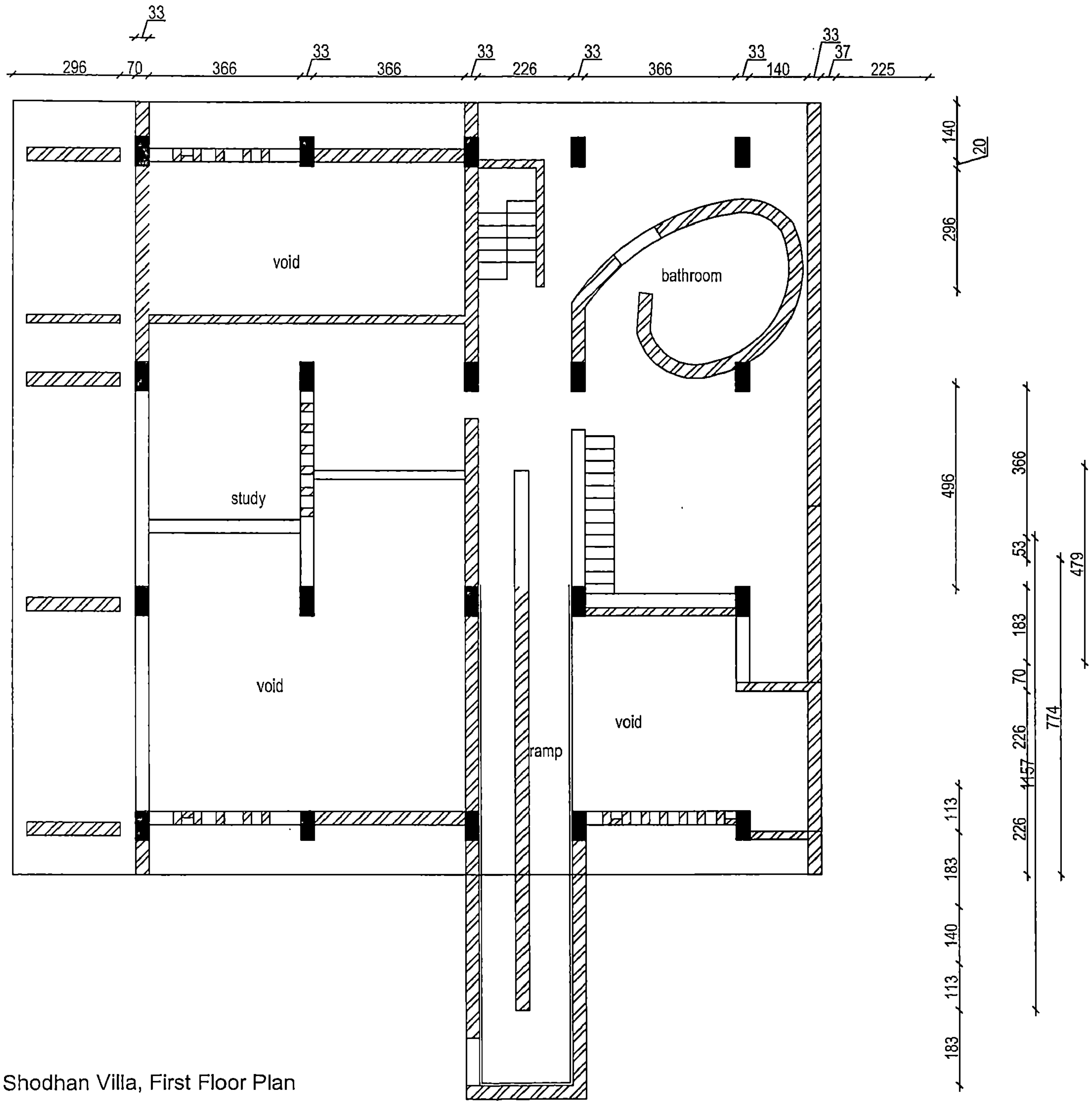


Figure 5.2.9 Shodhan Villa, First Floor Plan

Dims. in cm.

SHODHAN VILLA

First Floor Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 44.

North

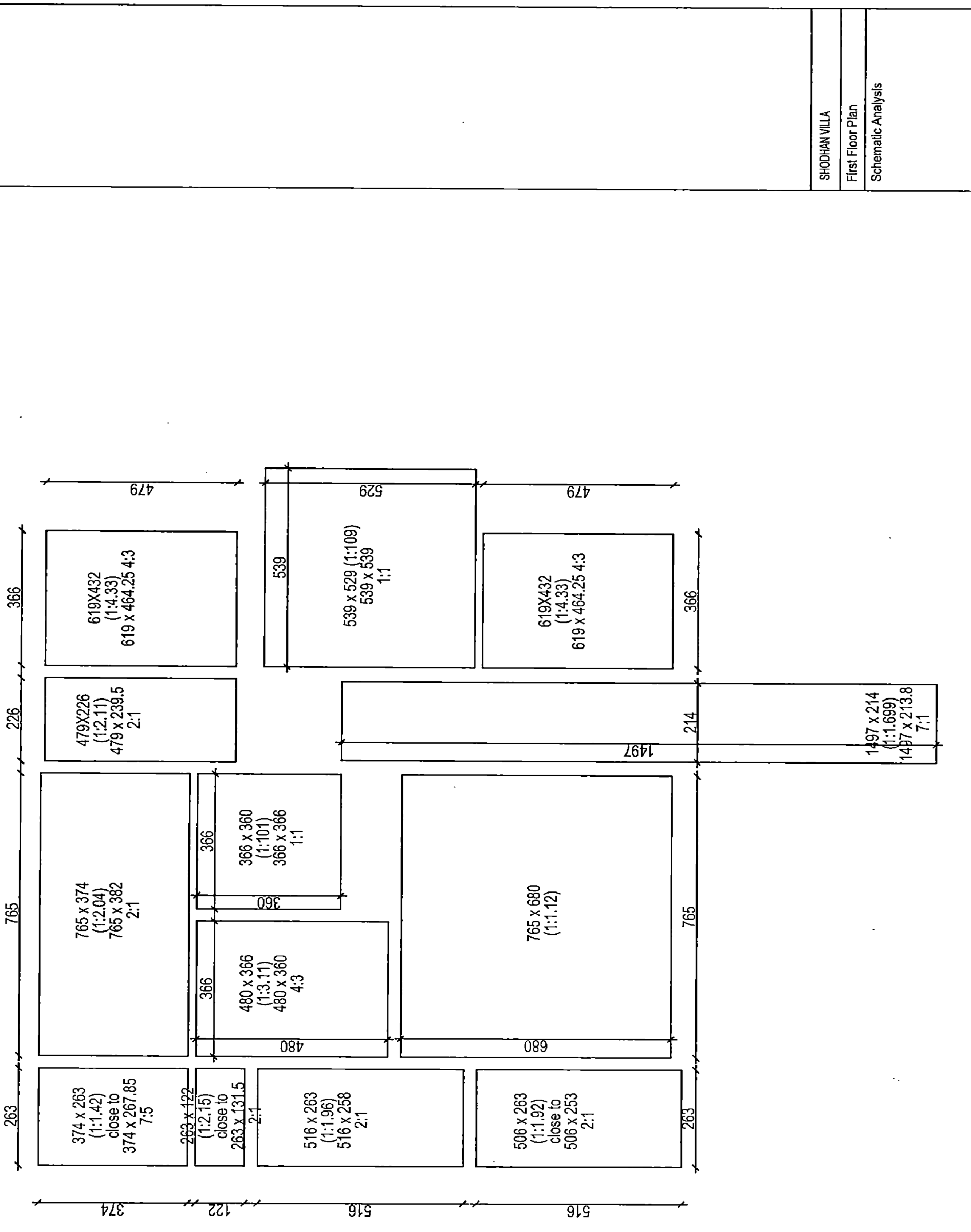


Figure 5.2.10 Shodhan Villa, First Floor Plan Of Schematic Analysis

DIMS. IN CM

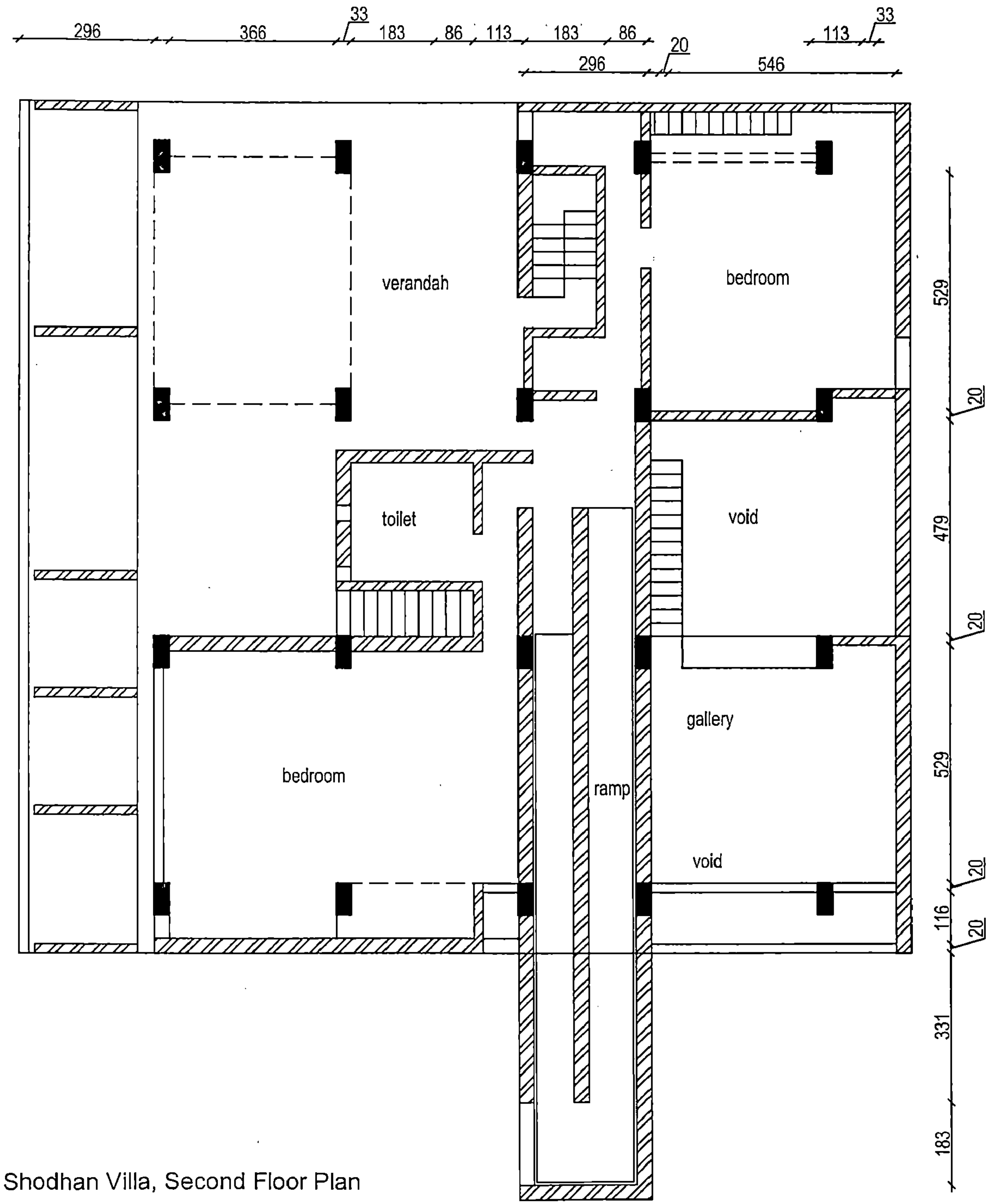


Figure 5.2.11 Shodhan Villa, Second Floor Plan

SHODHAN VILLA

Second Floor Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 45.

North

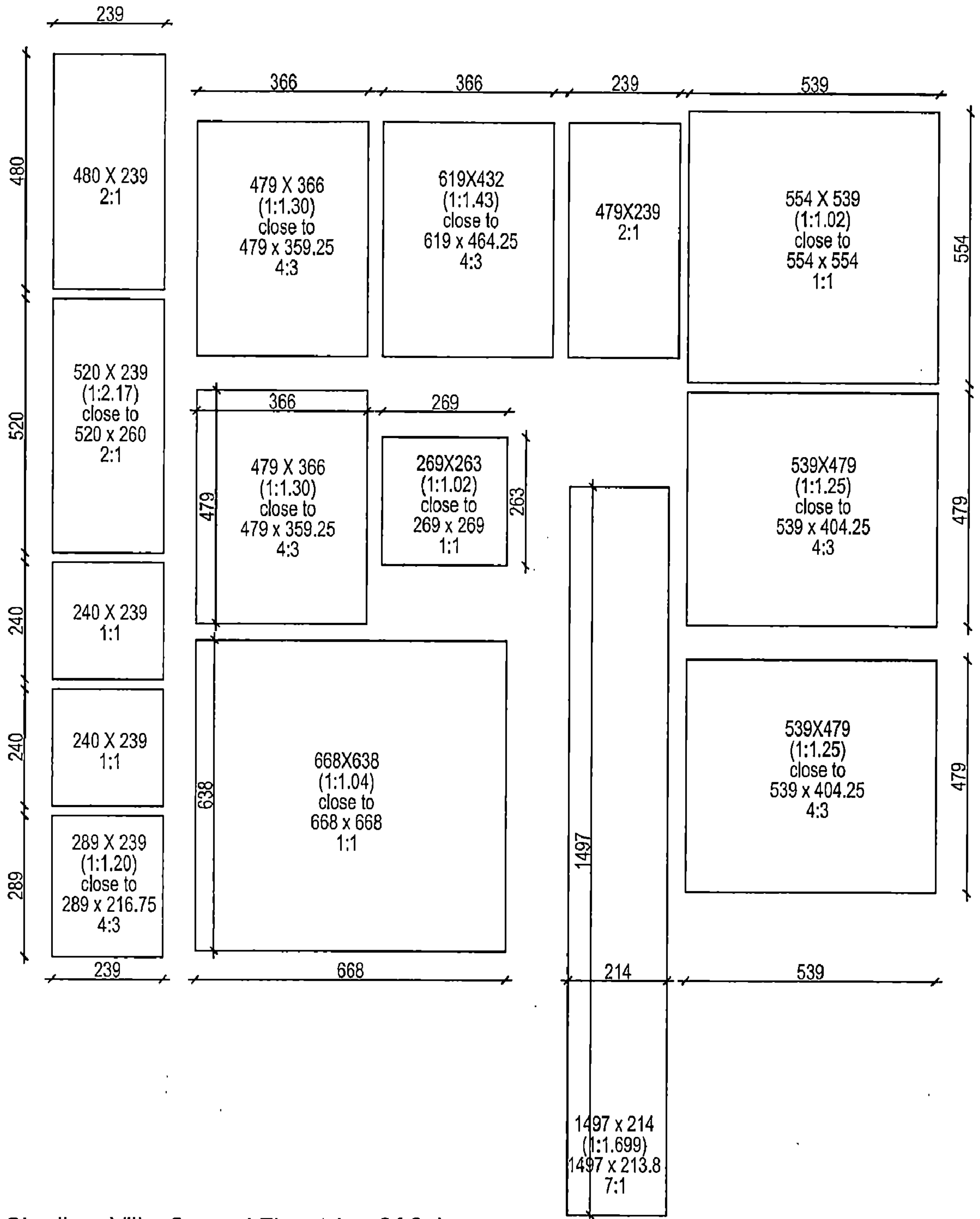


Figure 5.2.12 Shodhan Villa, Second Floor Plan Of Schematic Analysis

SHODHAN VILLA

Second Floor Plan

Schematic Analysis

North

DIMS. IN CM

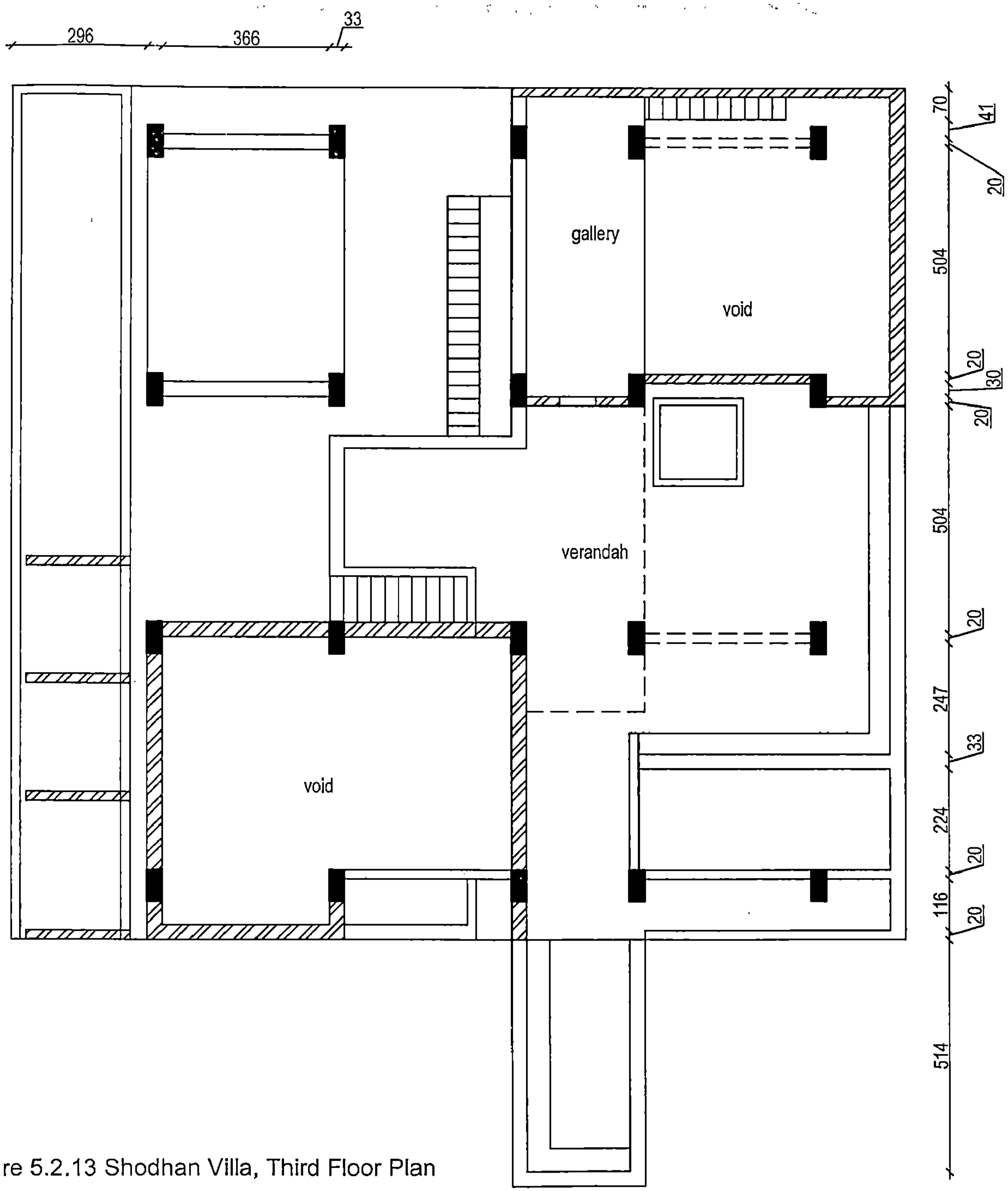


Figure 5.2.13 Shodhan Villa, Third Floor Plan

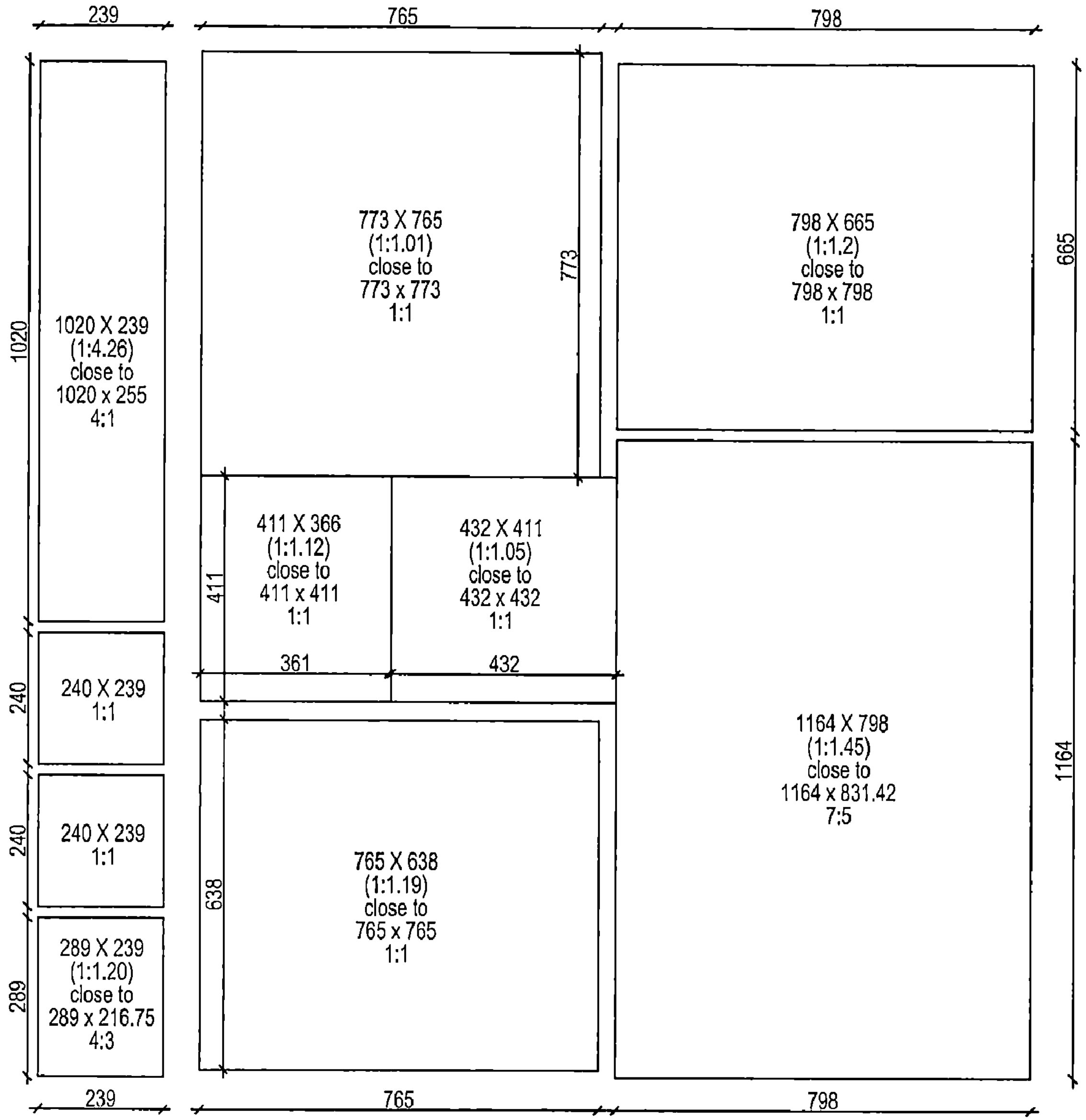
DIMS. IN CM

SHODHAN VILLA

Third Floor Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 46.

North



SHODHAN VILLA

Third Floor Plan

Schematic Analysis

North

Figure 5.2.14 Shodhan Villa, Third Floor Plan Of Schematic Analysis

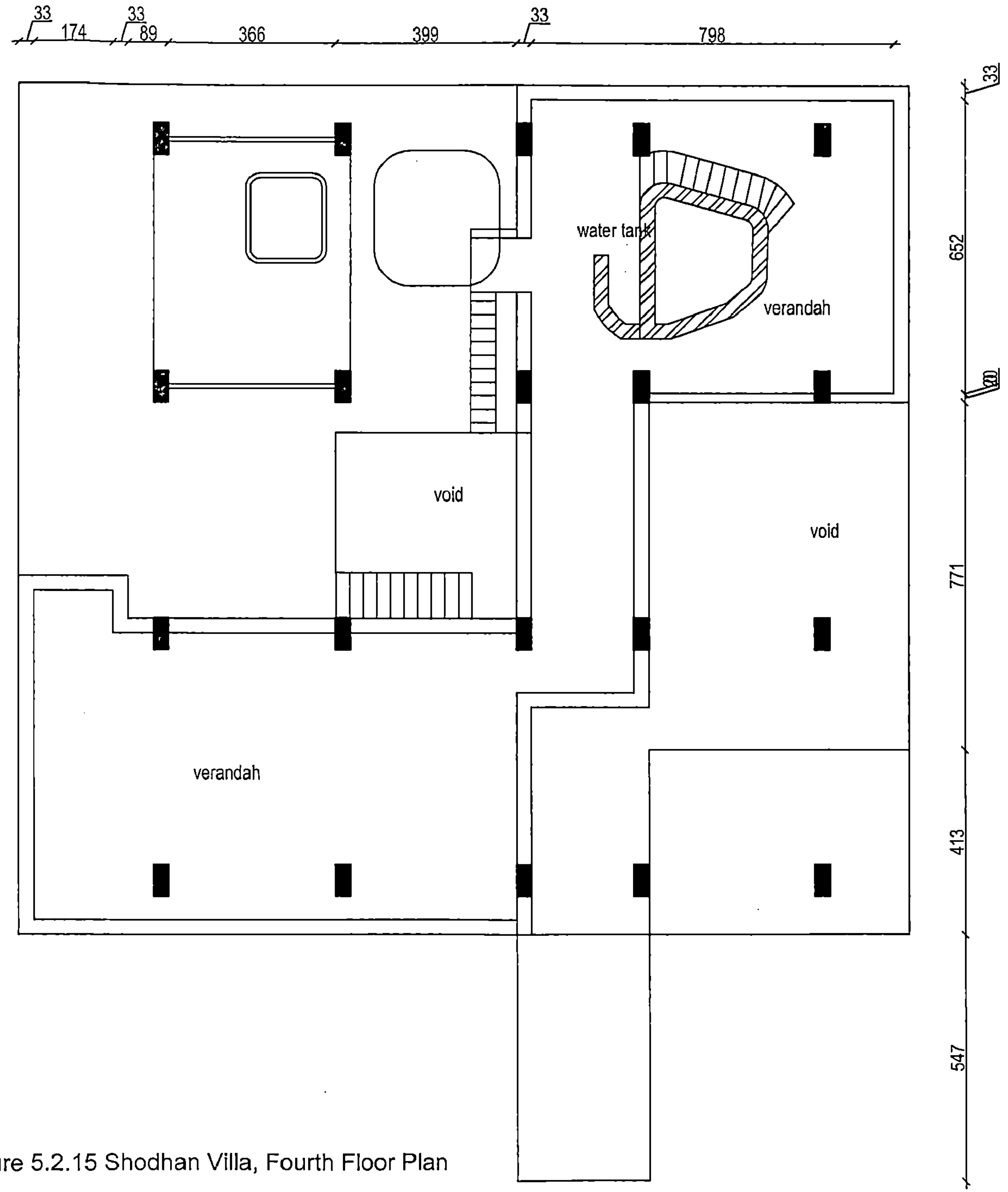


Figure 5.2.15 Shodhan Villa, Fourth Floor Plan

DIMS: IN CM

SHODHAN VILLA

Fourth Floor Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 47.

North

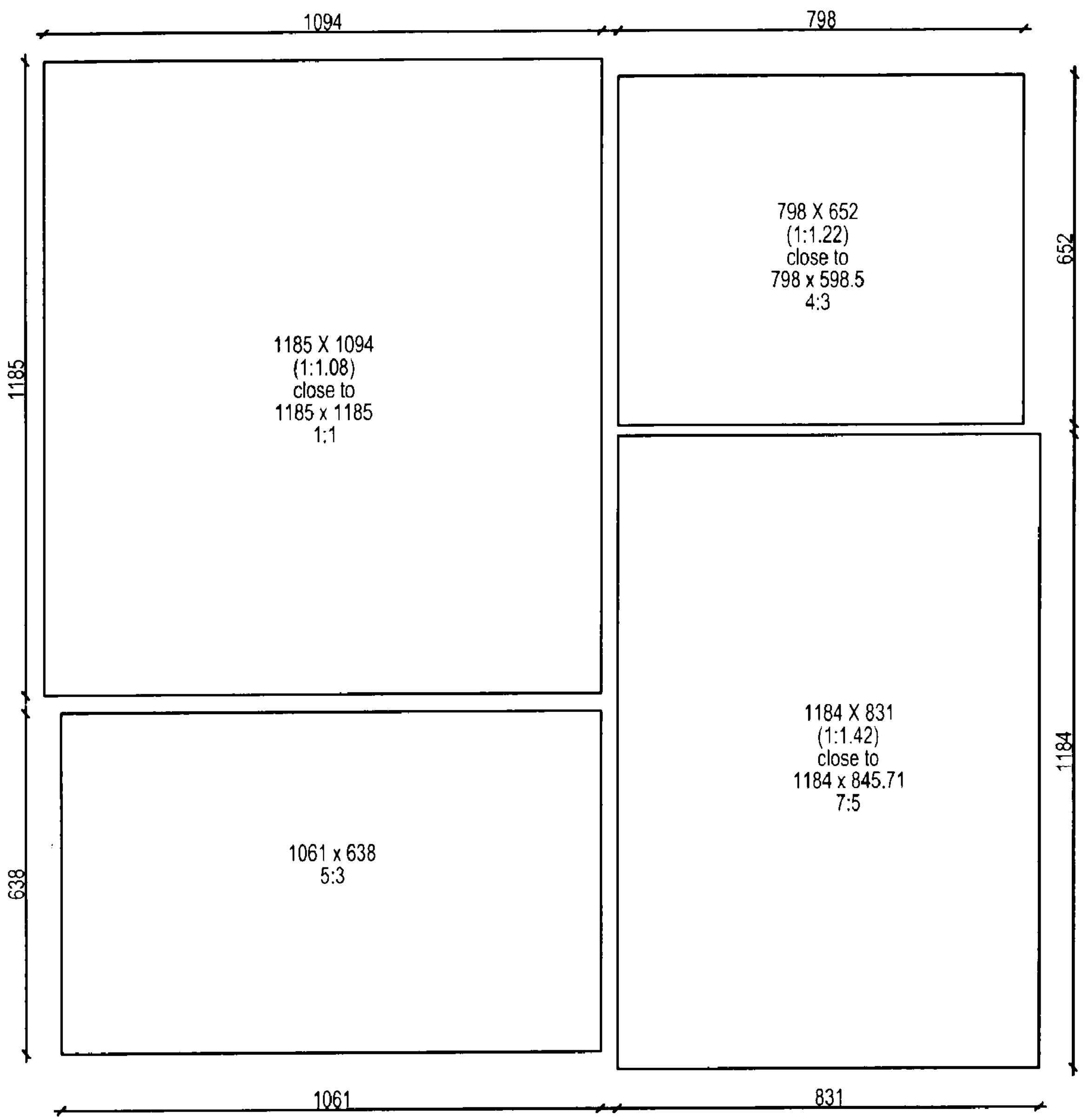


Figure 5.2.16 Shodhan Villa, Fourth Floor Plan Of Schematic Analysis

SHODHAN VILLA

Fourth Floor Plan

Schematic Analysis

North

DIMS. IN CM.

Figure 5.2.17 Shodhan Villa, On Site Photograph

SHODHAN VILLA

Structural System Plan

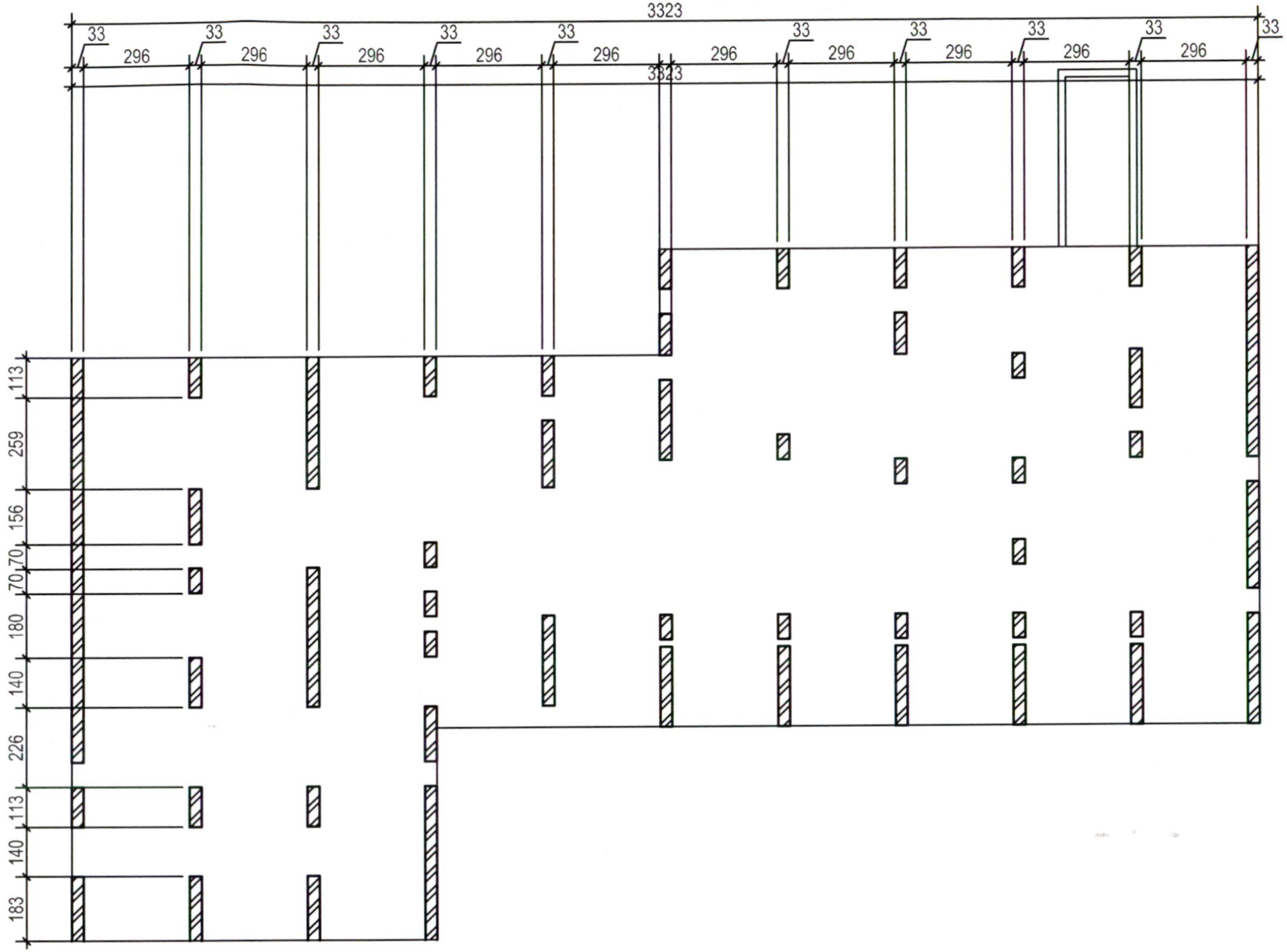
Source: http://www.
fondationlecorbusier.fr

Figure 5.2.18 Sarabhai House, On Site Photograph

SARABHAI HOUSE

Structural System Plan

Source: http://www.
fondationlecorbusier.fr



Dims. in cm.

SARABHAI HOUSE

Structural System Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 59.

North

Figure 5.2.19 Sarabhai House, Structural System Plan

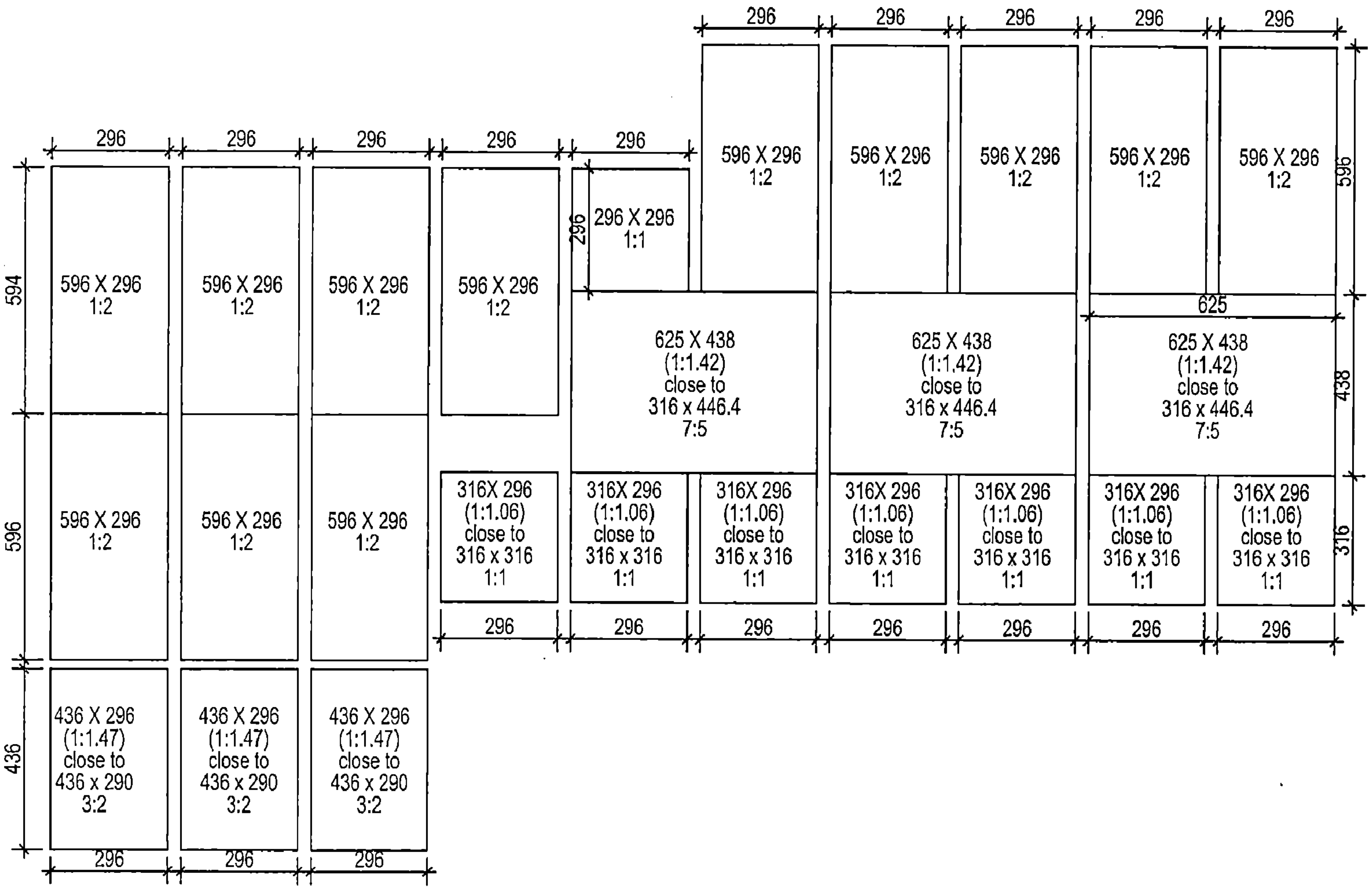


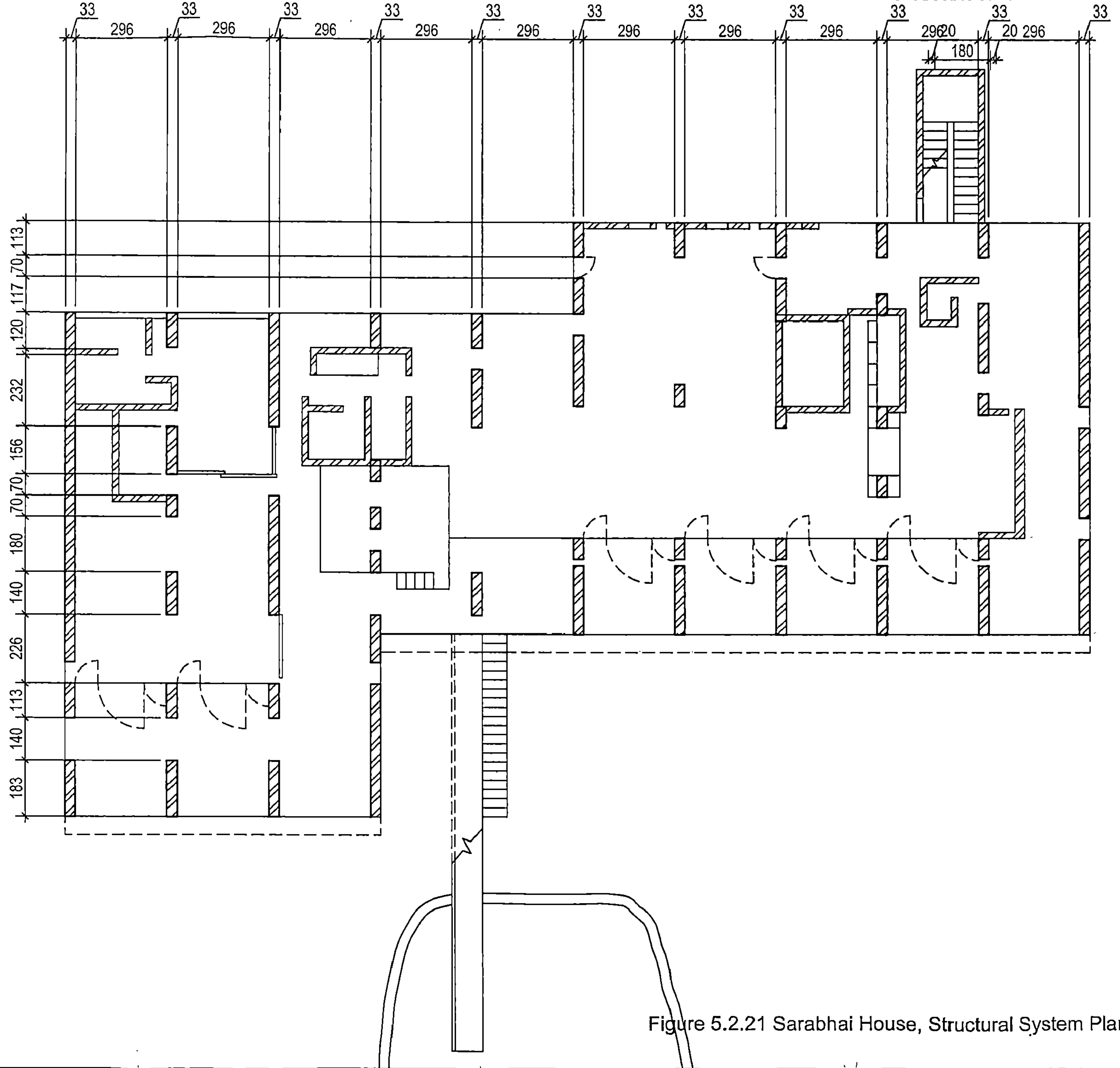
Figure 5.2.20 Sarabhai House, Structural System Plan

SARABHAI HOUSE

Structural System Plan

Schematic Analysis

North



Dims . in cm.

SARABHAI HOUSE

Ground Floor Plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 60.

North

Figure 5.2.21 Sarabhai House, Structural System Plan

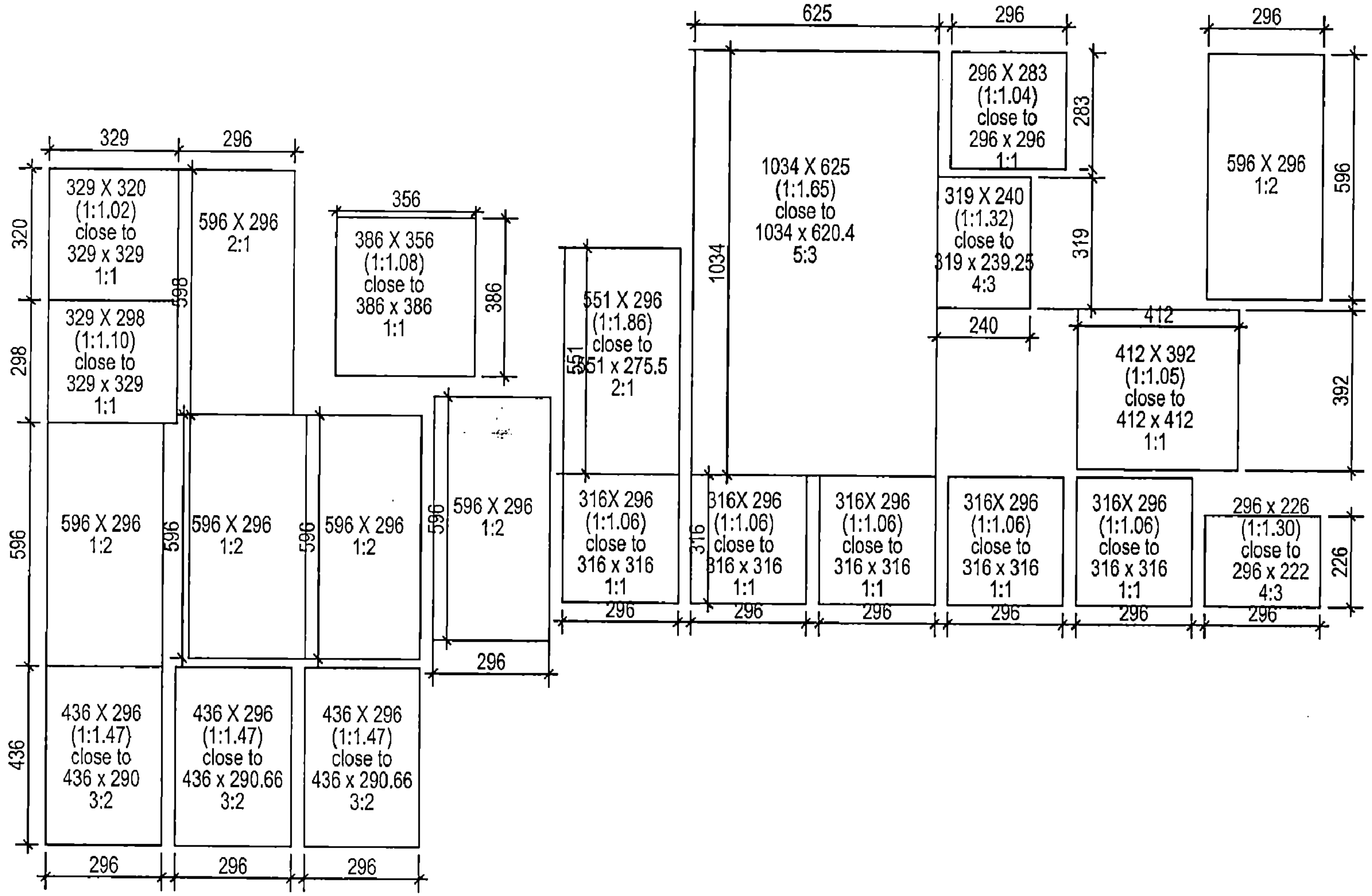


Figure 5.2.22 Sarabhai House, Structural System Plan

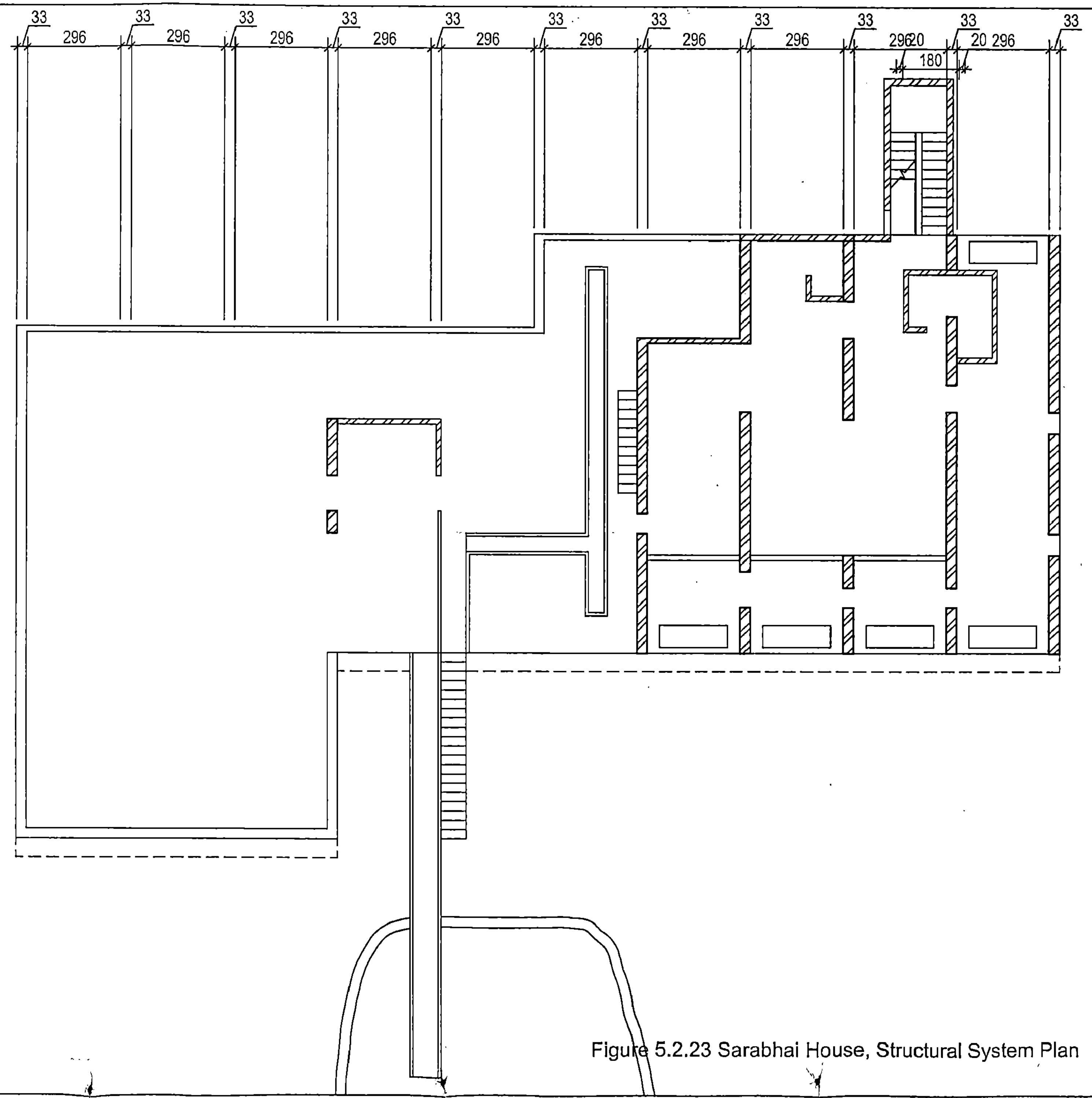
SARABHAI HOUSE

Ground Floor Plan

Schematic Analysis

North

Dims in cm



DIMS. IN CM.

SARABHAI HOUSE

First Floor plan

Redrawn from source:
Dhabuwala; Jagdish,
Study of scale and proportion and use of the modulor in the works of Le Corbusier,
Plate 61.

North

Figure 5.2.23 Sarabhai House, Structural System Plan

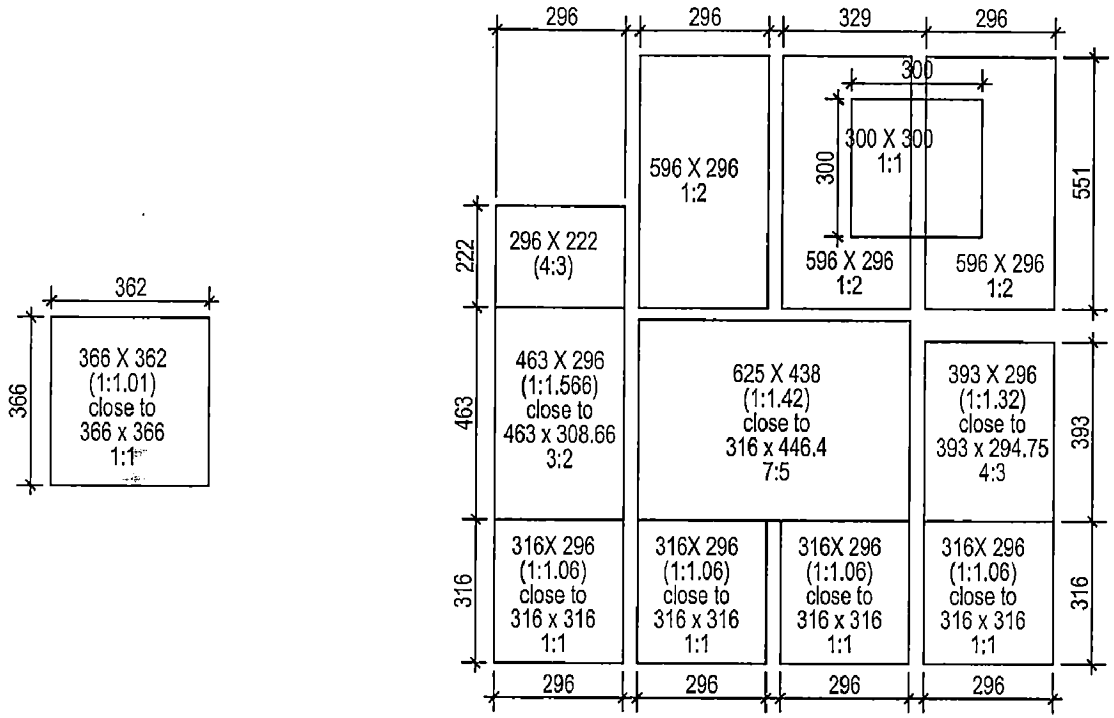


Figure 5.2.24 Sarabhai House, Structural System Plan

SARABHAI HOUSE

First Floor plan

Schematic Analysis

North

Dims. IN CM.

Table 5.2- Room and proporotional dimensions of Shodhan villa & Sarabhai house													
First Floor	Room Count	Room Dim From Le corbuser's plan		Found Ratio			Modified /Proposed room dimension		Proposed Room Ratio			Difference between original and proposed room size	
Structural System Plan	1	479	366	1	:	1.309	479	359.25	4	:	3	6.75	
Structural System Plan	2	479	226	1	:	2.119	479	239.50	2	:	1	-13.50	
Structural System Plan	3	765	479	1	:	1.597	765	510.00	3	:	2	-31.00	
Structural System Plan	4	625	479	1	:	1.305	625	468.75	4	:	3	10.25	
Ground Floor	1	506	263	1	:	1.924	506	253	2	:	1	10.00	
Ground Floor	2	765	489	1	:	1.564	765	510	3	:	2	-21.00	
Ground Floor	3	798	495	1	:	1.612	798	478.8	5	:	3	16.20	
Ground Floor	4	1028	765	1	:	1.344	1028	771	4	:	3	-6.00	
Ground Floor	5	502	366	1	:	1.372	502	376	4	:	3	-10.00	
Ground Floor	6	539	348	1	:	1.549	539	359.33	3	:	2	-11.33	
Ground Floor	7	1497	214	1	:	6.995	1497	213.8	7	:	1	0.20	
Ground Floor building size		2251	1892	1	:	1.190	2251	2251	1	:	1	-359.00	
First Floor	1	374	263	1	:	1.422	374	267.85	7	:	5	-4.85	
First Floor	2	263	122	1	:	2.156	263	131.5	2	:	1	-9.50	
First Floor	3	516	263	1	:	1.962	516	258	2	:	1	5.00	
First Floor	4	506	263	1	:	1.924	506	253	2	:	1	10.00	
First Floor	5	765	374	1	:	2.045	765	382	2	:	1	-8.00	
First Floor	6	480	366	1	:	1.311	480	360	4	:	3	6.00	
First Floor	7	765	680	1	:	1.125	765	765	1	:	1	-85.00	
First Floor	8	479	226	1	:	2.119	479	239.5	2	:	1	-13.50	
First Floor	9	366	360	1	:	1.017	366	366	1	:	1	-6.00	
First Floor	10	619	432	1	:	1.433	619	464.25	4	:	3	-32.25	
First Floor	11	539	529	1	:	1.019	539	539	1	:	1	-10.00	
First Floor	12	619	432	1	:	1.433	619	464.25	4	:	3	-32.25	
First Floor	13	1497	214	1	:	6.995	1497	213.8	7	:	1	0.20	
Second Floor	1	480	239	1	:	2.008	480	239	2	:	1	0.00	
Second Floor	2	520	239	1	:	2.176	520	260	2	:	1	-21.00	
Second Floor	3	240	239	1	:	1.004	240	240	1	:	1	-1.00	
Second Floor	4	240	239	1	:	1.004	240	240	1	:	1	-1.00	
Second Floor	5	289	239	1	:	1.209	289	216.75	4	:	3	22.25	
Second Floor	6	479	366	1	:	1.309	479	359.25	4	:	3	6.75	
Second Floor	7	479	366	1	:	1.309	479	359.25	4	:	3	6.75	
Second Floor	8	668	638	1	:	1.047	668	668	1	:	1	-30.00	
Second Floor	9	619	432	1	:	1.433	619	464.25	4	:	3	-32.25	
Second Floor	10	269	263	1	:	1.023	269	269	1	:	1	-6.00	
Second Floor	11	479	239	1	:	2.004	479	239.5	2	:	1	-0.50	
Second Floor	12	554	539	1	:	1.028	554	554	1	:	1	-15.00	
Second Floor	13	539	479	1	:	1.125	539	404.25	4	:	3	74.75	
Second Floor	14	539	479	1	:	1.125	539	404.25	4	:	4	74.75	
Second Floor	15	1497	214	1	:	6.995	1497	213.8	7	:	1	0.20	

First Floor	Room Count	Room Dim From Le corbuser's plan		Found Ratio			Modified /Proposed room dimension		Prop osed Roo m Ratio			Difference between original and proposed room size	
Third Floor	1	1020	239	1	:	4.268	1020	255	4	:	1	-16.00	
Third Floor	2	240	239	1	:	1.004	240	240	1	:	1	-1.00	
Third Floor	3	240	239	1	:	1.004	240	240	1	:	1	-1.00	
Third Floor	4	289	239	1	:	1.209	289	216.75	4	:	3	22.25	
Third Floor	5	773	765	1	:	1.010	773	773	1	:	1	-8.00	
Third Floor	6	411	366	1	:	1.123	411	411	1	:	1	-45.00	
Third Floor	7	765	638	1	:	1.199	765	765	1	:	1	-127.00	
Third Floor	8	798	665	1	:	1.200	798	798	1	:	1	-133.00	
Third Floor	9	1164	798	1	:	1.459	1164	831.42	7	:	5	-33.42	
Fourth Floor	1	7785	1094	1	:	7.116	7785	1185	1	:	1	-91.00	
Fourth Floor	2	1185	1094	1	:	1.083	1185	1185	1	:	1	-91.00	
Fourth Floor	3	1061	638	1	:	1.663	1061	636.6	5	:	3	1.40	
Fourth Floor	4	798	652	1	:	1.224	798	598.5	4	:	3	53.50	
Fourth Floor	5	1184	831	1	:	1.425	1184	845.71	7	:	5	-14.71	
Average difference between original & proposed dimension for Shodhan villa												**-18.40**	**mm**
												-0.72	**inch**
SARABHAI HOUSE													
Structural System Plan	1	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	2	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	3	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	4	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	5	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	6	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	7	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	8	436	296	1	:	1.473	436	329	3	:	2	-33.00	
Structural System Plan	9	436	296	1	:	1.473	436	329	3	:	2	-33.00	
Structural System Plan	10	436	296	1	:	1.473	436	329	3	:	2	-33.00	
Structural System Plan	11	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	12	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	13	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	14	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	15	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	16	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	17	316	296	1	:	1.068	316	316	1	:	2	-20.00	
Structural System Plan	18	296	296	1	:	1.000	296	296	1	:	2	0.00	
Structural System Plan	19	625	438	1	:	1.427	625	446.4	7	:	5	-8.40	
Structural System Plan	20	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	21	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	22	596	296	1	:	2.014	596	329	1	:	2	-33.00	

First Floor	Room Count	Room Dim From Le corbuser's plan		Found Ratio			Modified /Proposed room dimension		Prop osed Roo m Ratio			Difference between original and proposed room size	
Structural System Plan	23	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	24	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	25	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	26	596	296	1	:	2.014	596	329	1	:	2	-33.00	
Structural System Plan	27	625	438	1	:	1.427	625	446.4	7	:	5	-8.40	
Structural System Plan	28	625	438	1	:	1.427	625	446.4	7	:	5	-8.40	
Structural System Plan	29	625	438	1	:	1.427	625	446.4	7	:	5	-8.40	
Ground Floor	1	329	320	1	:	1.028	329	329	1	:	1	-9.00	
Ground Floor	2	329	298	1	:	1.104	329	329	1	:	1	-31.00	
Ground Floor	3	596	296	1	:	2.014	596	298	1	:	2	-2.00	
Ground Floor	4	436	296	1	:	1.473	436	290	3	:	2	6.00	
Ground Floor	5	596	296	1	:	2.014	596	298	1	:	2	-2.00	
Ground Floor	6	596	296	1	:	2.014	596	298	1	:	2	-2.00	
Ground Floor	7	436	296	1	:	1.473	436	290	3	:	2	6.00	
Ground Floor	8	386	356	1	:	1.084	386	386	1	:	1	-30.00	
Ground Floor	9	596	296	1	:	2.014	596	298	1	:	2	-2.00	
Ground Floor	10	436	296	1	:	1.473	436	290.66	3	:	2	5.34	
Ground Floor	11	596	296	1	:	2.014	596	298	1	:	2	-2.00	
Ground Floor	12	316	296	1	:	1.068	316	316	1	:	1	-20.00	
Ground Floor	13	316	296	1	:	1.068	316	316	1	:	1	-20.00	
Ground Floor	14	316	296	1	:	1.068	316	316	1	:	1	-20.00	
Ground Floor	15	316	296	1	:	1.068	316	316	1	:	1	-20.00	
Ground Floor	16	296	226	1	:	1.310	296	222	4	:	3	4.00	
Ground Floor	17	551	296	1	:	1.861	551	275.5	2	:	1	20.50	
Ground Floor	18	316	296	1	:	1.068	316	316	1	:	1	-20.00	
Ground Floor	19	1034	625	1		1.654	1034	620.4	5	:	3	4.60	
Ground Floor	20	296	296	1		1.000	296	296	1	:	1	0.00	
Ground Floor	21	319	240	1		1.329	319	239.25	4	:	3	0.75	
Ground Floor	22	412	392	1		1.051	412	412	1	:	1	-20.00	
Ground Floor	23	596	296	1	:	2.014	596	298	1	:	2	-2.00	
First Floor	1	366	362	1	:	1.011	366	366	1	:	1	-4.00	
First Floor	2	296	222	1	:	1.333	296	298	4	:	3	-76.00	
First Floor	3	463	296	1	:	1.564	463	308.66	1	:	2	-12.66	
First Floor	4	316	296	1	:	1.068	316	316	1	:	1	-20.00	
First Floor	5	316	296	1	:	1.068	316	316	1	:	1	-20.00	
First Floor	6	316	296	1	:	1.068	316	316	1	:	1	-20.00	
First Floor	7	316	296	1	:	1.068	316	316	1	:	1	-20.00	
First Floor	8	625	438	1	:	1.427	625	298	7	:	5	140.00	
First Floor	9	596	296	1	:	2.014	596	298	1	:	2	-2.00	

First Floor	Room Count	Room Dim From Le corbuser's plan		Found Ratio			Modified /Proposed room dimension		Prop osed Roo m Ratio			Difference between original and proposed room size	
First Floor	10	596	296	1	:	2.014	596	298	1	:	2	-2.00	
First Floor	11	300	300	1	:	1.000	300	300	1	:	1	0.00	
First Floor	12	393	296	1	:	1.328	393	294.75	4		3	1.25	
Average difference between original & proposed dimension for Sarabhai house												**-14.45**	**mm**
												-0.57	**inch**
Total average difference between original & proposed dimension for Shodha villa & Sarabhai house												**-16.43**	**mm**
												-0.65	**inch**

5.2.1.6 CONCLUSION

As seen from analysis of schematic line drawings, it could be deduced that 'Modulor' did not generate room ratios like 2:1 (which seems a constant ratio between blue and red series of 'Modulor') or 1: 1.61803398874989 which is golden ratio (fundamental and constitutional law of 'Modulor'). Fabric of ratio generated through interaction of these fundamental ratios or dimensions based on Modulor in 'x' and 'y' axis does not fall to justification of ratios generated through multiplication or division of primary ratios of modulor (theory adopted and explained in previous chapter). Ratio formed from multiplication of basic ratio could be understood as (a:b x c:d = ac:bd) that is; 2:1 x 1:1.61 = 2: 1.61. Ratio formed from division of basic ratio could be understood as (a:b / c:d = bc:ad) that is; 2:1 / 1:1.61 = 1: 3.22.

Analysis of plans indicates planned fabric is interwoven with varied texture of ratios. This gives rise to question on constitution of 'Modulor'; did it infer in disguise to other theories of proportion? Analysis holds a distant but distinct similarity between 'Modulor' and Palladian theory of proportion. Considering buffer for structural errors due to construction methods and errors enhanced during regenerating process through scaled drawings up to 25 to 50 mm, it could be deduce that there seems underlying similarity between Palladian theory of proportion and 'Modulor'. Though the dimensions of these structures as gathered from the source are not found to subscribe to any particular ratio from Palladian theory of proportion, none the less they are observed to fall close to them, suggestively imply underlying inclination or similarity of such proportional theory in planning grammar of 'Modulor'. On scrutiny of all rectified room dimensions it can be deduced that there is an average difference of 18.40 millimeter (0.72 inch) between original dimension and proposed (or rectified) room dimension (as seen in table 5.2) for Shodhan Villa while same difference for Sarabhai house is 14.45 millimeter (0.57 inch) and average difference of both houses as against their original dimensions is 16.43 millimeter (0.65 inch). From this one can conclude a distant underlaying similarity between the two proportioning theories.

One can understand that as 'Modulor' was based on arbitrary human proportion of ideal man (as seen in two different versions illustrated in figure 5.2.1 and 5.2.2), ratios generated by its adaptation in plan are variable and not absolute values as they are in case of Palladian theory of proportions.

5.2.2 ANCIENT THEORY OF PROPORTIONS

COMPARATIVE STUDY OF PLANNING PRINCIPLES FOR RESIDENCE FROM VASTU SHASTRA (INDIAN TRADITIONAL ARCHITECTURE) AND PALLADIAN THEORY OF PROPORTION.

This part of study is to bring to notice the subject from ancient India that may have relevance to Palladian theory of proportion without its critical examination which may be a subject of research in self. It is an attempt to identify probable relationship between planning principles for residential unit in Indian traditional architecture and Palladian theory of proportion.

5.2.2.1 SELECTION OF VASTU SHASTRA FOR STUDY

This work fundamentally studies application and revival of Palladio's theory of proportion in practice in Indian sub-continent. Vastu Shastra is taken up as ancient Indian treatise on proportions that too followed human body and its parts as measuring yard and units. This raises a possibility of similarity between Palladian theory of proportion and Vastu Shastra. This part of the study is an effort to unearth any such similarities between the two proportioning system with same underlying fundamental base of human anatomy.

To general belief in contemporary context of Ahmedabad, Vastu Shastra for residential planning is widely and predominately practiced to allot each activity of house to a particular direction to occupy on plot (e.g. kitchen is allotted South East corner or North West corner of the plot, which is domain of Agni; God of fire. Such ordains of Vastu Shastra have been employed in first three test applications from contemporary context as underlying guiding principles of planning.) rather than following it primarily as proportioning tool of design. This has led to analytical understanding of theories from North and South Indian schools of thought rather than having built case studies (those are constructed on the basis of proportional implications of theory of Vastu Shastra) to analyze.

5.2.2.2 VASTU SHASTRA

Vastu Shastra had other system of proportioning that may have been practiced in ancient India. This research herewith is synoptically studying relevant part of its theory to generate an overview of proportioning system practiced in ancient India.

Vastu Shastra is the Hindu science of architecture. It deals with sacred texts and principles that dictate form and space, talks about fascinating tradition of sacred geometries and planning concepts directed at harmonizing the manifest world with the non manifest, the physical world of matter and form with the cosmic truths of the infinite

5.2.2.3 HISTORY OF VASTU SHASTRA

"Whence the countries of India derived their architecture is a question that has occupied abler pens than that which we wield" writes Joseph Gwilt in his illustrated voluminous work The Encyclopedia of Architecture, pg 25.

Architectonics of the Hindus, now remnant of antiquity, laid its foundation from time immemorial when people of India felt that the universe is actuated by a Supreme Power. They have been endeavoring to realize its realty and in their final analysis they have come to the conclusion that human existence blossoms surrendering to His testimonies and the laws of nature and the outcome was formulation of the norms. These authorative rudiments of designing are contained in Vastu Shastra also called *Sthapatya Shastra.*

The *Puranas* and the *Agamas* are believed to spur the fountain-head of this ancient lore. *Vastu Shastra* is said to be an *Upaveda* attached to *Atharvaveda.* In course of time, large texts must have been written because it is stated in the *Brihat - Samihita* of *Varahamihtra* (middle of the sixth century A.D.), the earliest among the exactly datable treatise, that the Hindu science of architecture i.e *Vastu shastra* had been handed down from Brahma through an unbroken chain of sages like *Garga*

The *Puranas* like the *Agni,* the *Matsya* and the *Garuda* of which the dates cannot be definitely stated, although they range from early to mid Medieval periods, also contain chapters on architecture. The *Vishnu-dharmottara,* the *Hayasirsha-paricharatra* and *Vaikhanasagama* of *Marichi* are among the other few works which may be attributed to a period between the seventh and ninth centuries A.D, The epics like the *Ramayana* and the *Mahabharata,* whose dates are also not specifically known, make mention of structures like *Chaitya-Prasada* etc., without, however, giving any precise description of their parts. In the centuries following the tenth, a host of texts on architecture *(Vastu Shastra)* came to be written dealing with the subject in an extremely detailed manner. Some of the most important texts are the *Samarangana sutradhara* by the famous king *Bhoja* of *Dhara* (eleventh century A.D.), the *Aparajita-prichha* also attributed to *Bhoja,* the *Sarada-tilaka,* the *Brihat-shilpa -shastra,* the *Vastuvidya,* the *Manushyaiaya-chandrika,* the *Vastu-rajavailabh* by *Mandana;* the architect of Rajasthan of fifteenth century, the *Manasotlasa* by king *Somesvara* (eleventh century), the *Mayamata;* the *Isanasiva-gurudeva-paddhati* (about eleventh century), the *Kashyapa-shilpa* (prior to fifteenth century), the *Prayoga-manjari* (prior to fifteenth century), the *Tantra-samuchaya* (about fifteenth century), the *Shilpa-ratna* of *Shkumara* (Srinivasan P.R., *'The Indian Temple Art and Architecture'*, pg.8.) and *Manasara;* named after its author; is believed to be as old as the *Agni,* the *Garuda* and the *Matsya Purana.* (Acharya P.K., *'Encyclopedia of Hindu Architecture'*, pg.110).

Each of these texts contains a number of rules and regulations relating to the whole gamut of building, from qualifications of the priest *(acharya)* and the architect *(shitpin),* the selection of site to the consecration of the finished structure. These priceless gems of the Hindu architecture are so unique and intricate that they arouse as much admiration today as centuries ago, offering immense canvas for study.

5.2.2.4 VASTU SHASTRA, VASTU AND VASTUPURUSHAMANDALA

Vastu Shastra is the Hindu science of architecture confined around *Vastu* with great Hindu compendiums of architectural rules, esoteric with very minutest of the acts of building. These scriptures specify the rigorous rules of Vedic mathematics in planning out of an individual building, again following a hierarchy corresponding to the social orders. These treatises are chiefly concerned with speculation about man's existence on the Earth, and his relationship with the Supernatural; *Brahma* and nature; *Prakriti.*

Shastra, meaning treatise on science, here focuses on *Vastu,* meaning the building or the site. In wider context; *Vastu* means sense of planning which precedes creation.

Vastu is a technical term for the Sanskrit root *Vas;* meaning; to dwell, localities fit for habitation. *Vastu* connotes places where mortals dwell. *Vastu* primarily means a site; hence any planning of the site or the construction thereon is *Vastu. Vastu,* a really existing thing, signifies residence as well as residue which bring the *Vastu* in the domain of cosmology including metaphysics as well as astronomy and astrology.

And thus emerged principles on amalgamation of different sciences were governed within the theological disciplines framed by Vastu Shastra The myriad manifestation of these intricate and intrinsic values all over India are an eloquent testimony to the indefatigable Indian craftsman who had a basic integrity of the tradition of his craft in form of *Vastupurushamandala,* a tool that proved durable and tenacious.

The *Vastupurushamandala* is a symbolic reduction of all specified layouts in form of a *Yantra*: cosmic diagram, attributed with inherent cosmo-religious significances. The *Vastupurushamandala* is a metaphysical plan of a Hindu building, a schematic plan of all architectural forms of the Hindus. It is the intellectual foundation of the building, a prognostication, a forecast of a plan's ascent and projection on the Earth which would be built up in the house or a temple. It is in a literal sense, a program which does not imply an identity of the actual plan. The actual and indefinitely varied plans have in the *Vastupurushamandala,* a layout of the component parts of a building.

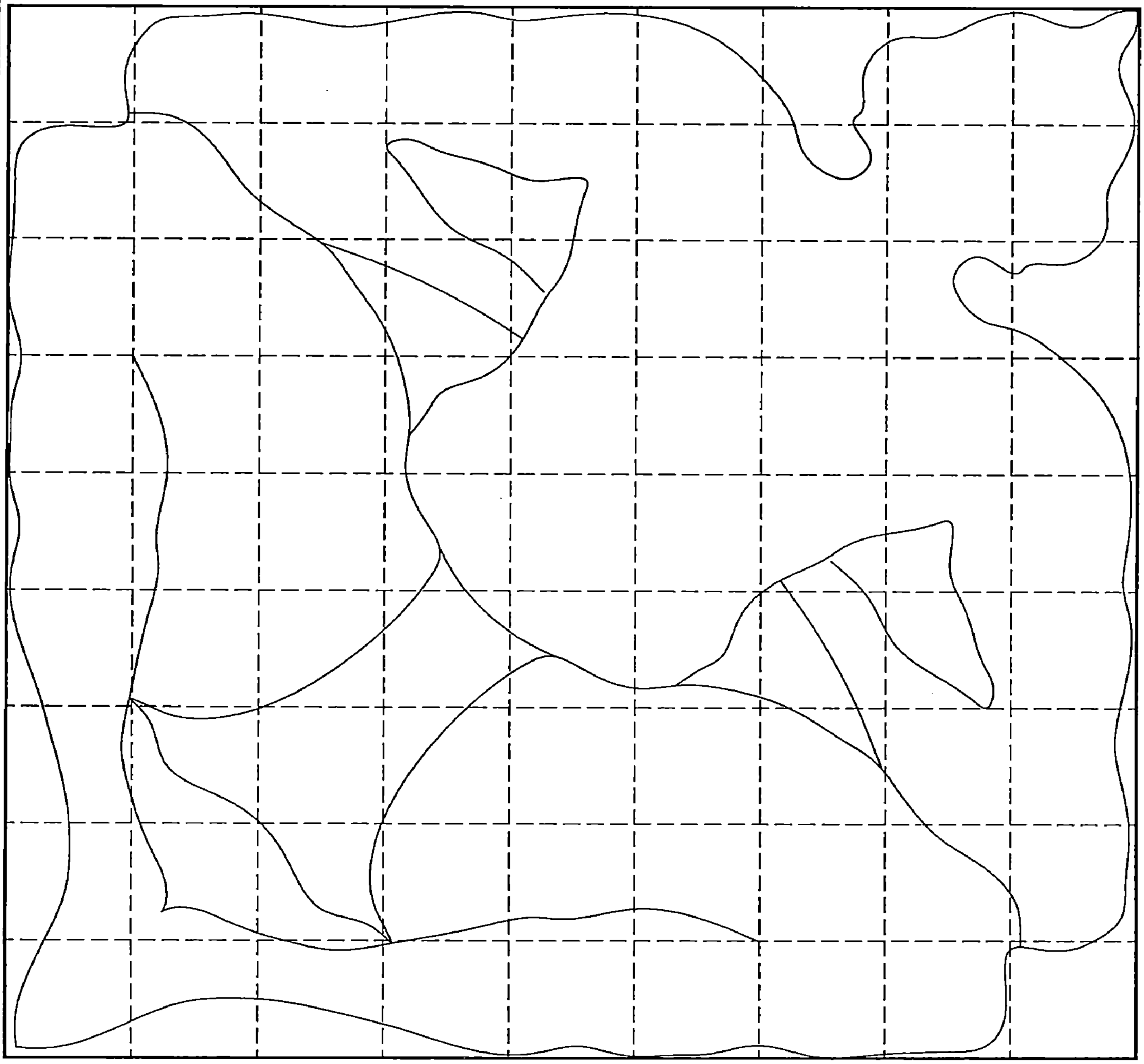
The *Vastupurushamandala*; the magic chart of the architecture of the Supreme Man forms the geometric, theological and academic backbone of the ancient Hindu architecture. *Vastupurushamandala* consists of three parts: *Vastu, Purusha* and *Mandala. Vastu* is primarily the site of the building. The *Purusha,* Supernal Man is the origin and source of existence in which the supreme principle; *Brahma* is beheld. It is beyond form and description, non-contingent. He is known by intellectual intuition as residing in man, the microcosm where man and Universe are equivalent. *Purusha* is the symbol of this equivalence. He is the presiding deity of the whole site, indicative of the metaphysical doctrine of *Vastubrahma.* This *Vastupurusha* with his head facing the North East; is encompassed by the *Mandala* which denotes any close polygon. The crux of the guiding philosophy of design of the *Mandala* was, the square, may be because their images were installed in shapes symbolizing stability rather than mobility. The square; most basic and elementary of all geometric polygons of equal side joined at right angles must have fulfilled their aims far more appropriately; hence the form of the *Vastupurushamandala* is square which is an essential form that can be converted into a triangle, a hexagon, an octagon and a circle of equal area, retaining its symbolism.

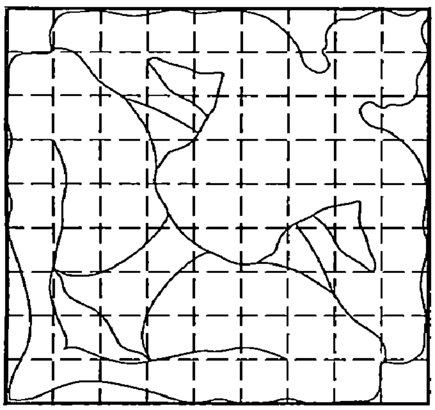
Thus emerged, the *Divine Chart* by coalition of these fundamentals; is called the *Vastupurushamandala* The square *Mandala,* at best; the *'Divine Chart* in English, was divided into one to one thousand eighty four equal squares or *Vastu Padas;* as an arithmetic progression of squares of first thirty two numbers and that containing sixty four or eighty one squares were the most celebrated The ground plan of a private house or of a city was to be divided into eighty one squares and that of a temple into sixty four squares. This subdividing of basic system helped the architects in calculating the relative proportion and orientation of the different parts of a building and to evolve a ground plan.

The priest then invested each of the squares with metaphysical and magic powers, by locating an individual deity in each. Forty five *Devas* in *Mandala* of eighty one squares were so located that the position of each sub- divided square in the total represented; the metaphysical power attributed to it. *Brahma,* the Supreme God, the Creator, invariably occupied the central square or a group of squares. This central space of the *Mandala* is the *Brahma - Sthana.* It is most sacred region and is the container of the core of all life, most sensitive part and hence left clear abiding to axiom that rule, walls and columns should not fall on the sensitive parts of *Vastu-purusha* such as the face, heart, stomach, chest, etc. This is sometimes regarded as the source of the inward looking concentric aspect of the Hindu architecture lesser deities were posted in the four corners and more minor ones filled up the balance. To invest the square with a human quality, apart from its divine one, it was shown as being able to accommodate within itself a human figure, *Vastu purusha* or *Vastu Nara,* though in a contorted yogic pose. This is graphically represented in figure 5.2.25.

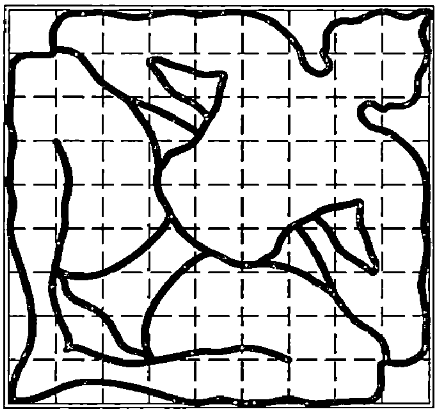
Having procure religious sanctity, geometric as well as human properties the emerging chart called; the *Vastupurushamandala* was now fit to be transformed into an architectural ground plan. This divine chart was the key that motivated scheme of the building plan and it is intimately associated with metaphysical implication of Vedic treatises on architecture.

Figure 5.2.25 Vastu purush Mandal And It Formative Proportions

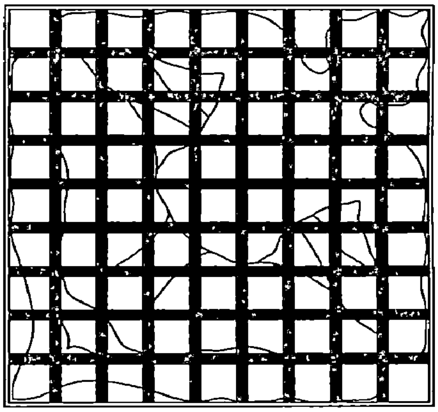




Vasu :
The Site

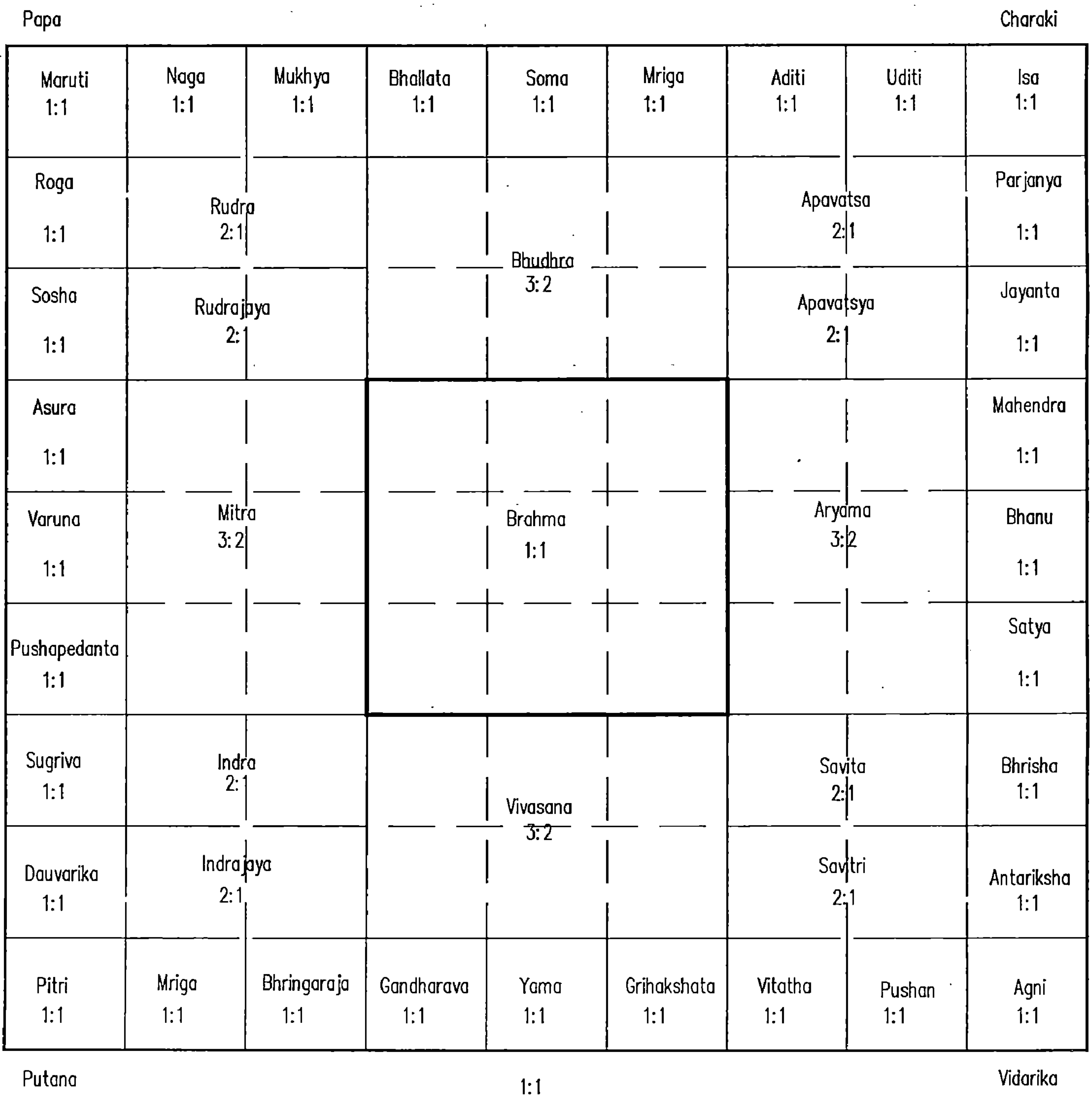


Purusha
Male Principle



Mandala
The Cosmic Diagram

Figure 5.2.26 Vastu Mandal And Its Formative Proportions



5.2.2.5 THE SYSTEM OF MEASUREMENTS IN VASTU SHASTRA

Manasara in chapter two titled 'The Qualification of Architects and the System of Measurement' *(sloka* forty to fifty three) and *Samrangana Sutradhara* in chapter nine titled *'Hastalasksana'* profess a nearly parallel system of measurements with common terminology as under.

The terms of the measurement system

Parmanu - It is the smallest ideal unit measurement, not visible to the naked eye, but visible only to a *yogi.*

Ratharenu - It is the mote of dust in a Sun-beam or a dust particle stuck to the wheel of a chariot as the term suggests and is visible to human eye.

Balagra - It is the tip of hair. *Roma* and *Valagra* are its synonym.

Liksha - It is a nit, a living organism.

Yuka - A louse, a living organism.

Yava - It is also called a *Java,* a barley corn for the purpose of measurement its width and not the length is considered. Its width is standardized as a basic unit for the practical purpose.

Angula - Here it means the width of the upper part of a thumb or the thickest part of the middle finger.

Musti - It measures the width of a fist, which is also equal to the width of four numbers of *angulas*

Vitasti - Tala i.e. span; measures the distance made by three *mustis.* It is also equal to the distance created by twelve *angulas* put side by side

Hasta-A cubit, *aratni,* a *gaja* are the synonyms of *hasta*
Aratni measures the length from the elbow to the tip of the little finger, while *hasta* measures the length from the elbow to the tip of the middle finger. It covers the distance occupied by twenty four angulas.

Vyama-It measures the height of a man from the root of hair on his fore-head to the soles. This distance is also called a fathom. This length is standardized. It is equal to the distance of eighty four *angulas* or three and a half *hasta.* Sometimes it is also called a *purusha.*

Purusha-One *purusha* is the length of a man standing on tip-toe (or not) with raised arms. It measures the distance of the one hundred and twenty *angulas* or it measures five *hastas.*

Danda-It is a measuring rod, often made from bamboo. It measures out hundred *angulas* i.e. three *hastas* or six *talas.*
This is graphically represented in figure 5.2.27.

Figure 5.2.27 Graphic Presention Of The System Of Measurement As Explained In The Vedic Texts

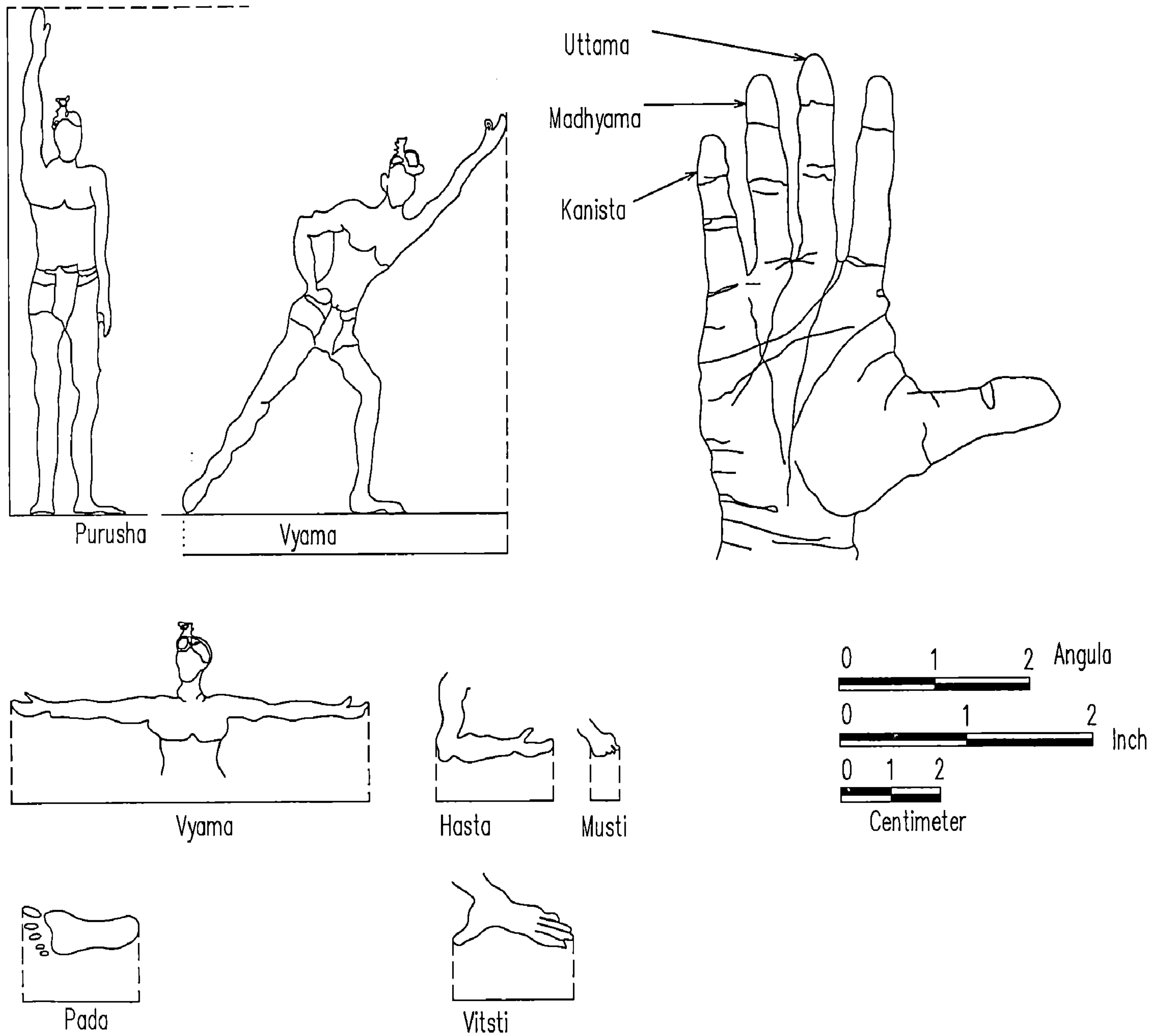


Table 5.2.2.6 System of measurement in 'mansara' and 'samrangan sutradhara'

MESAUREMENT SYSTEM AS EXPLAINED IN 'MANSARA'					
8	Paramanu	=	1	Ratha Dhulis	(car dust-Molecule)
8	Ratha Dhulis	=	1	Valagra	(hair end)
8	Valagras	=	1	Likshas	(nit)
8	Likshas	=	1	Yuka	(louse)
8	Yukas	=	1	Yuva	(basley-corn)
8	Yuvas	=	1	Angula	(Finger breadh)
12	Angula	=	1	Vitasti	(Small cubit)
2	Vitasti	=	1	Kishku	
26	Angulas	=	1	Dhanur Musti	
27	Angulas	=	1	Dhanur Graha	
4	Dhanur Musti	=	1	Danda	
8	Dandas	=	1	Rajju	

MESAUREMENT SYSTEM AS EXPLAINED IN 'SAMARANGANA SUTRADHARA '					
	Here an angula is basic unit of measurement, as it is shown below.				
1	Angulas	=	1	Matra	
2	Angulas	=	1	Kala	
3	Angulas	=	1	Parva	
4	Angulas	=	1	Musti	
5	Angulas	=	1	Tal	
6	Angulas	=	1 / 4	Hasta	
7	Angulas	=	1	Disti	
8	Angulas	=	1	Tuni	
9	Angulas	=	1	Pradesa	
10	Angulas	=	1	Sayatala	
11	Angulas	=	1	Gokarna	
12	Angulas	=	1	Viitasti	
14	Angulas	=	1	Pada	
21	Angulas	=	1	Ratni	
24	Angulas	=	1	Aratni or a Hasta	
42	Angulas	=	1	Kishku	
84	Angulas	=	1	Vyama or Purusha	
96	Angulas	=	1	Chapa or Nadiyuga	
100	Angulas	=	1	Danda	
30	Dhanusha	=	1	Nalva	
1000	Dhanusha	=	1	Krosa	
2000	Dhanusha	=	1	Gavayuti	
4	Gavyutis	=	1	Yojana	

5.2.2.7 SELECTION OF MANASARA AND SAMARANGANA SUTRADHARA

According to Dr. D.N. Shukla, the erudite author, *Vastu Shastra* is illustrated in two most representative text of Indian art, the *Manasara* of *Dravida* School or southern school called *Maya* School of architecture and the *Samarangana Sutradhara* of *Nagara* School or Northern School called *Visvakarma* School of architecture.

5.2.2.8 MANSARA

Regarding proportions of width to breadth of a dwelling, *Mansara* in chapter thirty six titled 'The situation and measurement of dwelling houses'; clause eight to thirteen specifies the ratio of the length to the breadth as follows : ***The length of the house should be greater than the breadth by one-fourth, one-half, three-fourths or twice (as much) or the length may be greater than twice by one-fourth, one-half, three-fourths or three times or it may be greater than three times by one- fourth, one-half, three-fourths or four times; thus should be the breadth and length of the house***.

Interpretation:

This could be inferred as 5:4, 3:2, 7:4, 2:1, 9:4, 5:2, 11:4, 3:1, 13:4, 7:2, 15:4 and 4:1. This is geometrically represented in figure 5.2.28.

5.2.2.9 SAMARANGANA SUTRADHARA

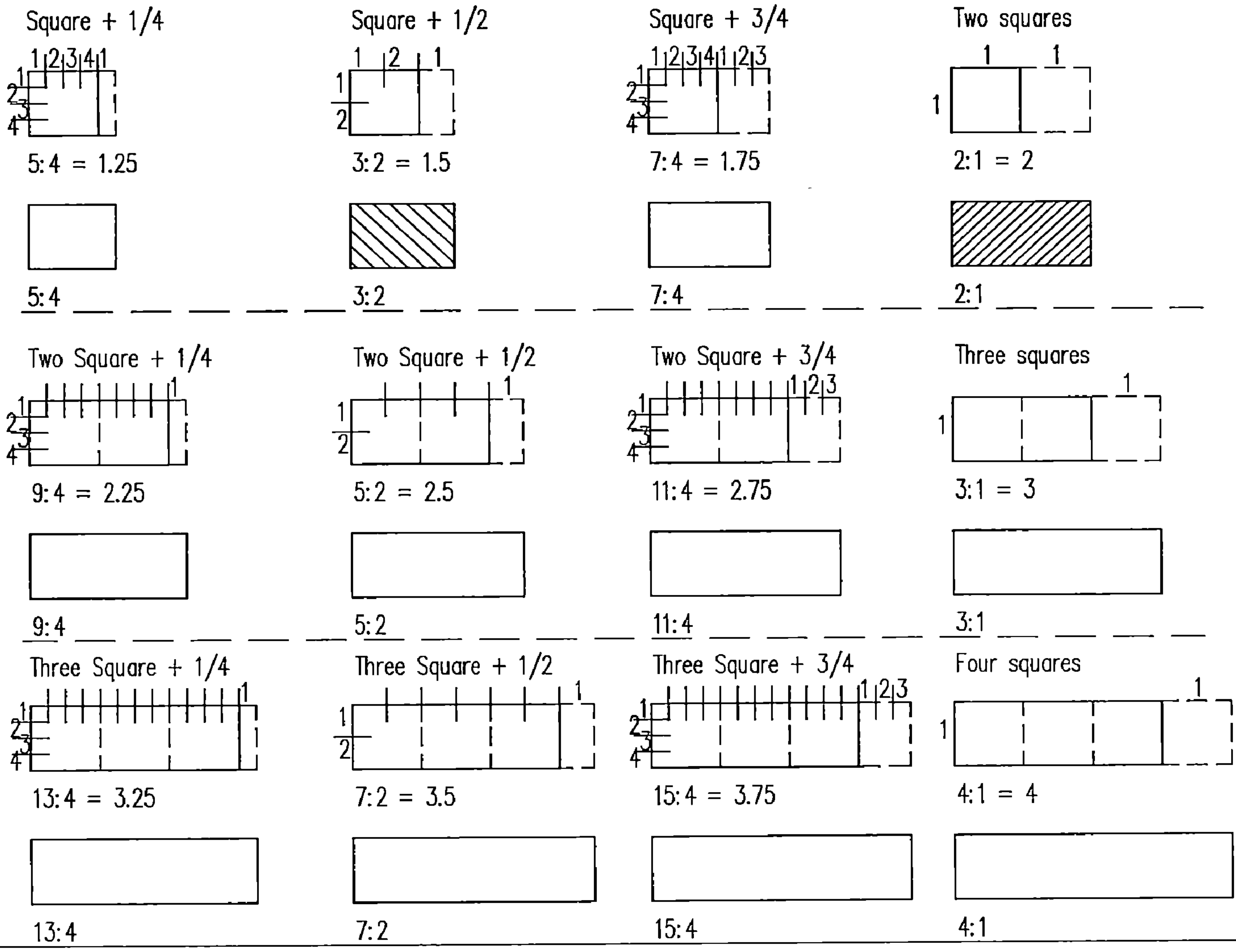
It may be noted that dimensions of the length and the breadth as well as the height of the houses varied according to the varied social status in Indian society of the houses owner. In the nineteenth chapter titled *'Ayadimirnaya'; Samarangana Sutradhara* (clause fifteen to twenty five) gives various alternative measurements in relation to the different structures of the different occupants having the different position in the social hierarchy. "***The house of the Brahmanas should have measurements of thirty two hastas, that of the commander and the priest sixty four hastas and that of kings however should take one hundred eight hastas. The text shows that like temple architecture; in domestic architecture too; the buildings 'Of Brahmanas are square or nearly square and if rectangular; the length exceeds the breadth by one-tenth only, In the buildings of***

Kshatriyas the excess is one- eighth; in those of Vaishyas and Shudras one-sixth and one- fourth respectively** (Samarangana Sutradhara,* ***chapter nineteen, sloka eighteen and nineteen). It shows that lower the caste the further remote from the perfection of square are the buildings."

Interpretation:

This could be inferred as 11:10, 9:8, 7:6 and 5:4. This is geometrically represented in figure 5.2.29.

Figure 5.2.28 Analytical Understanding Of Proportional Theory In Mansara Text



ANALYTICAL UNDERSTANDING OF PALLADIO'S PROPORTIONAL THEORY

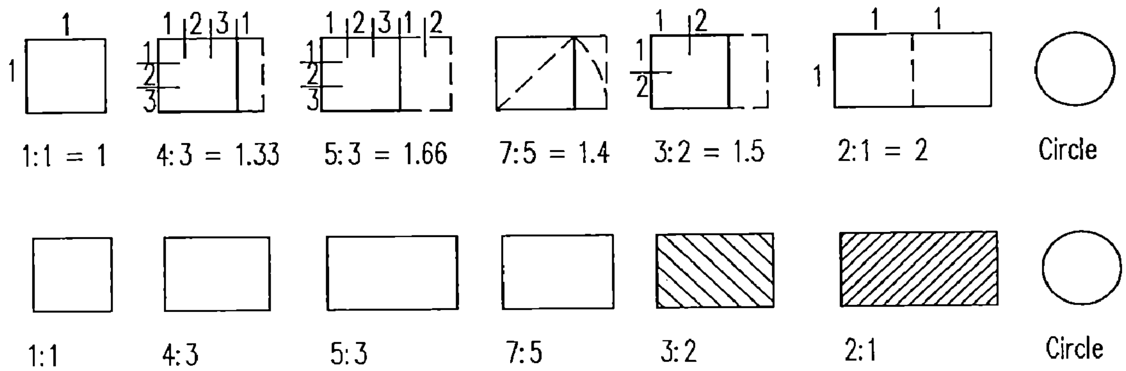
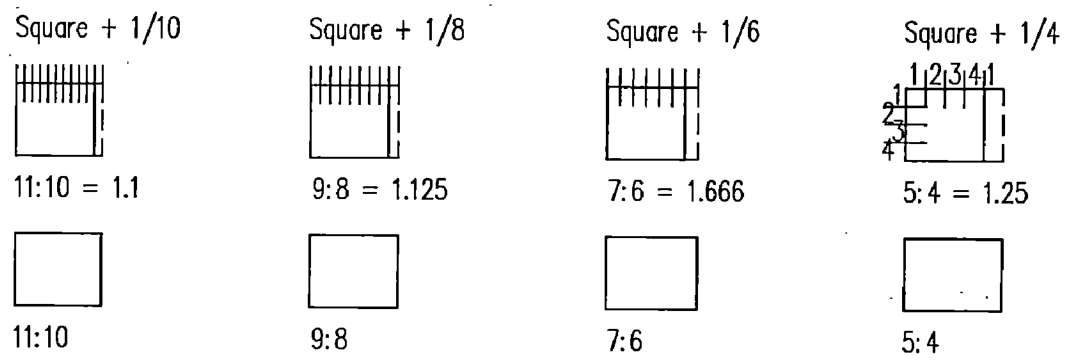
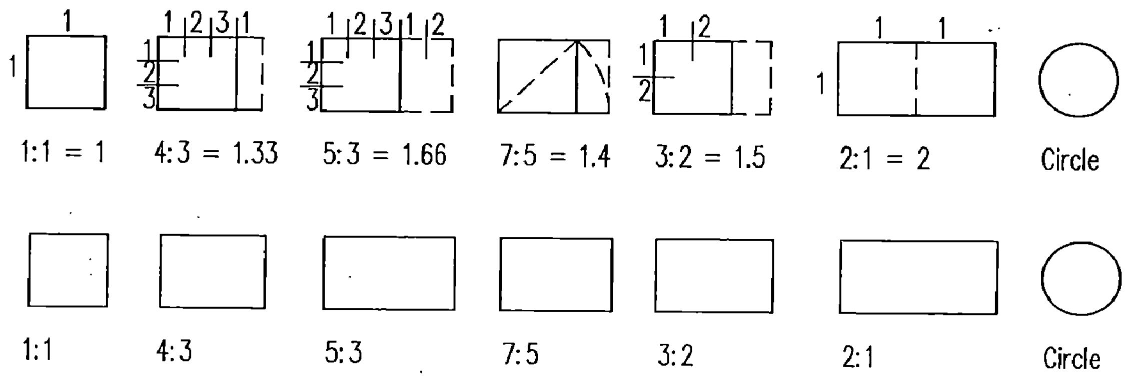


Figure 5.2.29 Analytical Understanding Of Proportional Theory In Samrangana Sutradhara Text



ANALYTICAL UNDERSTANDING OF PALLADIO'S PROPORTIONAL THEORY



5.2.2.10 GEOMETRY OF VASTUPURUSHAMANDALA AND PALLADIAN PROPORTIONS

As observed through figure 5.2.26, main square of Vastupurushamandala is divided in 9 x 9 squares. Thus obtained 81 sub squares were then clubbed together and allotted to particular deity. According to the importance presiding God; they were allotted either - one square, two squares, six squares and nine squares to Brahma at centre. If these units of allotted squares were dwelled upon during construction besides just allotting direction to an activity on plot, it would manifest Palladian proportion as shown in figure 5.2.26. Unfortunately this aspect is generally not followed in contemporary residential planning practice in Ahmedabad and to general belief in modern Indian architectural practice of residential planning and hence this study does not illustrate any such examples in test applications.

On scrutinization of Vastupurushamandala from Palladian theory's view point, one can observe predominance of ratio 1:1 in construction of its basic geometry and ratios such as 3:2, 2:1and 1:1in its internal constitution. This gives idea of resemblance between organizational geometry of Vastupurushamandala and Palladian theory of seven room ratios.

5.2.2.11 CONCLUSION

Aim being to study concepts of proportional theory from Vastu Shahtra, through interpretation of the text; it is seen that there is little similarity between Manasara text and Palladian theory of proportions. Of these 12 room ratios (5:4, 3:2, 7:4, 2:1, 9:4, 5:2, 11:4, 3:1, 13:4, 7:2, 15:4 and 4:1.) prescribed in *Mansara,* it is noticed that only two ratios namely 3:2 and 2:1 are stated in Palladian theory of proportion. Of 4 room ratios prescribed in *Samarangana Sutradhara,* it is noticed that none of the ratios are stated in Palladian theory of proportion.

On consideration of theories of derived ratios as explained earlier in the thesis; one can mark distinct underlying similarity between Manasara text and Palladian theory of proportions. Three ratios namely 9:4, 3:1 and 4:1 find its mention in Alberti's theory of room ratio. One can understand 5:4 as ratio formed from division of basic ratio 5:3 / 4:3

= 5:4 (a:b / c:d = bc:ad). It could also be understood as square and a fourth. 7:4 could be interpreted as rational convergent of square root three or square and three quarters. 5:2 could be interpreted as rational convergent of square root six. It could be interpreted as ratio formed from multiplication of basic ratio 5:3 x 3:2 = 5:2 (a:b x c:d = ac:bd). 11:4 could be understood as close to rational convergent of square root of 5 which is 11:5.
7:2 which is 14:4 and close to 14:5, could be derived from multiplications of basic ratios as 7:5 x 2:1 = 14:5 (a:b x c:d = ac:bd).

Similarly ratios from *Samarangana Sutradhara* could be deduced as follows.
11:10 is close to 1:1 as 11:11. We can understand 9:8 as ratio formed from division of basic ratio 3:2 / 4:3 = 9:8 (a:b / c:d = bc:ad). 7:6 is close to 7:5 and 5:4 as mentioned earlier could be understood as ratio formed from division of basic ratio 5:3 / 4:3 = 5:4 (a:b / c:d = bc:ad). It could also be understood as square and a fourth.

Thus it could be summarized that from 12 ratios prescribed in Mansara text, 8 ratios find mention in Palladian theory of proportion or could be derived on other such related theories of proportions that might have been used by Palladio in developing is palette of proportions. This is about 75% similarities in prescribed ratios from two different theories. Similarly all ratios (i.e. 100%) from *Samarangana Sutradhara* text could be seen as related to Palladian palette of proportions.

CHAPTER SIX: CONCLUSIONS AND SCOPE OF FURTHER STUDY

6.1 CONCLUSIONS

In reference to aim of the study, forgone study and analysis, conclusion can be encapsulated as follows:

6.1.1 RELEVANCE OF PROPORTIONS IN ARCHITECTURE: An appeal to human senses.

6.1.1.1 Aesthetic sense

That 'proportions' are integral part of nature is an unquestionable truth. One need to observe nature and the truth reveals itself. These relationships in nature are harmonious and can be manifested in art, architecture and music is proven by Pythagoras, Plato and all other great personalities in various fields of art and science. These harmonic relationships when translated into proportion in architecture; creates visual delight and it appeals to our sense of aesthetics. Like in nature, proportions create a balance which imparts grace, dignity and beauty to buildings. As described by Palladio and his predecessors; beauty and proportions go hand in hand. In architecture, proportions mere integral part in definition of beauty and has been employed through ages from ancients to medieval to Renaissance. Though its relevance was questioned thereafter, it once again gained interest of historians of theory in nineteenth and twentieth century. Having survived through ages, proportions have been established as a constituent part of architecture appealing to our sense of beauty and aesthetics.

6.1.1.2 Psychological sense

Man himself is created by nature and 'proportions' being harmonic in nature; having universal appeal, man can automatically relate to it. It is like second nature which appeals to our inner sense. Moreover, when proportions are derived from proportions of human body, man can immediately relate to it. Proportionate building gives a sense of belonging to human being and appeals to his psychological need.

6.1.1.3 Scientific rationale

A human mind constantly looks for logical explanation for its entire doings. When in architecture; it looks for rationale in design and proportions being mathematical in nature appeals to reasoning human mind. It gives logical explanation for all the dimensions employed in creating a building and is not arbitrary. When 'proportions' are used in design of building, architecture moves from the realm of art field into a scientific field which satisfies the ever questioning mind of human beings.

6.1.1.4 Creative sense

The question then; that arises in mind is 'Are proportions hampering to the creative process of design in architecture?' Contrary to the question, proportions can aid in creative process. It can serve as knowledge base through which excellent creations can be designed. One can look forward by studying what is already known to us and then transcended beyond it. Like wisely said "creativity is not about inventing a cartwheel every time; but it is to use cartwheel creatively".

Thus appealing to human senses, proportions have universal appeal which does not belong to an age, civilization, culture or place and were relevant in ancient times, during Renaissance and are also relevant today.

6.1.2 CONCLUSIONS BASED ON STUDY OF HISTORICAL BACKGROUND

- Through derivation from musical notes or principles of sound formation Pythagoras is suggesting following ratios 1:1, 2:1, 3:2, 4:3, and 5:3. Those are observed being adopted in Palladian Villa plans.
- Through description of cosmic division of universe or principles of composition, Plato states following ratios which are found being adopted by Palladio in Villa Plans. 2:1, 3:2, 4:3, 9:8.
- Through study of proportion of human body and principles of proportions, Vitruvius suggests following ratios, some of them are being adopted by Palladio in his practice. 1:1, 2:1, 3:1, 3:2, 4:1, 4:3, 5:3, 5:4, 5:6, 6:1, 7:4, 8:1, 9:4,1:1 and root two.
- Through study of proportion of human body, Pythagorean Lambda or principles of proportions, Alberti implies following ratios that are seen partially being

implemented (3:1, 4:1, 8:3, 9:4) in Palladian plans of book two. 2:1, 3:1, 3:2, 4:1, 4:3, 5:1, 5:3, 6:1, 7:5, 8:3, 9:4, 16:9 and 27:8.

- Main musical proportions could be understood as follows. 1:1= octave, 16:15 = minor second, 9:8 = major second, 6:5= minor third, 5:4 = major fourth, 4:3 = perfect fourth, 7:5 = triton, 3:2 = perfect fifth, 8:5 = minor sixth, 5:3 = major sixth, 16:9 = minor seventh, 15:8 = major seventh and 2:1 = double octave.

Concluding note:

Understanding morphology of Palladian plans thorough analysis suggests that hypothesis of objective could be deduced affirmatively that Palladio did infer scholarship of his planning grammar from numerological teachings set by progenitors of the theory. Through analysis and as mentioned above it is observed that Palladio implies use of ratios that could be attributed to be derived from theory of his predecessors. This validates our hypothesis that Pythagoras, Plato, Vitruvius and Alberti laid a path to formation of Palladio's understanding of proportions in theory and practice and that Palladio did infer from his predecessors.

6.1.3 CONCLUSIONS BASED ON STUDY OF PALLADIAN THEORY OF PROPORTIONS

- Palladio's proportional theory of seven room ratios comprised of following ratios 1:1, 4:3, 5:3, 7:5, 3:2, 2:1 and circle.
- Other ratios observed in Palladian plans of book two could be inferred as ratios derived from multiplication of basic ratios, ratios derived from division of basic ratios, ratios as rational convergent of square root of a number and ratios as square plus fraction of it.
- Ratios derived from multiplication of basic ratios: 3:1 = 2:1 x 3:2, 4:1 = 2:1 x 2:1,

5:2 = 5:3 x 3:2, 7:3 = 5:3 x 7:5, 8:3 = 2:1 x 4:3, 9:4 = 3:2 x 3:2 and 10:3 = 5:3 x 2:1.

- Ratios derived from division of basic ratios: 5:4 = 5:3 / 4:3 and 6:5 = 2:1 / 5:3.
- Ratios as rational convergent of square root of a number: 7:5 = root2, 7:4 = root 3, 7:3 = root 5, 9:4 = root 5, 5:2 = root 6, 18:7which close to 17:7 = root 6, 12:5 which is close to 11:5 = root 5.

- Ratios as square plus fraction of it: 5:4 = square and a fourth, 6:5 = square and one fifth, 7:4 = square and three quarters,7:6 = square and a sixth, 8:5 = square and three fifths, 8:7= square and a seventh, 9:7= square and two sevenths and 13:8= square and five eights.

Concluding note:

This study unearths probable underlying mathematics of planning grammar that Palladio may have intentionally used or suggestively implied and may not be comprehensible on first look at the plans. It is noticed and understood that Palladio does not limit his planning grammar to seven musical ratios and derives his theory from mathematics of his predecessors. With the aid of analysis it could be deduced that Palladio is much less doctrinaire than is commonly thought and it maybe difficult to formulate a theory of his planning grammar as purly musical in nature.

6.1.4 CONCLUSIONS BASED ON ANALYSIS OF PALLADIAN PLATES

Analysis of Palladio's plate unearths his planning grammar which had interesting mix of ratios.

- It can be observed that Palladio's plans had two sets of ratios. First, the main rooms and the front side which conferred to his basic seven ratios namely 1:1, 2:1, 3:2 and 4:3 being used majorly. Secondly, the smaller rooms had non standard ratios which were derived from multiplication and division of basic ratios, Alberti's room ratios or rational convergent of numbers (square root of numbers). At times the main room and adjoining smaller rooms were proportionately interlocked corresponding to whole to part relationship. From analysis of Palladio's plans with room dimensions as derived through line diagrams (i.e. overcoming errors of construction, site limitations, typographical mistakes etc. and come to intended or ideal room sizes and ratios), it is seen he implies the use of room ratio 1:1 (with 22.91 per cent) the most in his villa plans followed by 2:1 (15.64%), 3:2 (15.27%), 4:3 (12.73%), 5:3 (5.45%), 7:5 (1.09%) and circle (0.73%) while derived and non theoretical ratios constitute for the residue. As seen from analysis of front and side of his plans, Palladio seems to have mainly used primary numbers 1, 2, 3 and 4 in such division. It is clear with this that Palladio subscribes to theory of his predecessors like Pythagorean Lambda. We can conclude that besides small integral numbers (1, 2, 3 and 4) of Greek musical scale, Palladio used a vast palette of ratios derived mathematically from basic ratios.

- It has been observed that Palladio used interesting themes for proportions in his planning like

1) Use of same ratios in one building, e.g. use of 3:2 in Plate 48, Villa Girolama De Godi at Lonedo.

2) Use of ratios in progression, e.g. in plate 4, Palazzo Iseppo de' Porti at Vicenza we see use of dimensions 10' x 10', 20' x 10', 30'x 20' and 30'x 30'which is 10: 20:30:: 1:2:3.

3) Use of any one number as module. e.g. in plate 15, Palazzo Montano Barbarano, number four is the module with dimensions such as 8', 12', 16', 24', 32' and 40'.

4) Use of sequential ratio of number, e.g. in plate 44; Villa Mario Repeta, Palladio uses sequential ratios of number five (5:1, 5:2, 5:3 and 5:4) in one plan which seems a unique and new way of adaptation of theory into practice.

- Palladio frequently used ratios based on series 12, 16, 18, 24, 27, 32 and 36 which correspond to harmonic ratios and at the same time used ratios derived from rational convergent of numbers.
- Though Palladio prescribes seven room ratio, use of circle in planning of his villas of book two are noticed in only in two plates; namely plate 13 and plate 43 which reinstates his view that circle being preferred shape should be used for buildings of God's, that is in temples and churches and hence has not used it extensively in residential planning.
- Not all plans of book two are bound within geometry of rectangle. Palladio is seen responding to irregular site form in his plan of plate 53; which if assumed and converted to geometry of regular polygon; displays adaptation of his theory in planning.

Concluding note:

Palladio's planning grammar did not restrict to seven room ratios prescribed by him but comprised of more complex and interesting matrix of ratios with underlined theme in each villa that he designed.

6.1.5 CONCLUSIONS BASED ON STATISTICAL ANALYSIS OF PLATES

It is thus observed that all villa plans of second book of *'I Quattro Libri Dell' Architecttura'* are not 'musical' in nature (i.e. based on seven musical ratios prescribed by Palladio) but are fundamentally mathematical, based on theory whose derivation could be drawn rooted to theory of pioneers and his predecessors. Following descriptive data is to statistically validate such thought.

'267 different lengths to width ratios or room sizes are noticed from villa plan plates of book two in part two of analysis. Of these 267, 101 or 37.83 percent correspond to Palladio's preferred or prescribed ratios. 35 or 13.11 percent correspond to ratios that could be derived from the theories of Palladio's predecessors while 131 or 49.06 percent could not be related or derived from these theories, which are termed 'non theoretical ratios'. Similarly from part three of analysis with schematic line diagrams or developed ideal plans; it is inferred 195 or 73.08 percent correspond to Palladio's preferred ratios, 68 or 25.47 percent ratios are related to the theories of predecessors and rest 4 or 1.5 percent fall under 'non theoretical ratios'. Part four of analysis that is restructured and redeveloped plans on the basis of schematic line diagrams with skin of contemporary construction methods shows that 169 or 63.30 percent of ratios are Palladio's preferred ratio while 46 or 17.23 percent of ratios finds its mathematical root to theory of Palladio's predecessors. Remaining 52 or 19.48 percent of ratios are 'non theoretical ratios'. To gather a clear understanding of application of theory; the study clubs results of 'prescribed' and 'derived' ratios; both having theoretical base. It is 50.94 percent for part two of analysis, 98.50percent for part three of analysis and 80.90 percent for part four of analysis. Thus when wall thickness is not considered in line drawings of part three of analysis, along with minor alterations in room dimension, a major pecentage of room ratios (proportions) fall in palette of Palldio's ratios.

Concluding note:

Cumulative result of 'prescribed' and 'derived' ratios show that altered and restructured plans are theoretically more ideal and could be adapted in contemporary design vocabulary and planning grammar.

6.1.6 CONCLUSION BASED ON SCHEMATIC ANALYSIS OF PALLADIAN PLATES: PALLADIAN PROPORTIONS AS ABSOLUTE VALUES

As observed with study of Palladian plans without consideration of wall thickness, one gets clear and better understanding of functioning and application of pure and derived room ratios in his plans. His plans could be observed to follow relationship of part to whole as majority of his plans are bound within rectangular polygon where it seems 'function was following a form' i.e. all functions were fitted inside a rectangular boundary. Whereas in today's context to practice flexibility in planning; it is 'form following the function' and such planning is not bound within rectangle (as in test applications) and hence it is difficult to coordinate part to whole at plan level everytime as seen in Palladio's plans. It is seen that Palladian theory can be implemented without considering for wall thickness to maximum, i.e. implementation of proportional theory is better deciphered without considering for wall thickness. By bringing in wall thickness in geometry bound planning it gives rise to residual ratios. It is also seen that the theory could be implemented with consideration of different wall thicknesses, as seen in plans redrawn with two feet thick wall thickness and also with 9 inch thick wall in redrawn Palladian plans and contemporary test applications.

Concluding note:

With this one can decipher and conclude that theory of proportion is independent of wall thickness, use of material and location as proportions are absolute values as governing factor of planning and design. It is valid with geometry of single line drawings implying it could be adopted in different designing fields besides architecture. To aide such thought of design; this work has tried to compile such dimensions that are proportionally related to each other. They are attached in appendix of the thesis in tabular format to render a ready reference base for designers.

6.1.7 CONCLUSIONS BASED ON TEST APPLICATIONS

6.1.7.1 LIMITATION AND RELEVANCE OF THEORY OF PALLADIAN PROPORTIONS IN CONTEMPORARY CONTEXT

Palladio's systematic reliance; majorly on whole number ratios (except root two as 7:5) and it's developed numerological derivation in forgone analysis posit that certain proportional relationship cause a visual delight whose triumph is beyond just being a tool of design. It could be gathered that geometrical rules governing Palladio's plans are assemblages of 'ideal' shapes or that 'ideal' or 'harmonic' dimensions. One has to derive his own spatial and visual design decisions by studying mutual consistency of principles employed in his buildings. Though it would be difficult to limit Palladian palette of ratios and to understand Palladio's feast; one has to create one's own individual designs on selection of ratios from Palladio's prescribed ratios and adopt them in practice on the basis of understanding of Palladian planning grammar developed through bygone analysis. Test applications demonstrate such attempts.

Based on such ideology, Palladio's theory of seven room ratios has been consciously adopted in modern day residential planning as seen in test application; as a step to revive the fading thought and theory of design. These experiments with theory are not to generate holistic reincarnation of adaptation of theory in plan. As described earlier these experiments with theory is an attempt to demonstrate an idea how probable plans could be developed on the basis of Palladian theory of proportion and interweaving it with contemporary life style and construction methods as used these days in Ahmedabad or urban India in general. From the study of test applications one can infer that adaptation of theory in modern plan cannot be computed to absolute perfection as against Palladian plans for obvious reason that modern day life style, requirements, aspirations, construction material and methodology have changed giving rise to different planning semantics. Whereas Palladian plans in general were bound by definite geometry of polygon, today it may not be same. One can try adopting it in geometry of individual rooms and where the design brief permits the use of geometry that is bound in quadrangular shape.

6.1.7.2 DRAWING PARALLEL BETWEEN MODERN THEORY (MODULOR) AND PALLADIAN THEORY OF PROPORTIONS

In effort to emboss out understanding of parallels between contemporary theory; (that may have employed complex set of proportions in planning) with respect to Palladian theory of seven room ratio, two residential works from Ahmedabad designed by Le Corbusier based on 'Modulor' were analyzed. It is seen from the analysis that both theories, though fundamentally do not exhibit any similarity in terms of prescribing room ratios for house plans, it could be interpreted as having faint resemblance on the basis of marginally modified room dimensions. Most of the room ratios adopted in works of Le Corbusier are observed to be fraction (for example 1:1.42) while as studied and noted earlier; Palladio adapts mainly to whole number ratios in planning.

As findings of all three studies namely, analysis of Palladian villa plans; analysis of plans of contemporary test applications and analysis of plans of these modern residential structures by Le Corbusier, exhibit same underlying formative guiding rules or principles of proportions (though different) and relation of its parts, it thus affirms the validation of the test applications and analysis of Palladio's villa plan plates.

6.1.7.3 DRAWING PARALLEL BETWEEN ANCIENT THEORY (VASTU SHASTRA) AND PALLADIAN THEORY OF PROPORTIONS

Even though Vastu Shastra is understood to be developed on the basis of human anatomy alike theories of Palladio's predecessors, one can infer that there is little in common between theoretical prescriptions of ratios between Vastu Shastra and Palladian theory of seven room ratios. Besides such striking lack of theoretical similarity, considering theories of Palladio's predecessors, it was observed that about 75% of ratios stated in *Mansara* and 100% ratios stated in *Samarangana Sutradhara* displays similarity with one stated in theory of Palladio or derived from the theories of his predecessors.

6.1.7.4 RELATIONSHIP BETWEEN PROPORTIONS AND DESIGN METHODOLOGY

The buildings studied in Palladio's villa plans and in test applications exhibit to have two distinct differences in design methodology. In Palladian plates, plans are bound by geometry of rectangular or circular shape and functions are assigned to it. In test applications the overall layout of plan is not bound by definite polygonal geometry. Based on design methodology adopted one can categorize it as follows:

FUNCTION FOLLOWS FORM: Form is predominant which is essentially generated from basic geometric shape of square, rectangle or circle. The façade is generated using additions and subtractions to the form. When form is predominant, proportion can be modulated to generate a plan wherein which the part corresponds to the whole and vice-versa.

FORM FOLLOWS FUNCTION: When function is predominant, the form is generic and is obtained by sequential juxtrapositioning and layering of various functions in plan. In such case each part is considered as whole and appropriate proportions are adopted which corresponds to the function of that part and its design brief. The conglomeration of these parts (which are treated as whole) are then clubbed together to create the whole layout which may or may not confirm to any prescribed set of proportions.

INTEGRATION OF ABOVE TWO METHODOLOGIES INTO ONE: A third method as seen practiced by Palladio integrates the above two design methodologies. Here the form (whole) was designed corresponding to the proportions (i.e. the overall whole was having a proportioning system). Then each function (part) within the frame also had prescribed proportioning system which were arranged and encompassed within it. This left with residual spaces which did not confirm to any ratios.

Concluding note: Depending upon design's demand, different approach to it can be adopted and yet proportions and proportioning system can still be employed to create a visually pleasing built form. The theory does work to generate visual delights and the application of these proportions gives visually pleasant results; the reason for this is unknown. It could be conceptualized that Palladian memorandum is to be taken as theory of proportional relationship. The theory has to be adopted as an approach and not the program of design.

6.1.8 OVERVIEW OF CONCLUSION

Among those who sculpted the architecture of Renaissance using the theory of ancients, it could be said without much disagreement that Andrea Palladio is the most discernible architect. As an antiquary of architecture it is to buttresses a stand to put forward a proposition without the fear of falling into hyperbole; that Palladio with his theory and work which occupies a luminous place in history of architecture; dimmed the glory of all his predecessors and that no architect after him has arrived so far from transcending him by propounding a theory for architecture of nobler caliber or even at equaling him by distinctively and meritoriously adapting his mathematical logic for architecture into practice. His immutable matrix of laws with such an unexcelled effectiveness to date marks a permanent place in making of architecture. His triumph of reason and civilization which is left with timeless validity embosses an indelible impression on architectural tradition; so stark and important that the term 'Palladian' endorses a particular style in architecture.

The theories of ancients may have indicated Palladio that the numerical equivalents of musical harmonies could, when applied to spatial relationship in architecture, make 'visual harmonies' as a universal dogma of design. But it would be too rigid to insist that Palladio's palette consisted only of seven proportional room shapes with musical analogy; for as seen through the foregone analysis; he himself has used other room ratios that conformed to his reasoning. It has been noticed that some of the ratios applied in these villas by Palladio are not bound by the restrictive proportionalities of musical theory but are generated by more permissive possibilities of arithmetic and rational measurements of geometric figures. And hence his insistence on mathematics as a fundamental discipline seems to be a 'certain truth'. His conviction that architecture is a science and that each part of a building has to be integrated into one and the same system of mathematical ratios; may be called as his fundamental axiom. As seen; this grouping of ratios may seem simple but use of right ratio not only inside the rooms but also in their relation to other rooms and over all layouts suggests and reconciles mathematics as conception of Palladio's architecture.

Pythagoras discovered that Greek musical consonances namely octave, fifth and fourth were determined by ratios of small whole numbers and can be expressed by progression 1:2:3:4. Plato explained the cosmic order and harmony in squares and cubes of double and triple proportions. This led to two geometrical progressions 1:2:4:8 and 1:3:9:27. Pythagorean and Platonic theory gave three types of proportions based on 'means' to derive the height. The occurrence of incommensurable ratios arose from Vitruvius's module system of proportions which added to the existing ratios of his predecessors. Human proportions gave number six and ten there place in proportioning system. Alberti added nine proportions based on musical harmony. Palladio declared seven proportions as perfect. This shows that Palladio though following his predecessors Pythagoras, Plato, Vitruvius and Alberti added much more to theory of proportions by developing his inheritance of the seven musical ratio into a 'palette of proportions.'

Palladio's feverish passion for proportional harmony through which he achieved such a tight and tidy synthesis of spaces and workable and logical grammar that stands out with scholastic distinction still seems valid so many centuries later.

To the contemporaries of computer cult this often disguised use of numbers derived from rational convergent of square root of a number, from Pythagorean lambda, as an impure musical harmony (by the virtue of multiple mathematical operations on the fundamental musical ratios) may not seem as an conscious attempt of design by Palladio and hence these attitudes may seem vicissitudious and not overwhelmingly interesting. But the unconquered excellence of Palladio's surviving architectural legacy makes the study worthwhile; for the knowledge of it not only develops an understanding of the theory of Palladian design based on a particular system of proportions and increases appreciation of the Palladian monuments but also gives us a direction by serving as a lighthouse of particular architectural grammar in the vast sea of knowledge of present digital age which sometimes appears to be vacillatory by self poised visionary befuddlements. Andrea Palladio's architectural legacy opens the doors to the vast arena of experimentation and exploration for an aspiring architect.

As mentioned earlier; the intent of all theories of proportion is to create a sense of order among the elements in a visual construction. Underlying any proportioning system, therefore, is a characteristic ratio, a permanent quality that is transmitted from one ratio to another. Thus, a proportioning system establishes a consistent set of visual relationships between the parts of building, as well as between the parts and their whole. In an architectural design, the multiplicity of elements can be visually unified by having all of its parts belong to the same family of proportions. They can provide a sense of order and heighten the continuity of a sequence of space.

Proportions are a simple tool and a precise aid to the dimensioning of objects to bring harmony into the work. Palladian theory of proportion may not help us to produce, but it eliminates automatically, in the progress of the work, the "hit and miss" in proportioning, the false notes in architectural composition, in the details and the relationship as a whole. One has to choose in a particular ratio depending on the demands of the composition itself, as tool already formulated, already well and truly in existence. Adopt them to establish order and clarity on the level of geometrical equilibrium achieving or claiming to achieve a veritable purification. Not as creative tool but as a tool to establish visual balance. Architectural works have their own spatial and visual properties; architects have to design these properties. Architects can learn about these visual properties by studying how these buildings were designed. Palladio has much to teach us and it is appropriate to look at his work not only to learn about his times, but also to learn how to apply his design principles to the architecture of the present. Today when we have studied his architecture and look at it as complex cohesion of theory of proportion from past, the challenge is to rediscover the essence of what holds them together. We need not reject, we must absorb and digest, reinvent and not repeat in totality. We got to find our own idiom. Today when you make judgments on beauty, you do not follow mere fancy, but the working of reasoning faculty that is inborn in the mind or faculty that is already established.

This study and adaptation of Palladio's theory of seven room ratios in practice may be considered as first baby steps into the vast field of learning and exploration. One would conclude that Palladio's plans are an object lesson in both education and practice and Palladio's corpus of written work and drawings can still be studied with profit.

6.2 SCOPE OF FURTHER STUDY

6.2.1 COMPARATIVE STUDY OF DIFFERENT THEORIES OF PROPORTIONS AND WORKS OF VARIOUS ARCHITECTS BASED ON IT.

The aim of this work is to understand Palladio plans, his theory and notice the application of his theory in his work (plans) and not to study works of ancient or modern day architects in general with adaptation of Palladian theory of proportion or any other relevant theories of proportions; which may vary from practicing architect to architect. It could be taken up as extension of this study. A study could be taken up to draw parallel between Palladian theory of proportion and other relevant theories of proportions. It could also draw parallel between Palladian villa plans and plans generated on the basis of other theories of proportion by other architects.

6.2.2 NEED TO STUDY PALLADIAN ELEVATIONS FOR DERIVATION OF PRACTICAL ROOM HEIGHT

With study of implementation of theory into contemporary practice, it is observed; a need to devise a theory to regulate and modulate height with flexibility which has minimum variation to suite contemporary construction methods of RCC frame structure and at same time be economical. This is necessary to support contemporary planning grammar where house plans are not confined within a rectangular whole as generally noticed in Palladian Villa plans. This height regulating ordains could probably be formulated by studying Palladian elevations and his theory of proportions on elevations along with proportions in nature, astronomy, color wheel, music and such independent yet allied subjects. After formulating table for heights based on methods of Arithmetic, Geometric and Harmonic mean, a need to generate a postulate of different strata of height constants is seen. To ease construction; a theory could be devised to stabilize room height for corresponding room floor area segments. For example one can set room height for room size of 301 to 400 sq. feet of floor area; fix another height for room size of 401 to 500 sq. feet of floor area and so on. It may be achieved by standardizing most common or adoptable room sizes for bungalow plan with purview of contemporary life style and construction method of particular region.

6.2.3 GENERATION OF ARCHITECTURAL LANGUAGE BASED ON PALLADIAN THEORY OF PROPORTION

This work does not extent to formulate an algorithm to generate plans, elevations, layouts and architectural language in general based on Palladian theory of proportions. A design algorithm and its impact on design can be taken up this point on. Such function can incorporate matrix of use of different materials of construction (to account for wall and plaster thickness) and its impact on proportional design.

NOTES ON APPENDIX

Appendix is supplementary text relevant to the subject of investigation at core. It is presented in four sub divisions.

First part of appendix outlines biographical highlights of prime authors of the theory of proportion that have been dealt in main text of the thesis (namely Pythagoras, Plato, Vitruvius, Alberti and Palladio) to have an idea of their life and works. Main source of information is Encyclopedia Britannica, Encyclopedia Encarta, Encyclopedia Wikipedia and 'A study in palladian palette of proportions'.

Second part documents table of dimensions based on Palladian Theory of Proportions as ready reference for designers to derive proportional designs.

Third part documents table of room height based on Palladian Theory of Proportions as ready reference.

Part four presents Palladian all plates from *' I Quattro Libri Dell'Architecttura'* book two in its original form; unaltered to have an idea of Palladian design ideology and presentation technique.

APPENDIX 1:
BIOGRAPHICAL HIGHLIGHTS

1.1 PYTHAGORAS

Pythagoras was Greek philosopher, mathematician and founder of the Pythagorean brotherhood that, although religious in nature, formulated principles that influenced the thought of Plato and Aristotle and contributed to the development of mathematics and Western philosophy.

1.1.1 Life

Born: 580- 572 BC, Samos, Ionia

Died: 500 -490 BC, Metapontum, Lucania

Pythagoras was born on Samos, a Greek island in the eastern Aegean, off the coast of Asia Minor. He was born to Pythais (his mother, a native of Samos) and Mnesarchus (his father, a Phoenician merchant from Tyre). As a young man, he left his native city for Croton, Calabria, in Southern Italy, to escape the tyrannical government of Polycrates. According to Iamblichus, Thales, impressed with his abilities, advised Pythagoras to head to Memphis in Egypt and study with the priests there who were renowned for their wisdom. He was also disciple in the temples of Tyre and Byblos in Phoenicia. It may have been in Egypt where he learned some geometric principles which eventually inspired his formulation of the theorem that is now called by his name. Upon his migration from Samos to Croton, Calabria, Italy, Pythagoras established a secret religious society very similar to (and possibly influenced by) the earlier Orphic cult.

Pythagoras undertook a reform of the cultural life of Croton, urging the citizens to follow virtue and form an elite circle of followers around himself called Pythagoreans. Very strict rules of conduct governed this cultural center. He opened his school to both male and female students uniformly. Those who joined the inner circle of Pythagoras's society called themselves the *Mathematikoi*. They lived at the school, owned no personal possessions and were required to assume a mainly vegetarian diet (meat that could be sacrificed was allowed to be eaten). Other students who lived in neighboring areas were also permitted to attend Pythagoras's school. Known as *Akousmatikoi*, these students were permitted to eat meat and own personal belongings. Richard Blackmore, in his book *The Lay Monastery* (1714), saw in the religious observances of the Pythagoreans, "the first instance recorded in history of a monastic life." According to Iamblichus, the Pythagoreans followed a structured life of religious teaching, common meals, exercise, reading and philosophical study. Music featured as an essential organizing factor of his life; the disciples would sing hymns to Apollo together regularly; they used the lyre to cure illness of the soul or body; poetry recitations occurred before and after sleep to aid the memory. Towards the end of his life he fled to Metapontum because of a plot against him and his followers by a noble of Croton named Cylon. He died in Metapontum around 90 years old from unknown causes.

1.1.2 Works

It is difficult to distinguish Pythagoras's teachings from those of his disciples. None of his writings have survived and Pythagoreans invariably supported their doctrines by indiscriminately citing their master's authority. Pythagoras however, is generally credited with the theory of the functional significance of numbers in the objective world and in music. Other discoveries often attributed to him (e.g., the incommensurability of the side and diagonal of a square, and the Pythagorean Theorem for right triangles) were probably developed only later by the Pythagorean school. More probably the bulk of the intellectual tradition originating with Pythagoras himself belongs to mystical wisdom rather than to scientific scholarship.

1.2 PLATO

Plato was a classical Greek philosopher, who, together with his mentor, Socrates, and his student, Aristotle, helped to lay the foundations of Western philosophy. Plato was also a mathematician, writer of philosophical dialogues and founder of the Academy in Athens, the first institution of higher learning in the western world.

1.2.1 Life

Born: 428-427 BC, Athens or Aegina, Greece

Died: 348-347 BC, Athens

Plato, the son of Ariston and Perictione, was born in Athens, or perhaps in Aegina, about 428 BC, the year after the death of the great statesman Pericles. His family, on both sides, was among the most distinguished in Athens. Ariston is said to have claimed descent from the god Poseidon through Codrus, the last king of Athens; on the mother's side, the family was related to the early Greek lawmaker Solon. Nothing is known about Plato's father's death. It is assumed that he died when Plato was a boy. Perictione apparently married as her second husband her uncle Pyrilampes, a prominent supporter of Pericles; and Plato was probably brought up chiefly in his house.

His own early ambitions like those of most young men of his class were probably political. After the fall of the oligarchy, he hoped for better things from the restored democracy. Eventually, however, he became convinced that there was no place for a man of conscience in Athenian politics. In 399 BC the democracy condemned Socrates to death, and Plato and other Socratic men took temporary refuge at Megara with Eucleides, founder of the Megarian school of philosophy. The next few years are said to have been spent in extensive travels in Greece, in Egypt and in Italy. Plato himself states that he visited Italy and Sicily at the age of 40 and was disgusted by the gross sensuality of life there but found a kindred spirit in Dion, brother-in-law of Dionysius I, the ruler of Syracuse.

The most important formative influence to which the young Plato was exposed was Socrates. It does not appear, however, that Plato belonged as "disciple" to the circle of Socrates' intimates. The *Seventh Letter* speaks of Socrates not as a "master" but as an older "friend". Plato owed to Socrates his commitment to philosophy, his rational method and his concern for ethical questions. Among other philosophical influences the most significant were those of Heracleitus and his followers, who disparaged the phenomenal world as an arena of constant change and flux and of the Pythagoreans, with whose metaphysical and mystical notions Plato had great sympathy.

1.2.2 Works

1.2.2.1 General features of the dialogues

The canon and text of Plato was apparently fixed at about the turn of the Christian era. By reckoning the *Letters* as one item, the list contained 36 works, arranged in nine tetralogies. None of Plato's works has been lost, and there is a general agreement among modern scholars that a number of small items *Alcibiades I, Alcibiades II, Theages, Erastae, Clitopho, Hipparchus,* and *Minos* are spurious. Most scholars also believe that the *Epinomis*, an appendix to the *Laws,* was written by the mathematician Philippus of Opus. The *Hippias Major* and the *Menexenus* are regarded as doubtful by some, though Aristotle seems to have regarded them as Platonic. Most of the 13 *Letters* are certainly later forgeries. About the authenticity of the *Seventh Letter*, which is by far the most important from the biographical and the philosophical points of view, there exists a long and unsettled controversy.

1.2.2.2 The earlier dialogues

In the *Republic,* the greatest of all the dialogues that precede the *Theaetetus*, there are three main strands of argument deftly combined into an artistic whole—the ethical and political, the aesthetic and mystical, and the metaphysical. Other major dialogues belonging to this period give special prominence to one of these three lines of thought: the *Phaedo* to the metaphysical theme; the *Protagoras* and the *Gorgias* to the ethical and political; the *Symposium* and the *Phaedrus* to the aesthetic. But it should be noted that Plato's dialogues are not philosophical essays, let alone philosophical treatises, and they do not restrict themselves to a single topic or subject.

1.2.2.3 Dialogues of search

The shorter dialogues, dealing with more special problems, generally of an ethical character, mostly conform to a common type: a problem in moral philosophy, often that of the right definition of a virtue is propounded, a number of tentative solutions are considered, and all are found to be vitiated by difficulties that cannot be dispelled. The reader is left, at the end of the conversation, aware of his ignorance of the very things that it is most imperative for a man to know. He has formally learned nothing but has been made alive to the confusions and fallacies in what he had hitherto been content to take as knowledge. The dialogues are "aporetic" and "elenctic": they pose puzzles (*aporiai* in Greek) without solving them, and Socrates' procedure consists in the successive refutation (*elenchos*) of the various views presented by his interlocutors.

1.2.2.4 Ethical and political dialogues

The *Gorgias*, the *Protagoras*, and the *Meno*, like several of the lesser dialogues, give prominence to ethical and political themes. The *Gorgias* begins ostensibly as an inquiry into the nature and worth of rhetoric, the art of advocacy professed by Gorgias, and develops into a plea of sustained eloquence and logical power for morality as against expediency as the sovereign rule of life, both private and public. It ends with an imaginative picture of the eternal destinies of the righteous and of the unrighteous soul.

1.2.2.5 Aesthetic and mystical dialogues

Both the *Symposium* and the *Phaedrus* present the Forms in a special light, as objects of mystical contemplation and as stimuli of mystical emotion. The immediate object of the *Symposium*, which records several banquet eulogies of *erōs* (erotic love), is to find the highest manifestation of the love that controls the world in the mystic aspiration after union with eternal and super cosmic beauty. It depicts Socrates as having reached the goal of union and puts the figure of Alcibiades, who has sold his spiritual birthright for the pleasures of the world, in sharp opposition to him. The main argument may be summarized thus: *Erōs* is a reaching out of the soul to a hoped for good. The object is eternal beauty. In its crudest form, love for a beautiful person is really a passion to achieve immortality through offspring by that person. A more spiritual form is the aspiration to combine with a kindred soul to give birth to sound institutions and rules of life. Still more spiritual is the endeavor to enrich philosophy and science through noble dialogue. The insistent seeker may then suddenly descry a supreme beauty that is the cause and source of all of the beauties so far discerned. The philosopher's path thus culminates in a vision of the Form of the Good, the supreme Form that stands at the head of all others.

1.2.2.6 Dialogues of critical reconstruction

The two works that probably anticipate the dialogues of Plato's old age, the *Parmenides* and *Theaetetus*, display a remarkable difference of tone, clearly the result of a period of fruitful reconstruction. The theory expounded in the *Phaedo* and *Republic* does not allow enough reality to the sensible world. These dialogues suppose that an entity capable of being sensed is a complex that participates in a plurality of Forms; what else it may be they do not say. Clearly, however, the relation between a thing and a Form (e.g., beauty), which has been called participation, needs further elucidation. In these dialogues truths of fact, of the natural world, have not yet had their importance recognized.

1.2.2.7 The later dialogues

Formally the important dialogues the *Sophist* and the *Statesman* are closely connected, both being ostensibly concerned with a problem of definition. The real purpose of the *Sophist*, however, is logical or metaphysical; it aims at explaining the true nature of negative predication, or denials that something is so. The object of the *Statesman*, on the other hand, is to consider the respective merits of two contrasting forms of government, personal rule and constitutionalism, and to recommend the second, particularly in the form of limited monarchy. The *Sophist* thus lays the foundations of all subsequent logic, the *Statesman* those of all constitutionalisms. A second purpose in both dialogues is to illustrate the value of careful classification as a basis for scientific definition.

1.2.2.8 List of dialogues

Plato's works are here listed in their traditional order, certain spurious items being omitted: *Euthyphrōn* (*Euthyphro*); *Apologia Sōkratous* (*Apology*); *Critōn* (*Crito*); *Phaedōn* (*Phaedo*); *Cratylos* (*Cratylus*); *Theaetētos* (*Theaetetus*); *Sophistēs* (*Sophist*); *Politikos* (*Statesman*); *Parmenidēs*; *Philēbos* (*Philebus*); *Symposion* (*Symposium*); *Phaedros* (*Phaedrus*); *Alkibiadēs* (*Alcibiades*); *Hipparchos* (*Hipparchus*); *Erastai* (*Lovers*); *Charmidēs*; *Lachēs*; *Lysis*; *Euthydēmos* (*Euthydemus*); *Prōtagoras*; *Gorgias*; *Menōn* (*Meno*); *Hippias Meizōn* (*Hippias Major*); *Hippias Elattōn* (*Hippias Minor*); *Iōn*; *Menexenos* (*Menexenus*); *Politeia* (*Republic*); *Timaeos* (*Timeaus*); *Critias*; *Nomoi* (*Laws*); and *Epinomis*.

1.3 VITRUVIUS

Marcus Vitruvius Pollio was a Roman writer, architect and engineer was active in the 1st century BC. Vitruvius served as a Ballista (artilleryman). He likely served as chief of the Ballista and actually operated the machines.

1.3.1 Life

Born 80–70 BC,

Died after 15 BC

Little is known about Vitruvius' life. His first name *Marcus* and his cognomen *Pollio* are uncertain. Most inferences about his life are extracted from his only surviving work *De Architectura.*

Born a free Roman citizen, by his own account Vitruvius served the Roman army alongside Marcus Antonius, Publius Minidius, and Gnaeus Cornelius, under Julius Caesar. As an army engineer he specialized in the construction of ballista and Scorpio artillery war machines for sieges. His service likely included North Africa, Hispania, Gaul and Pontus. At various locations described by Vitruvius, battles and sieges occurred. Of the battlegrounds of the Gallic War there is reference to the siege of Avaricum 52 BC, the Battle of Gergovia 52 BC, the Battle of Alesia 52 BC, and the siege of Uxellodunum 51 BC (all centred on sieges of large Gallic *oppida*). Of sites involved in Caesar's civil war, we find the Siege of Massilia 49BC, the Battle of Dyrrhachium of 48 BC (Albania), the Battle of Pharsalus 48 BC (Greece), the Battle of Zela of 47 BC (Turkey) and the Battle of Thapsus 46 BC in Caesar's African campaign. A legion that fits the same sequence of locations is the Legio VI Ferrata, of which ballista would be an auxilia unit. During this same time period a Roman military officer Mamurra also served as *praefectus fabrum* in Hispania, Gaul and Pontus under Julius Caesar. Some have suggested that these two people may be the same, though there is no mention of Caesar's invasions of Britain in *De Architectura*, nor of other things with which Mamurra was associated, equestrian military practices and personal wealth. Additionally Caesar appears to have outlived Mamurra, whereas Vitruvius dedicated *De Architectura* to the emperor Augustus. Rather, Vitruvius has the recurrent theme of politics outweighing skill throughout the ten books of *De Architectura*, possibly in reference to Mamurra. In later years the emperor Augustus, through his sister Octavia

Minor, sponsored Vitruvius, entitling him with a pension to guarantee financial independence.

Mainly known for his writings, Vitruvius was himself an architect. In Roman times architecture was a broader subject than at present including the modern fields of architecture, construction management, construction engineering, chemical engineering, civil engineering, materials engineering, mechanical engineering, military engineering and urban planning. Frontinus mentions him in connection with the standard sizes of pipes. The only building, however, that we know Vitruvius to have worked on is one he tells us about, a basilica completed in 19 BC. It was built at Fanum Fortunae, now the modern town of Fano. The *Basilica di Fano* (to give the building its Italian name) has disappeared so completely that its very site is a matter of conjecture, although various attempts have been to visualise it. The early Christian practice of converting Roman basilica (public buildings) into cathedrals implies the basilica may be incorporated into the cathedral located in Fano.

The date of his death is unknown.

1.3.2 Works

Vitruvius is the author of *De Architectura*, known today as *The Ten Books on Architecture*, a treatise written of Latin and Greek on architecture, dedicated to the emperor Augustus. This work is the only surviving major book on architecture from classical antiquity.

Vitruvius is famous for asserting in his book *De Architectura* that a structure must exhibit the three qualities of *firmitas, utilitas, and venustas* that is, it must be strong or durable, useful, and beautiful. According to Vitruvius, architecture is an imitation of nature. As birds and bees built their nests, so humans constructed housing from natural materials that gave them shelter against the elements. When perfecting this art of building, the Ancient Greek invented the architectural orders: Doric, Ionic and Corinthian. It gave them a sense of proportion, culminating in understanding the proportions of the greatest work of art: the human body. This led Vitruvius in defining his Vitruvian Man, as drawn magnificently by Leonardo da Vinci: the human body inscribed in the circle and the square (the fundamental geometric patterns of the cosmic order).

Vitruvius is sometimes loosely referred to as the first architect, but it is more accurate to describe him as the first Roman architect to have written surviving records of his field. He himself cites older but less complete works. He was less an original thinker or creative intellect than a codifier of existing architectural practice. It should also be noted that Vitruvius had a much wider scope than modern architects. Roman architects practiced a wide variety of disciplines; in modern terms, they could be described as being engineers, architects, landscape architects, artists, and craftsmen combined. Etymologically the word architect derives from Greek words meaning 'master' and 'builder'. The first of the Ten Books deals with many subjects which now come within the scope of landscape architecture.

1.4 ALBERTI

Leon Battista Alberti was an Italian author, artist, architect, poet, priest, linguist, philosopher, and cryptographer, and general Renaissance humanist polymath.

1.4.1 Life

1.4.1.2.1 Childhood and education

Born: February 18, 1404, Genoa

Died: April 20, 1472, Rome

An Italian humanist, Alberti is often seen as a model of the Renaissance "universal man." He was born in Genoa, one of two illegitimate sons of a wealthy Florentine merchant, Lorenzo Alberti. Leon Battista's mother, Bianca Fieschi, was a Bolognese widow who died during an outbreak of bubonic plague. Like many other families, the Albertis had been expelled from their native city, Florence by the republican government run by the Albizzis. At the time of Leon Battista's birth his father Lorenzo lived in Genoa but the family soon moved to Venice where Lorenzo ran the family bank with his brother. Lorenzo married again in 1408. The ban on the family was lifted in 1428 and that same year Leon visited Florence for the first time.

Alberti received the best education then available to an Italian nobleman. From around 1414 to 1418 he studied classics at the famous school of Gasparino Barzizza in Padua. He then completed his education at the University of Bologna, where he studied law. In his youth, according to stories, Alberti could, with his feet together, jump over a man's head, he was a superb horseman, and he learned music without a master and yet his compositions were admired by professional judges.

After the death of his father, Alberti was supported by his uncles. In his twenties Alberti wrote *On the Advantages and Disadvantages of Letters,* which he dedicated to his brother Carlo, also a scholar and writer. Alberti's Latin comedy, *Philodoxus,* aimed to teach that a man dedicated to study and hard work can attain glory, just as well as a rich and fortunate man. For a short time it was passed as a genuinely antique Roman play. Like Petrarch, who had been the first famous philologist to study the works of the ancient Roman poets, Alberti loved classics, but he compared continual reading and rereading in libraries. Later he also complained, that "the learned don't become rich, or if they do become rich from literary pursuits, the sources of their wealth are shameful." Other early works, *Amator* (ca. 1429), *Ecatonfilea* (ca. 1429), and *Deiphira* (ca. 1429-1434), dealt with love, virtues, and failed relationships.

1.4.1.2 Early career

Alberti received his doctorate in canon law in 1428. In the early 1430s he went to Rome where he worked as an abbreviator at the Papal Curia, drafting papal briefs. A master of Latin and Italian, Alberti also rewrote in Latin traditional lives of saints and martyrs. After taking holy orders to the priesthood, he was deemed to hold the prorate of San Martino a Gangalandi at Lastra a Signa. In 1448 he was appointed rector of the parish of San Lorenzo in Mugello. Alberti served also as a papal inspector of monuments, and advised Pope Nicholas V, a former fellow student from Bologna, on the ambitious building projects in the city of Rome.

In the mid-1430s, Alberti moved to Florence with Pope Eugenius IV, who had been driven out of the Holy City. Alberti was appointed canon of the Florentine Cathedral. He admired greatly its dome, designed by Filippo Brunelleschi. At that time it was the largest in the world other than the Roman Pantheon, a unique manifestation of the integration of art, science, and technology, the spiritual symbol of the Florentine Rinascita. "Who could be hard or envious enough to fail to praise Pippo [Filippo]," wrote Alberti, "the architect on seeing here such a large structure, rising above the skies, ample to cover with its shadow all the Tuscan people."

In 1450, Alberti was commissioned to transform the Gothic church of S. Francesco, Rimini, into a memorial to the local warlord Sigismondo Pandolfo Malatesta, his wife Isotta, and courtiers. The church is usually known as the Tempio Malatestiano. Its dominating form is the classical triumphal arch, Alberti's favorite structure, but the severe, restrained façade was never quite finished. Alberti himself did not live in Rimini. He corresponded with his assistants, who were responsible for most of the actual rebuilding. Like the Tempio Malatestiano, the façade of Santa Maria Novella in Florence is considered to be a landmark in the formation of Renaissance architecture. The only buildings Alberti designed entirely himself, were S. Sebastiano (1460), still under work during Alberti's lifetime, and S. Andrea (1470), completed in the 18th century. Its triumphal arch was even grander than in the Tempio Malatestiano.

De pictura (1435), the first version of *On Painting,* Alberti wrote in Latin. He then translated it into Italian under the title *Della pittura* (1436). Alberti dedicated the book to Filippo Brunelleschi, among others. He also credited Donatello (ca. 1386-1466), Lorenzo Ghiberti, Masaccio, and Filippo with "a genius for every laudable enterprise in no way inferior to any of the ancients." Brunelleschi was a self-learned architect originally he was trained as a goldsmith. Brunelleschi's early achievements included his formulation of the laws of linear perspective, which he presented in two panels. The creation of a pictorial space and perspective was fundamental to Renaissance art. In his own work, Alberti codified the basic geometry so that the linear perspective became mathematically coherent and related to the spectator. However, the technical first part of the book did not have any illustrations. After Alberti, Piero Della Francesca presented his own theory of perspective in *De prospectiva pingendi.*

1.4.2 Works

1.4.2.1 Study of perspective

Alberti regarded mathematics as the common ground of art and the sciences. "To make clear my exposition in writing this brief commentary on painting," Alberti began his treatise, *Della pittura* (On Painting), "I will take first from the mathematicians those things with which my subject is concerned." This treatise, *De Pictura*, and it relied in its scientific content on classical optics in determining perspective as a geometric instrument of artistic and architectural representation. Alberti was well-versed in the sciences of his age. His knowledge of optics was connected to the handed-down long-standing tradition of the *Kitab al-manazir* (*The Optics*; *De aspectibus*) of the Arab polymath Alhazen (Ibn al-Haytham, d. ca. 1041). In both *Della pittura* and *De statua*, a short treatise on sculpture, Alberti stressed that "all steps of learning should be sought from nature." The ultimate aim of an artist is to imitate nature. Painters and sculptors strive "through by different skills, at the same goal, namely that as nearly as possible the work they have undertaken shall appear to the observer to be similar to the real objects of nature." However, Alberti did not mean that artists should imitate nature objectively, as it is, but the artist should be especially attentive to beauty, "for in painting beauty is as pleasing as it is necessary." The work of art is, according to Alberti, so constructed that it is impossible to take anything away from it or add anything to it, without impairing the beauty of the whole. Beauty was for Alberti "the harmony of all parts in relation to one another," and subsequently "this concord is realized in a particular number, proportion, and arrangement demanded by harmony." Alberti's thoughts on harmony were not new they could be traced back to Pythagoras but he set them in a fresh context, which fit in well with the contemporary aesthetic discourse. In Rome, Alberti had plenty of time to study its ancient sites, ruins, and objects. His detailed observations, included in his *'De Re Aedificatoria'* (1452, *Ten Books of Architecture*), were patterned after the *De Architectura* by the Roman architect and engineer Vitruvius. The work was the first architectural treatise of the Renaissance. It covered a wide range of subjects, from history to town planning, and engineering to the philosophy of beauty. *'De Re Aedificatoria'*, a large and expensive book, was not fully published until 1485, after which it became a major reference for architects. However, the book was written "not only for craftsmen but also for anyone interested in the noble arts," as Alberti put it. Originally published in Latin, the first Italian edition came out in

1546 and the standard Italian edition by Cosimo Bartoli was published in 1550. Pope Nicholas V, to whom Alberti dedicated the whole work, dreamed of rebuilding the city of Rome, but he managed to realize only a fragment of his visionary plans. Through his book, Alberti opened up his theories and ideals of the Florentine Renaissance to architects, scholars and others. Alberti wrote *I Libri Della famiglia* which discussed education, marriage, household management, and money in the Tuscan dialect. The work was not printed until 1843. Like Erasmus decades later, Alberti stressed the need for a reform in education.

1.4.2.2 Architectural works

For the Rucellai family in Florence Alberti designed several buildings, the façade of Palazzo Rucellai, executed by Bernardo Rosselino, the façade of Santa Maria Novella, the marble-clad shrine of the Holy Sepulchre, and perhaps also the Capella Rucellai.

- S. Francesco, Tempio Malatestiano, Rimini (1447,1453-50)
- Façade of Palazzo Rucellai (1446-51)
- Completion of the facade of Santa Maria Novella, Florence (1448-70).
- San Sebastiano, Mantua (begun 1458)
- Pienza, possibly as consultant (1459-62)
- Sepolcro Rucellai in San Pancrazio (1467)
- Tribune for Santissima Annunziata, Florence (1470, completed with alterations, 1477).
- Sant'Andrea, Mantua (begun 1471)

1.4.2.3 Other works and legacy

Among Alberti's smaller studies, pioneering in their field, were a treatise in cryptography, *De componendis cifris*, and the first Italian grammar. With the Florentine cosmographer Paolo Toscanelli he collaborated in astronomy, a close science to geography at that time, and produced a small Latin work on geography, *Descriptio urbis Romae* (*The Panorama of the City of Rome*). Just a few years before his death, Alberti completed *De iciarchia* (*On Ruling the Household*), a dialogue about Florence during the Medici rule. Alberti died on April 20, 1472 in Rome.

1.4.2.4 Contributions in other fields

Alberti made a variety of contributions to several fields:

- Alberti was the creator of a theory called istoria. In his treatise, 'On Painting', he explains the theory, of the accumulation of people, animals, and buildings, which create harmony amongst each other.
- In art, he is best known for his treatise *De pictura* (On painting) (1435) which contained the first scientific study of perspective. The Latin version had been dedicated to Alberti's humanist patron, Gianfrancesco Gonzaga of Mantua. He also wrote works on sculpture, *De Statua*.
- Alberti used his artistic treatises to propound a new humanistic theory of art. He drew on his contacts with early Quattrocento artists such as Brunelleschi and Masaccio to provide a practical handbook for the renaissance artist.
- Whilst Alberti's treatises on painting and architecture have been hailed as the founding texts of a new form of art, breaking from the Gothic past, it is impossible to know the extent of their practical impact within his lifetime. His praise of the Calumny of Apelles led to several attempts to emulate it, including paintings by Botticelli and Signorelli. His stylistic ideals have been put into practice in the works of Mantegna, Piero Della Francesca and Fra Angelico. But how far Alberti was responsible for these innovations and how far he was simply articulating the trends of the artistic movement, with which his practical experience had made him familiar, is impossible to ascertain.
- He has been credited with being the author, or alternatively the designer of the important woodcut illustrations, of the *Hypnerotomachia Poliphili*, a strange fantasy novel (Liane Lefaivre, *Leon Battista Alberti's Hypnerotomachia Poliphili*, Cambridge: MIT Press, 1997). There is a good deal of debate about this attribution; however the attribution to Alberti of the illustrations appears to be gaining wide acceptance.
- Some studies (D. Mazzini, S. Simone, *Villa Medici a Fiesole. Leon Battista Alberti e il prototipo di villa rinascimentale*, Centro Di, Firenze 2004) propose that the Villa Medici in Fiesole might owe its design to Alberti, not to Michelozzo, and that it then became the prototype of the Renaissance villa. Maybe also that this hilltop dwelling, commissioned by Giovanni de' Medici, Cosimo Vecchio's second son, with its view over the city, is the very first example of a Renaissance villa: that is to say it follows the Albertian criteria for rendering a country dwelling a "villa suburbana".

Under this perspective the Villa Medici in Fiesole could therefore be considered the "muse" for numerous other buildings.

- Apart from his treatises on the arts, Alberti also wrote: *Philodoxus* ("Lover of Glory", 1424), *De commodis litterarum atque incommodis* ("On the Advantages and Disadvantages of Literary Studies", 1429), *Intercoenales* ("Table Talk", ca. 1429), *Della famiglia* ("On the Family", begun 1432) *Vita S. Potiti* ("Life of St. Potitus", 1433), *De iure* (On Law, 1437), *Theogenius* ("The Origin of the Gods", ca. 1440), *Profugorium ab aerumna* ("Refuge from Mental Anguish",), *Momus* (1450) and *De Iciarchia* ("On the Prince", 1468).These and other works were translated and printed in Venice by the humanist Cosimo Bartoli in 1586.
- Alberti was an accomplished cryptographer by the standard of his day, and invented the first polyalphabetic cipher which is now known as the Alberti cipher and machine-assisted encryption using his Cipher Disk. The polyalphabetic cipher was, at least in principle, for it was not properly used for several hundred years, the most significant advance in cryptography since before Julius Caesar's time. Cryptography historian David Kahn titles him the "Father of Western Cryptography", pointing to three significant advances in the field which can be attributed to Alberti: *"the earliest Western exposition of cryptanalysis, the invention of polyalphabetic substitution, and the invention of enciphered code"* (David Kahn (1967). *The codebreakers: the story of secret writing*. New York: MacMillan.).
- Alberti claimed in his "autobiography" to be an accomplished musician and organist, but there is no hard evidence to support this claim. In fact, musical posers were not uncommon in his day. He held the appointment of canon in the metropolitan church of Florence, and thus; perhaps had the leisure to devote himself to this art, but this is only speculation.
- He was also interested in the drawing of maps and worked with the astronomer, astrologer, and cartographer Paolo Toscanelli.

1.5 PALLADIO

Italian architect, regarded as the greatest architect of 16th-century northern Italy. His designs for palaces (palazzo) and villas, notably the Villa Rotunda (1550–51) near Vicenza, and his treatise *I Quattro Libri Dell' Architettura* (1570; *The Four Books of Architecture*) made him one of the most influential figures in Western architecture.

1.5.1 Life

Born: 8 November 1508, Padua, Italy.

Died: 19 August 1580, Vicenza, Italy

1.5.1.1 Early life

Palladio was born in the northern Italian region of the Veneto, where as a youth he was apprenticed to a sculptor in Padua until, at the age of 16; he moved to nearby Vicenza and enrolled in the guild of the bricklayers and stonemasons. He was employed as a mason in workshops specializing in monuments and decorative sculpture in the style of the Mannerist architect Michele Sanmicheli of Verona. Between 1530 and 1538 Count Gian Giorgio Trissino, a Humanist poet and scholar, was rebuilding his villa at Cricoli outside Vicenza in the ancient Roman, or classical style. Palladio, working there as a mason, was noticed by Trissino, who undertook to expand his practical experience with a Humanist education. The Villa Trissino was rebuilt to a plan reminiscent of designs of Baldassarre Peruzzi, an important High Renaissance architect. Planned to house a learned academy for Trissino's pupils, who lived a semimonastic life studying mathematics, music, philosophy and classical authors, the villa represented Trissino's interpretation of the ancient Roman architect and theorist Vitruvius, whom Palladio was later to describe as his master and guide. The name Palladio was given to Andrea, after a Humanist habit, as an allusion to the mythological figure Pallas Athena and to a character in Trissino's poem "Italia liberata dai goti."

1.5.2 Works

1.5.2.1 Early Architecture

Probably Palladio's first independent design was the Villa Godi (ca. 1538-1542) at Lonedo. Its simplified, stripped-down style reveals very little influence of ancient architecture, but its emphasis on clean-cut cubical masses foreshadows his mature style. The Casa Civena (1540-1546) in Vicenza, with its paired Corinthian pilasters above the ground-floor arcade, is more in the Roman High Renaissance manner, perhaps inspired by the publications of Sebastiano Serlio. In 1541 Trissino took Palladio to Rome to study the ancient monuments. At this time Palladio began a magnificent series of drawings of ancient buildings. The incomplete Palazzo Thiene (commissioned 1542, constructed ca. 1545-1550) in Vicenza is in the style of Giulio Romano, particularly in its heavy rustication of the ground floor and the massive stone blocks superimposed on the window frames of the main story. As Giulio Romano was in Vicenza in 1542, it is possible that he contributed to the design, since Palladio was still designated as a mason in the contract. The grandiose project, never completed, for the Villa Thiene (before 1550) at Quinto was influenced by Palladio's study of ancient Roman sanctuaries and baths. The only completed pavilion has a temple front facade, his first use of a temple front to decorate a villa, which became a hallmark of his style.

For many years the city of Vicenza had been considering how to refurbish its Gothic law court, the Palazzo della Ragione. In 1546 Palladio's project to surround the old building with loggias was approved, and he was commissioned to erect one bay in wood as a model. In 1547 and 1549 Palladio made further trips to Rome. In 1549 he began to construct two superimposed, arcaded loggias around the Palazzo della Ragione (completed 1617), known ever since as the Basilica Palladiana. Each bay of the loggias is composed of an arch flanked by lintels supported by columns. The motif of the arch flanked by lintels, although it was first used by Bramante and was popularized in Serlio's book, has been called in English the Palladian motif since Palladio used it on the Basilica.

1.5.2.2 Mature Style

Palladio created on the mainland around Venice a magnificent series of villas for the Venetian and Vicenzan nobility. The most renowned is the Villa Capra, or the Rotunda (1550-1551, with later revisions), near Vicenza. It is a simplified, cube like mass capped by a dome over the central, round salon and has identical temple front porches on the four sides of the block. The absolute symmetry of the design was unusual in Palladian villas; the architect explained that it permitted equal views over the countryside around the hill on which the villa sits.

The city of Vicenza was almost completely rebuilt with edifices after Palladio's designs. The Palazzo Chiericati (now the Museo Civico) is a two-story structure facing on the square with a continuous Doric colonnade on the ground floor after the idea of an ancient Roman forum; the walled and fenestrated central section of the upper floor is flanked by Ionic colonnades. The facade of the Palazzo Iseppo Porto (ca. 1550-1552) is based on Bramante's Palazzo Caprini in Rome, but the plan is Palladio's version of an ancient Roman house with an entrance atrium and a large peristyle, or court, on the central axis behind the building block.

In 1554 Palladio made his last trip to Rome and in the same year published a fine guidebook to the antiquities of Rome, Le antichità di Roma. During the next year a group of Vicenzans, including Palladio, founded the Accademia Olimpica for the furthering of arts and sciences. In 1556 Daniele Barbaro, a Venetian humanist, published a commentary on the architectural treatise of the ancient Roman writer Vitruvius for which Palladio made the illustrations. At the same time Palladio designed for Barbaro and his brother at Maser (ca. 1555-1559) one of the loveliest of all villas. The Villa Barbaro (now Volpi) is set into a gentle hillside. The central, two-storied casino with a temple front of Ionic half-columns and pediment is flanked by single-story arcades connecting it to the service buildings, for the villa also served as a farm. In the 16th century the nobility of the Veneto attempted to improve the agricultural productivity of the land, and their villas served as residences during the periods when they supervised the farming.

Palladio's first architecture in the city of Venice was the commencement of the monastery of S. Giorgio Maggiore, whose refectory he completed (1560-1562). This was followed by the church of S. Giorgio Maggiore (1565-1610), which has a basilical plan with apsidal transept arms and a deep choir. The facade (designed 1565, executed 1607-1610), with its temple front on four giant half columns flanked by two half temple fronts on smaller pilasters, is Palladio's solution to the translation of a Christian church design into the classical mode. He applied a similar facade to the older church of S. Francesco della Vigna (ca. 1565). The Palazzo Valmarana (1565-1566) in Vicenza uses giant Corinthian pilasters, except at the ends, to emphasize the planar aspect of the facade adapted to its urban location.

1.5.2.3 Late Style

The truncated Loggia del Capitaniato (1571-1572) in Vicenza has giant half columns with an arcaded loggia below. In many of its details this design reveals an un-classical spirit. The short side, however, is modeled on an ancient triumphal arch and commemorates the victory of Lepanto in October 1571, which occurred while the loggia was being executed. As the chief architect of Venice, Palladio designed the festival triumphal arch and the decorations to welcome the entry of King Henry III of France to Venice in July 1574.

To fulfill a vow of salvation from the disastrous plague of 1575-1576 the Venetian Senate commissioned Palladio to build the Church of the Redentore (1576-1592). Perhaps influenced by the Church of the Gesù in Rome, it is a wide basilica with side chapels and a trilobed crossing with deep choir. The facade, approached by monumental stairs, is a more unified version of his earlier church facades. For the Villa Barbaro at Maser he designed a separate chapel, the Tempietto (1579-1580), modeled on the ancient Roman Pantheon. Palladio executed a theater, the Teatro Olimpico (1580), in Vicenza for the Accademia Olimpica. Based on the design of an ancient Roman theater, the auditorium is segmental in plan, facing a stage modeled on a Roman scalene frons. The perspective stage scenery in wood and stucco was added by Vincenzo Scamozzi after Palladio's design.

1.5.3 The Design Elements of Palladio: 3-Part design ideology

Drawing upon his own insights and observations, upon the re-discovered treatise of the Roman writer Vitruvius and the writings of Alberti and Serlio, and upon the works of elders such as Raphael, Falconetto, Sanmicheli and Sansovino, Palladio devised a solution with three principal elements:

1) Dramatic exterior motifs.
2) Economical materials.
3) Internal harmony and balance.

1.5.3.1 Dramatic Exterior Motifs

Palladio developed three primary types of exterior elevations that we have come to characterize as Palladian. The simplest and most modest, presents a loggia pierced by three openings. The second type borrows the Greek temple front. It was Palladio's inspiration to adapt the Greek pediment and columns to private residences. The third and most innovative and modern of the three motifs was the double decked column loggia. That is columns on top of columns.

1.5.3.1.1 First Motif: The Three-Opening Loggia

The first motif of the three-opening loggia appears in Palladio's very first villa: Villa Godi (1537-'42 and 1549-'52 A.D.). There is symmetrical balance from left to right. This may seem insignificant but it has many antecedents. It is a striking contrast to the unsymmetrical gothic palaces of Venice and it becomes a cornerstone of Palladian villas. With the introduction of this motif of the three-opening loggia; Palladio begins to open the villa to the world outside. Villa Gazzotti at Bertesuna (1542-'47 and 1550-'55 A.D.), Villa Pisani at Bagnolo (1542-'44 and 1561-'69 A.D.), Villa Saraceno at Finale (1545-1548 A.D.), Villa Caldogno at Caldongo (1548-'52 and 1569-70 A.D.) are all substantially similar and modest in their exterior motif.

1.5.3.1.2 Second Motif: Greek Temple Front

A dramatic turn came in architectural practice of Palladio when he introduced temple motifs in villa facades with Villa Barbara (1549-1558 A.D.). Villa Barbara in Maser is one of Palladio's most magnificent and influential designs. It has the true Greek temple-front. Not projecting forward but surmounted by a brilliant classical pediment. The Venetians call these farm buildings "barchessas." At the ends of the barchessas Palladio added dovecotes on top and faced them with sundials. The result is one of the lasting legacies of Western public architecture: 5-part profile. The Villa Barbara (1549-58 A.D.) in the village of Maser adjacent to the famous hilltown of Asolo is the inception of this legacy. The elevation shows, the parts from left to right: 1-Left Dovecote; 2-Left Barchessa; 3-Residence; 4-Right Barchessa; 5-Right Dovecote. Another example of the 5-part form is Villa Emo at Fanzolo (1559-65 A.D.). The dovecotes on the ends are less prominent here, the temple front has freestanding columns.

1.5.3.1.3 Third Motif: Double Decked Column Loggias

Palladio's third major motif was of two loggias, one on top of the other. The garden side Villa Cornaro at Piombino Dese (1551-53 A.D.) shows this motif in its simpler form, with the loggia recessed within the central core of the villa. It's a place to sit and look from a protected area out into the world. But Villa Cornaro is one of Palladio's double-faced villas. At villa Cornaro a projecting two storey loggia surmounted by a classical pediment marks the major entry from the main road, while the loggia facing the garden is recessed. A two storey loggia at the villa Giustinian in Roncade (155-13 A.D.) by Tullio Lombardo that was an immediate precedent seems to be a source of an inspiration for Palladio to adapt the motif of double decked loggia in residential architecture.

1.5.3.2 Economical Materials

The palaces of Venice itself are built of stone brought from distant mainland quarries. The stone was then usually clad in marble from Istria or beyond. But because Palladio had achieved his visual impact through his design motifs, he could build his villas of brick instead of stone, and clad them in stucco instead of marble. Palladio used terra cotta for ornate capitals except on South and North facade; where he used stone because of weather. He used wood for architrave that supported mighty pediments. Wood was covered with straw lathing and then stucco. Inside the walls were bare although the cornices and ceilings may be magnificently decorated. The missing element today is the tapestries. In the 16th century the palace walls were covered in magnificent tapestries, both for their beauty and for their insulating qualities in the winter. Since the villas were in the countryside; they were only for use in the summer farming season, the insulating qualities were not needed for warmth. So by using frescos, Palladio eliminated the huge cost of tapestries.

1.5.3.3 Interior Harmony and Balance

This is the most evanescent element of Palladio's solution. His exterior motifs, innovative as they are can be copied; his economical materials can be duplicated, even improved. But Palladio's balance and harmony seem to live only in his 18 surviving villas. The harmony and balance of Palladio's interior spaces is their great epiphany triumph but it seems to elude the Palladians of other countries and later times. Palladio certainly tried to conceptualize and convey his insight which he formulated in terms of proportional theory of seven room shapes. Palladio states that the parts of a house must correspond to the whole and to each other. This seems simple in theory but has proved very difficult for most of Palladio's posterity and wannabes to put it into practice. Secondly, as to the shapes of individual rooms, he offers multitudinous possibilities, from the square and the circle to rectangles in a variety of ratios of width to length. Finally, Palladio varies the volumetric size of his rooms with the creativity and discipline. His inspiration here is said to have been the classical Roman baths with their rooms on three scales.

James Ackreman summarizes Palladian stimulus that led to formulation of his principles as:

1) Hierarchy, or the systematic built-up from dependent parts to a focal core.

2) The integration by proportionality, in three dimensions, of part to part and part to whole.

3) The co-ordination of exterior and interior design by representing the interior organization on the facades and by consistency in the proportional system.

1.5.4 Chronology

- 1508: Born in Padua on 30 November
- 1521: Begins work as a stone mason
- 1540: Begins his first work, Villa Godi in Lonedo
- 1544: Begins construction of Villa Pisani in Bagnolo
- 1545: Involved in the refurbishment of the Basilica of Vicenza
- 1550: Produces drawings for Palazzo Chiericati and Villa Foscari
- 1552: Begins work on Villa Cornaro and the palace of Iseppo De' Porti
- 1554: Begins work on Villa Barbaro in Maser
- 1556: In Udine he works on Casa Antonini and in Vicenza begins with Palazzo Thiene. While his assignments increase along with his fame, he collaborates with Daniele Barbaro on his commentary on Vitruvius, providing the drawings.
- 1557: Begins Villa Badoer in the Po river valley
- 1558: Realises a project for the church of San Pietro di Castello in Venice and probably in the same year begins the construction of Villa Malcontenta
- 1559: Begins Villa Emo in the village of Fanzolo di Vedelago
- 1561: Begins the construction of Villa Pojana and at the same time of the refectory of the Benedictine San Giorgio Monastery, and subsequently the facade of the monastery *Monastero per la Carità* and the Villa Serego

- 1562: Begins the facade of San Francesco della Vigna and work on San Giorgio Maggiore
- 1565: Begins the construction of Villa Cagollo in Vicenza and Villa Pisani (Montagnana) in Montagnana
- 1566: *Palazzo Valmarana* and Villa Zeno
- 1567: Begins works for the Villa Capra "La Rotunda"
- 1570: He is nominated *Proto della Serenissima* (chief architect of the Republic of Venice), and publishes in Venice *I Quattro Libri dell' Architettura* (The Four Books of Architecture)
- 1571: Realises: *Villa Piovene*, *Palazzo Porto Barbaran*, the *Loggia del Capitanio* and *Palazzo Porto Breganze*.
- 1574: Publishes the 'Commentari' (commentaries) of Caesar and works on studies for the front of the Basilica di San Petronio in Bologna
- 1577: Begins the construction of the church of *Il Redentore*
- 1580: Prepares drawings for the interior of the church of *S. Lucia* in Venice and in the same year on 23 March oversees the beginning of the construction of the *Teatro Olimpico* but dies on 19 August 1580

APPENDIX 2 and 3: TABLE OF PALLADIAN ROOM SIZES and TABLE OF PALLADIAN ROOM HEIGHTS

2.1 Note on datum of accuracy and computation for tables:

This part of study computes various room sizes with respect to Palladian theory of room ratios as reference table. Developed here are probable room sizes on the basis of five room ratios (eliminating circle and 1:1 - which is a square) on FPS system (foot, pound, seconds) which Palladio seem to have followed (though not congruent to present day basic unit) in *'I Quattro Libri Dell' Architecttura' book two.* This table in foot and inches is calibrated to accuracy of 1/8", which is easy to decipher and generates dimensions that are equivalent to units of fraction adopted by Palladio (e.g. ¼, ½, ¾ etc.). For convenience in practical use in computer software like Auto CAD or calculator, same values are tabulated in its decimal values by its side; thus spreading the table over two facing pages. For convenience study adopts following decimal equivalents of inch: 1"= 0.08, 2"= 0.17, 3"= 0.25, 4"= 0.33, 5"= 0.44, 6"= 0.50, 7"= 0.58, 8"= 0.67, 9"= 0.75, 10"= 0.83, 11"= 0.92, 12"= 1.0.

The tabulation is in two parts. The first generates data on incremental side of basic dimension while the second part is on diminishing side from the basic unit of length. The nomenclature followed is 3:4, 5:7, 2:3, 3:5, 1:2 in part one and 4:3, 7:5, 3:2, 5:3, 2:1 (Larger number first; as suggested by Prof. Lionel March as rule of thumb for clarity and consistency which has been followed throughout this study) in part two suggesting the derivation of incremental value or larger side of room from a shorter in first part and vice a versa in the part two.

The scope of computation for both the tables has been limited to the basic length of 100 feet as to general practice in modern day residential planning (in India) rooms beyond certain sizes are not adopted.

2.2 Format of tabulation for table of Palladian room sizes:

Top horizontal row states different room ratios in ascending and descending order. Extreme left vertical column holds primary room lengths (that are marked in bold fonts) with incremental value of one inch. Its proportionally calculated room widths are stated under respective ratios mentioned in column head. For example, if primary room length is 1'; its complementary room width that is related to it with ratio of 2:3 is 1'6" and room width that is related to it with ratio of 3:2 is 8".

On similar guide lines, second part of this appendix (appendix 3) tabulates probable room heights calculated on basis of Arithmetic Mean, Geometric Mean and Harmonic Mean as value for AM is greater than value for GM; which is greater than value for GM for same set of room dimensions.

2.3 Format of tabulation for table of Palladian room heights:

Top horizontal row states different room ratios in ascending and descending order. Extreme left vertical column holds primary room lengths (that are marked in bold fonts) with incremental value of six inch. Its proportionally calculated room widths (also marked in bold fonts) are stated under respective ratios mentioned in column head. Under these calculated room widths are mentioned room heights calculated on basis of Arithmetic Mean, Geometric Mean and Harmonic Mean which are marked in second column from left. For example, if primary room length is 1'; its complementary room width that is related to it with ratio of 2:1 is 2'. For this room of 1' x 2' size; its room height as per AM is 1'6", 1'5" according to GM and 1'4" according to HM.

For setting convenience at referring these table that are spread over two facing pages for one primary room length, the following page is left blank to set proper chronology of facing pages.

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
1' 0"	1' 4"	1' 4 3/4"	1' 6"	1' 8"	2' 0"	**1.00**	1.33	1.40	1.50	1.67	2.00
1' 1"	1' 5 3/8"	1' 6 1/4"	1' 7 1/2"	1' 9 5/8"	2' 2"	**1.08**	1.44	1.52	1.62	1.81	2.17
1' 2"	1' 6 5/8"	1' 7 5/8"	1' 9"	1' 11 3/8"	2' 4"	**1.17**	1.56	1.63	1.75	1.94	2.33
1' 3"	1' 8"	1' 9"	1' 10 1/2"	2' 1"	2' 6"	**1.25**	1.67	1.75	1.88	2.08	2.50
1' 4"	1' 9 3/8"	1' 10 3/8"	2' 0"	2' 2 5/8"	2' 8"	**1.33**	1.78	1.87	2.00	2.22	2.67
1' 5"	1' 10 5/8"	1' 11 3/4"	2' 1 1/2"	2' 4 3/8"	2' 10"	**1.42**	1.89	1.98	2.13	2.36	2.83
1' 6"	2' 0"	2' 1 1/4"	2' 3"	2' 6"	3' 0"	**1.50**	2.00	2.10	2.25	2.50	3.00
1' 7"	2' 1 3/8"	2' 2 5/8"	2' 4 1/2"	2' 7 5/8"	3' 2"	**1.58**	2.11	2.22	2.37	2.64	3.17
1' 8"	2' 2 5/8"	2' 4"	2' 6"	2' 9 3/8"	3' 4"	**1.67**	2.22	2.33	2.50	2.78	3.33
1' 9"	2' 4"	2' 5 3/8"	2' 7 1/2"	2' 11"	3' 6"	**1.75**	2.33	2.45	2.63	2.92	3.50
1' 10"	2' 5 3/8"	2' 6 3/4"	2' 9"	3' 5/8"	3' 8"	**1.83**	2.44	2.57	2.75	3.06	3.67
1' 11"	2' 6 5/8"	2' 8 1/4"	2' 10 1/2"	3' 2 3/8"	3' 10"	**1.92**	2.56	2.68	2.88	3.19	3.83
2' 0"	2' 8"	2' 9 5/8"	3' 0"	3' 4"	4' 0"	**2.00**	2.67	2.80	3.00	3.33	4.00
2' 1"	2' 9 3/8"	2' 11"	3' 1 1/2"	3' 5 5/8"	4' 2"	**2.08**	2.78	2.92	3.12	3.47	4.17
2' 2"	2' 10 5/8"	3' 3/8"	3' 3"	3' 7 3/8"	4' 4"	**2.17**	2.89	3.03	3.25	3.61	4.33
2' 3"	3' 0"	3' 1 3/4"	3' 4 1/2"	3' 9"	4' 6"	**2.25**	3.00	3.15	3.38	3.75	4.50
2' 4"	3' 1 3/8"	3' 3 1/4"	3' 6"	3' 10 5/8"	4' 8"	**2.33**	3.11	3.27	3.50	3.89	4.67
2' 5"	3' 2 5/8"	3' 4 5/8"	3' 7 1/2"	4' 3/8"	4' 10"	**2.42**	3.22	3.38	3.63	4.03	4.83
2' 6"	3' 4"	3' 6"	3' 9"	4' 2"	5' 0"	**2.50**	3.33	3.50	3.75	4.17	5.00
2' 7"	3' 5 3/8"	3' 7 3/8"	3' 10 1/2"	4' 3 5/8"	5' 2"	**2.58**	3.44	3.62	3.87	4.31	5.17
2' 8"	3' 6 5/8"	3' 8 3/4"	4' 0"	4' 5 3/8"	5' 4"	**2.67**	3.56	3.73	4.00	4.44	5.33
2' 9"	3' 8"	3' 10 1/4"	4' 1 1/2"	4' 7"	5' 6"	**2.75**	3.67	3.85	4.13	4.58	5.50
2' 10"	3' 9 3/8"	3' 11 5/8"	4' 3"	4' 8 5/8"	5' 8"	**2.83**	3.78	3.97	4.25	4.72	5.67
2' 11"	3' 10 5/8"	4' 1"	4' 4 1/2"	4' 10 3/8"	5' 10"	**2.92**	3.89	4.08	4.38	4.86	5.83
3' 0"	4' 0"	4' 2 3/8"	4' 6"	5' 0"	6' 0"	**3.00**	4.00	4.20	4.50	5.00	6.00
3' 1"	4' 1 3/8"	4' 3 3/4"	4' 7 1/2"	5' 1 5/8"	6' 2"	**3.08**	4.11	4.32	4.62	5.14	6.17
3' 2"	4' 2 5/8"	4' 5 1/4"	4' 9"	5' 3 3/8"	6' 4"	**3.17**	4.22	4.43	4.75	5.28	6.33
3' 3"	4' 4"	4' 6 5/8"	4' 10 1/2"	5' 5"	6' 6"	**3.25**	4.33	4.55	4.88	5.42	6.50
3' 4"	4' 5 3/8"	4' 8"	5' 0"	5' 6 5/8"	6' 8"	**3.33**	4.44	4.67	5.00	5.56	6.67
3' 5"	4' 6 5/8"	4' 9 3/8"	5' 1 1/2"	5' 8 3/8"	6' 10"	**3.42**	4.56	4.78	5.13	5.69	6.83
3' 6"	4' 8"	4' 10 3/4"	5' 3"	5' 10"	7' 0"	**3.50**	4.67	4.90	5.25	5.83	7.00
3' 7"	4' 9 3/8"	5' 1/4"	5' 4 1/2"	5' 11 5/8"	7' 2"	**3.58**	4.78	5.02	5.37	5.97	7.17
3' 8"	4' 10 5/8"	5' 1 5/8"	5' 6"	6' 1 3/8"	7' 4"	**3.67**	4.89	5.13	5.50	6.11	7.33
3' 9"	5' 0"	5' 3"	5' 7 1/2"	6' 3"	7' 6"	**3.75**	5.00	5.25	5.63	6.25	7.50
3' 10"	5' 1 3/8"	5' 4 3/8"	5' 9"	6' 4 5/8"	7' 8"	**3.83**	5.11	5.37	5.75	6.39	7.67
3' 11"	5' 2 5/8"	5' 5 3/4"	5' 10 1/2"	6' 6 3/8"	7' 10"	**3.92**	5.22	5.48	5.88	6.53	7.83
4' 0"	5' 4"	5' 7 1/4"	6' 0"	6' 8"	8' 0"	**4.00**	5.33	5.60	6.00	6.67	8.00
4' 1"	5' 5 3/8"	5' 8 5/8"	6' 1 1/2"	6' 9 5/8"	8' 2"	**4.08**	5.44	5.72	6.13	6.81	8.17
4' 2"	5' 6 5/8"	5' 10"	6' 3"	6' 11 3/8"	8' 4"	**4.17**	5.56	5.83	6.25	6.94	8.33
4' 3"	5' 8"	5' 11 3/8"	6' 4 1/2"	7' 1"	8' 6"	**4.25**	5.67	5.95	6.38	7.08	8.50
4' 4"	5' 9 3/8"	6' 3/4"	6' 6"	7' 2 5/8"	8' 8"	**4.33**	5.78	6.07	6.50	7.22	8.67
4' 5"	5' 10 5/8"	6' 2 1/4"	6' 7 1/2"	7' 4 3/8"	8' 10"	**4.42**	5.89	6.18	6.63	7.36	8.83
4' 6"	6' 0"	6' 3 5/8"	6' 9"	7' 6"	9' 0"	**4.50**	6.00	6.30	6.75	7.50	9.00
4' 7"	6' 1 3/8"	6' 5"	6' 10 1/2"	7' 7 5/8"	9' 2"	**4.58**	6.11	6.42	6.88	7.64	9.17
4' 8"	6' 2 5/8"	6' 6 3/8"	7' 0"	7' 9 3/8"	9' 4"	**4.67**	6.22	6.53	7.00	7.78	9.33
4' 9"	6' 4"	6' 7 3/4"	7' 1 1/2"	7' 11"	9' 6"	**4.75**	6.33	6.65	7.13	7.92	9.50
4' 10"	6' 5 3/8"	6' 9 1/4"	7' 3"	8' 5/8"	9' 8"	**4.83**	6.44	6.77	7.25	8.06	9.67
4' 11"	6' 6 5/8"	6' 10 5/8"	7' 4 1/2"	8' 2 3/8"	9' 10"	**4.92**	6.56	6.88	7.38	8.19	9.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
1' 0"	0' 9"	0' 8 5/8"	0' 8"	0' 7 1/4"	0' 6"	1.00	0.75	0.71	0.67	0.60	0.50
1' 1"	0' 9 3/4"	0' 9 1/4"	0' 8 5/8"	0' 7 3/4"	0' 6 1/2"	1.08	0.81	0.77	0.72	0.65	0.54
1' 2"	0' 10 1/2"	0' 10"	0' 9 3/8"	0' 8 3/8"	0' 7"	1.17	0.87	0.83	0.78	0.70	0.58
1' 3"	0' 11 1/4"	0' 10 3/4"	0' 10"	0' 9"	0' 7 1/2"	1.25	0.94	0.89	0.83	0.75	0.63
1' 4"	1' 0"	0' 11 3/8"	0' 10 5/8"	0' 9 5/8"	0' 8"	1.33	1.00	0.95	0.89	0.80	0.67
1' 5"	1' 3/4"	1' 1/8"	0' 11 3/8"	0' 10 1/4"	0' 8 1/2"	1.42	1.06	1.01	0.94	0.85	0.71
1' 6"	1' 1 1/2"	1' 7/8"	1' 0"	0' 10 3/4"	0' 9"	1.50	1.13	1.07	1.00	0.90	0.75
1' 7"	1' 2 1/4"	1' 1 5/8"	1' 5/8"	0' 11 3/8"	0' 9 1/2"	1.58	1.19	1.13	1.06	0.95	0.79
1' 8"	1' 3"	1' 2 1/4"	1' 1 3/8"	1' 0"	0' 10"	1.67	1.25	1.19	1.11	1.00	0.83
1' 9"	1' 3 3/4"	1' 3"	1' 2"	1' 5/8"	0' 10 1/2"	1.75	1.31	1.25	1.17	1.05	0.88
1' 10"	1' 4 1/2"	1' 3 3/4"	1' 2 5/8"	1' 1 1/4"	0' 11"	1.83	1.37	1.31	1.22	1.10	0.92
1' 11"	1' 5 1/4"	1' 4 3/8"	1' 3 3/8"	1' 1 3/4"	0' 11 1/2"	1.92	1.44	1.37	1.28	1.15	0.96
2' 0"	1' 6"	1' 5 1/8"	1' 4"	1' 2 3/8"	1' 0"	2.00	1.50	1.43	1.33	1.20	1.00
2' 1"	1' 6 3/4"	1' 5 7/8"	1' 4 5/8"	1' 3"	1' 1/2"	2.08	1.56	1.49	1.39	1.25	1.04
2' 2"	1' 7 1/2"	1' 6 5/8"	1' 5 3/8"	1' 3 5/8"	1' 1"	2.17	1.62	1.55	1.44	1.30	1.08
2' 3"	1' 8 1/4"	1' 7 1/4"	1' 6"	1' 4 1/4"	1' 1 1/2"	2.25	1.69	1.61	1.50	1.35	1.13
2' 4"	1' 9"	1' 8"	1' 6 5/8"	1' 4 3/4"	1' 2"	2.33	1.75	1.67	1.56	1.40	1.17
2' 5"	1' 9 3/4"	1' 8 3/4"	1' 7 3/8"	1' 5 3/8"	1' 2 1/2"	2.42	1.81	1.73	1.61	1.45	1.21
2' 6"	1' 10 1/2"	1' 9 3/8"	1' 8"	1' 6"	1' 3"	2.50	1.88	1.79	1.67	1.50	1.25
2' 7"	1' 11 1/4"	1' 10 1/8"	1' 8 5/8"	1' 6 5/8"	1' 3 1/2"	2.58	1.94	1.85	1.72	1.55	1.29
2' 8"	2' 0"	1' 10 7/8"	1' 9 3/8"	1' 7 1/4"	1' 4"	2.67	2.00	1.90	1.78	1.60	1.33
2' 9"	2' 3/4"	1' 11 5/8"	1' 10"	1' 7 3/4"	1' 4 1/2"	2.75	2.06	1.96	1.83	1.65	1.38
2' 10"	2' 1 1/2"	2' 1/4"	1' 10 5/8"	1' 8 3/8"	1' 5"	2.83	2.12	2.02	1.89	1.70	1.42
2' 11"	2' 2 1/4"	2' 1"	1' 11 3/8"	1' 9"	1' 5 1/2"	2.92	2.19	2.08	1.94	1.75	1.46
3' 0"	2' 3"	2' 1 3/4"	2' 0"	1' 9 5/8"	1' 6"	3.00	2.25	2.14	2.00	1.80	1.50
3' 1"	2' 3 3/4"	2' 2 3/8"	2' 5/8"	1' 10 1/4"	1' 6 1/2"	3.08	2.31	2.20	2.06	1.85	1.54
3' 2"	2' 4 1/2"	2' 3 1/8"	2' 1 3/8"	1' 10 3/4"	1' 7"	3.17	2.37	2.26	2.11	1.90	1.58
3' 3"	2' 5 1/4"	2' 3 7/8"	2' 2"	1' 11 3/8"	1' 7 1/2"	3.25	2.44	2.32	2.17	1.95	1.63
3' 4"	2' 6"	2' 4 5/8"	2' 2 5/8"	2' 0"	1' 8"	3.33	2.50	2.38	2.22	2.00	1.67
3' 5"	2' 6 3/4"	2' 5 1/4"	2' 3 3/8"	2' 5/8"	1' 8 1/2"	3.42	2.56	2.44	2.28	2.05	1.71
3' 6"	2' 7 1/2"	2' 6"	2' 4"	2' 1 1/4"	1' 9"	3.50	2.63	2.50	2.33	2.10	1.75
3' 7"	2' 8 1/4"	2' 6 3/4"	2' 4 5/8"	2' 1 3/4"	1' 9 1/2"	3.58	2.69	2.56	2.39	2.15	1.79
3' 8"	2' 9"	2' 7 3/8"	2' 5 3/8"	2' 2 3/8"	1' 10"	3.67	2.75	2.62	2.44	2.20	1.83
3' 9"	2' 9 3/4"	2' 8 1/8"	2' 6"	2' 3"	1' 10 1/2"	3.75	2.81	2.68	2.50	2.25	1.88
3' 10"	2' 10 1/2"	2' 8 7/8"	2' 6 5/8"	2' 3 5/8"	1' 11"	3.83	2.87	2.74	2.56	2.30	1.92
3' 11"	2' 11 1/4"	2' 9 5/8"	2' 7 3/8"	2' 4 1/4"	1' 11 1/2"	3.92	2.94	2.80	2.61	2.35	1.96
4' 0"	3' 0"	2' 10 1/4"	2' 8"	2' 4 3/4"	2' 0"	4.00	3.00	2.86	2.67	2.40	2.00
4' 1"	3' 3/4"	2' 11"	2' 8 5/8"	2' 5 3/8"	2' 1/2"	4.08	3.06	2.92	2.72	2.45	2.04
4' 2"	3' 1 1/2"	2' 11 3/4"	2' 9 3/8"	2' 6"	2' 1"	4.17	3.12	2.98	2.78	2.50	2.08
4' 3"	3' 2 1/4"	3' 3/8"	2' 10"	2' 6 5/8"	2' 1 1/2"	4.25	3.19	3.04	2.83	2.55	2.13
4' 4"	3' 3"	3' 1 1/8"	2' 10 5/8"	2' 7 1/4"	2' 2"	4.33	3.25	3.10	2.89	2.60	2.17
4' 5"	3' 3 3/4"	3' 1 7/8"	2' 11 3/8"	2' 7 3/4"	2' 2 1/2"	4.42	3.31	3.15	2.94	2.65	2.21
4' 6"	3' 4 1/2"	3' 2 5/8"	3' 0"	2' 8 3/8"	2' 3"	4.50	3.38	3.21	3.00	2.70	2.25
4' 7"	3' 5 1/4"	3' 3 1/4"	3' 5/8"	2' 9"	2' 3 1/2"	4.58	3.44	3.27	3.06	2.75	2.29
4' 8"	3' 6"	3' 4"	3' 1 3/8"	2' 9 5/8"	2' 4"	4.67	3.50	3.33	3.11	2.80	2.33
4' 9"	3' 6 3/4"	3' 4 3/4"	3' 2"	2' 10 1/4"	2' 4 1/2"	4.75	3.56	3.39	3.17	2.85	2.38
4' 10"	3' 7 1/2"	3' 5 3/8"	3' 2 5/8"	2' 10 3/4"	2' 5"	4.83	3.62	3.45	3.22	2.90	2.42
4' 11"	3' 8 1/4"	3' 6 1/8"	3' 3 3/8"	2' 11 3/8"	2' 5 1/2"	4.92	3.69	3.51	3.28	2.95	2.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
5' 0"	6' 8"	7' 0"	7' 6"	8' 4"	10' 0"	5.00	6.67	7.00	7.50	8.33	10.00
5' 1"	6' 9 3/8"	7' 1 3/8"	7' 7 1/2"	8' 5 5/8"	10' 2"	5.08	6.78	7.12	7.63	8.47	10.17
5' 2"	6' 10 5/8"	7' 2 3/4"	7' 9"	8' 7 3/8"	10' 4"	5.17	6.89	7.23	7.75	8.61	10.33
5' 3"	7' 0"	7' 4 1/4"	7' 10 1/2"	8' 9"	10' 6"	5.25	7.00	7.35	7.88	8.75	10.50
5' 4"	7' 1 3/8"	7' 5 5/8"	8' 0"	8' 10 5/8"	10' 8"	5.33	7.11	7.47	8.00	8.89	10.67
5' 5"	7' 2 5/8"	7' 7"	8' 1 1/2"	9' 3/8"	10' 10"	5.42	7.22	7.58	8.13	9.03	10.83
5' 6"	7' 4"	7' 8 3/8"	8' 3"	9' 2"	11' 0"	5.50	7.33	7.70	8.25	9.17	11.00
5' 7"	7' 5 3/8"	7' 9 3/4"	8' 4 1/2"	9' 3 5/8"	11' 2"	5.58	7.44	7.82	8.37	9.31	11.17
5' 8"	7' 6 5/8"	7' 11 1/4"	8' 6"	9' 5 3/8"	11' 4"	5.67	7.56	7.93	8.50	9.44	11.33
5' 9"	7' 8"	8' 5/8"	8' 7 1/2"	9' 7"	11' 6"	5.75	7.67	8.05	8.63	9.58	11.50
5' 10"	7' 9 3/8"	8' 2"	8' 9"	9' 8 5/8"	11' 8"	5.83	7.78	8.17	8.75	9.72	11.67
5' 11"	7' 10 5/8"	8' 3 3/8"	8' 10 1/2"	9' 10 3/8"	11' 10"	5.92	7.89	8.28	8.88	9.86	11.83
6' 0"	8' 0"	8' 4 3/4"	9' 0"	10' 0"	12' 0"	6.00	8.00	8.40	9.00	10.00	12.00
6' 1"	8' 1 3/8"	8' 6 1/4"	9' 1 1/2"	10' 1 5/8"	12' 2"	6.08	8.11	8.52	9.13	10.14	12.17
6' 2"	8' 2 5/8"	8' 7 5/8"	9' 3"	10' 3 3/8"	12' 4"	6.17	8.22	8.63	9.25	10.28	12.33
6' 3"	8' 4"	8' 9"	9' 4 1/2"	10' 5"	12' 6"	6.25	8.33	8.75	9.38	10.42	12.50
6' 4"	8' 5 3/8"	8' 10 3/8"	9' 6"	10' 6 5/8"	12' 8"	6.33	8.44	8.87	9.50	10.56	12.67
6' 5"	8' 6 5/8"	8' 11 3/4"	9' 7 1/2"	10' 8 3/8"	12' 10"	6.42	8.56	8.98	9.63	10.69	12.83
6' 6"	8' 8"	9' 1 1/4"	9' 9"	10' 10"	13' 0"	6.50	8.67	9.10	9.75	10.83	13.00
6' 7"	8' 9 3/8"	9' 2 5/8"	9' 10 1/2"	10' 11 5/8"	13' 2"	6.58	8.78	9.22	9.87	10.97	13.17
6' 8"	8' 10 5/8"	9' 4"	10' 0"	11' 1 3/8"	13' 4"	6.67	8.89	9.33	10.00	11.11	13.33
6' 9"	9' 0"	9' 5 3/8"	10' 1 1/2"	11' 3"	13' 6"	6.75	9.00	9.45	10.13	11.25	13.50
6' 10"	9' 1 3/8"	9' 6 3/4"	10' 3"	11' 4 5/8"	13' 8"	6.83	9.11	9.57	10.25	11.39	13.67
6' 11"	9' 2 5/8"	9' 8 1/4"	10' 4 1/2"	11' 6 3/8"	13' 10"	6.92	9.22	9.68	10.38	11.53	13.83
7' 0"	9' 4"	9' 9 5/8"	10' 6"	11' 8"	14' 0"	7.00	9.33	9.80	10.50	11.67	14.00
7' 1"	9' 5 3/8"	9' 11"	10' 7 1/2"	11' 9 5/8"	14' 2"	7.08	9.44	9.92	10.63	11.81	14.17
7' 2"	9' 6 5/8"	10' 3/8"	10' 9"	11' 11 3/8"	14' 4"	7.17	9.56	10.03	10.75	11.94	14.33
7' 3"	9' 8"	10' 1 3/4"	10' 10 1/2"	12' 1"	14' 6"	7.25	9.67	10.15	10.88	12.08	14.50
7' 4"	9' 9 3/8"	10' 3 1/4"	11' 0"	12' 2 5/8"	14' 8"	7.33	9.78	10.27	11.00	12.22	14.67
7' 5"	9' 10 5/8"	10' 4 5/8"	11' 1 1/2"	12' 4 3/8"	14' 10"	7.42	9.89	10.38	11.13	12.36	14.83
7' 6"	10' 0"	10' 6"	11' 3"	12' 6"	15' 0"	7.50	10.00	10.50	11.25	12.50	15.00
7' 7"	10' 1 3/8"	10' 7 3/8"	11' 4 1/2"	12' 7 5/8"	15' 2"	7.58	10.11	10.62	11.37	12.64	15.17
7' 8"	10' 2 5/8"	10' 8 3/4"	11' 6"	12' 9 3/8"	15' 4"	7.67	10.22	10.73	11.50	12.78	15.33
7' 9"	10' 4"	10' 10 1/4"	11' 7 1/2"	12' 11"	15' 6"	7.75	10.33	10.85	11.63	12.92	15.50
7' 10"	10' 5 3/8"	10' 11 5/8"	11' 9"	13' 5/8"	15' 8"	7.83	10.44	10.97	11.75	13.06	15.67
7' 11"	10' 6 5/8"	11' 1"	11' 10 1/2"	13' 2 3/8"	15' 10"	7.92	10.56	11.08	11.88	13.19	15.83
8' 0"	10' 8"	11' 2 3/8"	12' 0"	13' 4"	16' 0"	8.00	10.67	11.20	12.00	13.33	16.00
8' 1"	10' 9 3/8"	11' 3 3/4"	12' 1 1/2"	13' 5 5/8"	16' 2"	8.08	10.78	11.32	12.13	13.47	16.17
8' 2"	10' 10 5/8"	11' 5 1/4"	12' 3"	13' 7 3/8"	16' 4"	8.17	10.89	11.43	12.25	13.61	16.33
8' 3"	11' 0"	11' 6 5/8"	12' 4 1/2"	13' 9"	16' 6"	8.25	11.00	11.55	12.38	13.75	16.50
8' 4"	11' 1 3/8"	11' 8"	12' 6"	13' 10 5/8"	16' 8"	8.33	11.11	11.67	12.50	13.89	16.67
8' 5"	11' 2 5/8"	11' 9 3/8"	12' 7 1/2"	14' 3/8"	16' 10"	8.42	11.22	11.78	12.63	14.03	16.83
8' 6"	11' 4"	11' 10 3/4"	12' 9"	14' 2"	17' 0"	8.50	11.33	11.90	12.75	14.17	17.00
8' 7"	11' 5 3/8"	12' 1/4"	12' 10 1/2"	14' 3 5/8"	17' 2"	8.58	11.44	12.02	12.87	14.31	17.17
8' 8"	11' 6 5/8"	12' 1 5/8"	13' 0"	14' 5 3/8"	17' 4"	8.67	11.56	12.13	13.00	14.44	17.33
8' 9"	11' 8"	12' 3"	13' 1 1/2"	14' 7"	17' 6"	8.75	11.67	12.25	13.13	14.58	17.50
8' 10"	11' 9 3/8"	12' 4 3/8"	13' 3"	14' 8 5/8"	17' 8"	8.83	11.78	12.37	13.25	14.72	17.67
8' 11"	11' 10 5/8"	12' 5 3/4"	13' 4 1/2"	14' 10 3/8"	17' 10"	8.92	11.89	12.48	13.38	14.86	17.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
5' 0"	3' 9"	3' 6 7/8"	3' 4"	3' 0"	2' 6"	5.00	3.75	3.57	3.33	3.00	2.50
5' 1"	3' 9 3/4"	3' 7 5/8"	3' 4 5/8"	3' 5/8"	2' 6 1/2"	5.08	3.81	3.63	3.39	3.05	2.54
5' 2"	3' 10 1/2"	3' 8 1/4"	3' 5 3/8"	3' 1 1/4"	2' 7"	5.17	3.87	3.69	3.44	3.10	2.58
5' 3"	3' 11 1/4"	3' 9"	3' 6"	3' 1 3/4"	2' 7 1/2"	5.25	3.94	3.75	3.50	3.15	2.63
5' 4"	4' 0"	3' 9 3/4"	3' 6 5/8"	3' 2 3/8"	2' 8"	5.33	4.00	3.81	3.56	3.20	2.67
5' 5"	4' 3/4"	3' 10 3/8"	3' 7 3/8"	3' 3"	2' 8 1/2"	5.42	4.06	3.87	3.61	3.25	2.71
5' 6"	4' 1 1/2"	3' 11 1/8"	3' 8"	3' 3 5/8"	2' 9"	5.50	4.13	3.93	3.67	3.30	2.75
5' 7"	4' 2 1/4"	3' 11 7/8"	3' 8 5/8"	3' 4 1/4"	2' 9 1/2"	5.58	4.19	3.99	3.72	3.35	2.79
5' 8"	4' 3"	4' 5/8"	3' 9 3/8"	3' 4 3/4"	2' 10"	5.67	4.25	4.05	3.78	3.40	2.83
5' 9"	4' 3 3/4"	4' 1 1/4"	3' 10"	3' 5 3/8"	2' 10 1/2"	5.75	4.31	4.11	3.83	3.45	2.88
5' 10"	4' 4 1/2"	4' 2"	3' 10 5/8"	3' 6"	2' 11"	5.83	4.37	4.17	3.89	3.50	2.92
5' 11"	4' 5 1/4"	4' 2 3/4"	3' 11 3/8"	3' 6 5/8"	2' 11 1/2"	5.92	4.44	4.23	3.94	3.55	2.96
6' 0"	4' 6"	4' 3 3/8"	4' 0"	3' 7 1/4"	3' 0"	6.00	4.50	4.29	4.00	3.60	3.00
6' 1"	4' 6 3/4"	4' 4 1/8"	4' 5/8"	3' 7 3/4"	3' 1/2"	6.08	4.56	4.35	4.06	3.65	3.04
6' 2"	4' 7 1/2"	4' 4 7/8"	4' 1 3/8"	3' 8 3/8"	3' 1"	6.17	4.62	4.40	4.11	3.70	3.08
6' 3"	4' 8 1/4"	4' 5 5/8"	4' 2"	3' 9"	3' 1 1/2"	6.25	4.69	4.46	4.17	3.75	3.13
6' 4"	4' 9"	4' 6 1/4"	4' 2 5/8"	3' 9 5/8"	3' 2"	6.33	4.75	4.52	4.22	3.80	3.17
6' 5"	4' 9 3/4"	4' 7"	4' 3 3/8"	3' 10 1/4"	3' 2 1/2"	6.42	4.81	4.58	4.28	3.85	3.21
6' 6"	4' 10 1/2"	4' 7 3/4"	4' 4"	3' 10 3/4"	3' 3"	6.50	4.88	4.64	4.33	3.90	3.25
6' 7"	4' 11 1/4"	4' 8 3/8"	4' 4 5/8"	3' 11 3/8"	3' 3 1/2"	6.58	4.94	4.70	4.39	3.95	3.29
6' 8"	5' 0"	4' 9 1/8"	4' 5 3/8"	4' 0"	3' 4"	6.67	5.00	4.76	4.44	4.00	3.33
6' 9"	5' 3/4"	4' 9 7/8"	4' 6"	4' 5/8"	3' 4 1/2"	6.75	5.06	4.82	4.50	4.05	3.38
6' 10"	5' 1 1/2"	4' 10 5/8"	4' 6 5/8"	4' 1 1/4"	3' 5"	6.83	5.12	4.88	4.56	4.10	3.42
6' 11"	5' 2 1/4"	4' 11 1/4"	4' 7 3/8"	4' 1 3/4"	3' 5 1/2"	6.92	5.19	4.94	4.61	4.15	3.46
7' 0"	5' 3"	5' 0"	4' 8"	4' 2 3/8"	3' 6"	7.00	5.25	5.00	4.67	4.20	3.50
7' 1"	5' 3 3/4"	5' 3/4"	4' 8 5/8"	4' 3"	3' 6 1/2"	7.08	5.31	5.06	4.72	4.25	3.54
7' 2"	5' 4 1/2"	5' 1 3/8"	4' 9 3/8"	4' 3 5/8"	3' 7"	7.17	5.37	5.12	4.78	4.30	3.58
7' 3"	5' 5 1/4"	5' 2 1/8"	4' 10"	4' 4 1/4"	3' 7 1/2"	7.25	5.44	5.18	4.83	4.35	3.63
7' 4"	5' 6"	5' 2 7/8"	4' 10 5/8"	4' 4 3/4"	3' 8"	7.33	5.50	5.24	4.89	4.40	3.67
7' 5"	5' 6 3/4"	5' 3 5/8"	4' 11 3/8"	4' 5 3/8"	3' 8 1/2"	7.42	5.56	5.30	4.94	4.45	3.71
7' 6"	5' 7 1/2"	5' 4 1/4"	5' 0"	4' 6"	3' 9"	7.50	5.63	5.36	5.00	4.50	3.75
7' 7"	5' 8 1/4"	5' 5"	5' 5/8"	4' 6 5/8"	3' 9 1/2"	7.58	5.69	5.42	5.06	4.55	3.79
7' 8"	5' 9"	5' 5 3/4"	5' 1 3/8"	4' 7 1/4"	3' 10"	7.67	5.75	5.48	5.11	4.60	3.83
7' 9"	5' 9 3/4"	5' 6 3/8"	5' 2"	4' 7 3/4"	3' 10 1/2"	7.75	5.81	5.54	5.17	4.65	3.88
7' 10"	5' 10 1/2"	5' 7 1/8"	5' 2 5/8"	4' 8 3/8"	3' 11"	7.83	5.87	5.60	5.22	4.70	3.92
7' 11"	5' 11 1/4"	5' 7 7/8"	5' 3 3/8"	4' 9"	3' 11 1/2"	7.92	5.94	5.65	5.28	4.75	3.96
8' 0"	6' 0"	5' 8 5/8"	5' 4"	4' 9 5/8"	4' 0"	8.00	6.00	5.71	5.33	4.80	4.00
8' 1"	6' 3/4"	5' 9 1/4"	5' 4 5/8"	4' 10 1/4"	4' 1/2"	8.08	6.06	5.77	5.39	4.85	4.04
8' 2"	6' 1 1/2"	5' 10"	5' 5 3/8"	4' 10 3/4"	4' 1"	8.17	6.12	5.83	5.44	4.90	4.08
8' 3"	6' 2 1/4"	5' 10 3/4"	5' 6"	4' 11 3/8"	4' 1 1/2"	8.25	6.19	5.89	5.50	4.95	4.13
8' 4"	6' 3"	5' 11 3/8"	5' 6 5/8"	5' 0"	4' 2"	8.33	6.25	5.95	5.56	5.00	4.17
8' 5"	6' 3 3/4"	6' 1/8"	5' 7 3/8"	5' 5/8"	4' 2 1/2"	8.42	6.31	6.01	5.61	5.05	4.21
8' 6"	6' 4 1/2"	6' 7/8"	5' 8"	5' 1 1/4"	4' 3"	8.50	6.38	6.07	5.67	5.10	4.25
8' 7"	6' 5 1/4"	6' 1 5/8"	5' 8 5/8"	5' 1 3/4"	4' 3 1/2"	8.58	6.44	6.13	5.72	5.15	4.29
8' 8"	6' 6"	6' 2 1/4"	5' 9 3/8"	5' 2 3/8"	4' 4"	8.67	6.50	6.19	5.78	5.20	4.33
8' 9"	6' 6 3/4"	6' 3"	5' 10"	5' 3"	4' 4 1/2"	8.75	6.56	6.25	5.83	5.25	4.38
8' 10"	6' 7 1/2"	6' 3 3/4"	5' 10 5/8"	5' 3 5/8"	4' 5"	8.83	6.62	6.31	5.89	5.30	4.42
8' 11"	6' 8 1/4"	6' 4 3/8"	5' 11 3/8"	5' 4 1/4"	4' 5 1/2"	8.92	6.69	6.37	5.94	5.35	4.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
9' 0"	12' 0"	12' 7 1/4"	13' 6"	15' 0"	18' 0"	9.00	12.00	12.60	13.50	15.00	18.00
9' 1"	12' 1 3/8"	12' 8 5/8"	13' 7 1/2"	15' 1 5/8"	18' 2"	9.08	12.11	12.72	13.63	15.14	18.17
9' 2"	12' 2 5/8"	12' 10"	13' 9"	15' 3 3/8"	18' 4"	9.17	12.22	12.83	13.75	15.28	18.33
9' 3"	12' 4"	12' 11 3/8"	13' 10 1/2"	15' 5"	18' 6"	9.25	12.33	12.95	13.88	15.42	18.50
9' 4"	12' 5 3/8"	13' 3/4"	14' 0"	15' 6 5/8"	18' 8"	9.33	12.44	13.07	14.00	15.56	18.67
9' 5"	12' 6 5/8"	13' 2 1/4"	14' 1 1/2"	15' 8 3/8"	18' 10"	9.42	12.56	13.18	14.13	15.69	18.83
9' 6"	12' 8"	13' 3 5/8"	14' 3"	15' 10"	19' 0"	9.50	12.67	13.30	14.25	15.83	19.00
9' 7"	12' 9 3/8"	13' 5"	14' 4 1/2"	15' 11 5/8"	19' 2"	9.58	12.78	13.42	14.37	15.97	19.17
9' 8"	12' 10 5/8"	13' 6 3/8"	14' 6"	16' 1 3/8"	19' 4"	9.67	12.89	13.53	14.50	16.11	19.33
9' 9"	13' 0"	13' 7 3/4"	14' 7 1/2"	16' 3"	19' 6"	9.75	13.00	13.65	14.63	16.25	19.50
9' 10"	13' 1 3/8"	13' 9 1/4"	14' 9"	16' 4 5/8"	19' 8"	9.83	13.11	13.77	14.75	16.39	19.67
9' 11"	13' 2 5/8"	13' 10 5/8"	14' 10 1/2"	16' 6 3/8"	19' 10"	9.92	13.22	13.88	14.88	16.53	19.83
10' 0"	13' 4"	14' 0"	15' 0"	16' 8"	20' 0"	10.00	13.33	14.00	15.00	16.67	20.00
10' 1"	13' 5 3/8"	14' 1 3/8"	15' 1 1/2"	16' 9 5/8"	20' 2"	10.08	13.44	14.12	15.13	16.81	20.17
10' 2"	13' 6 5/8"	14' 2 3/4"	15' 3"	16' 11 3/8"	20' 4"	10.17	13.56	14.23	15.25	16.94	20.33
10' 3"	13' 8"	14' 4 1/4"	15' 4 1/2"	17' 1"	20' 6"	10.25	13.67	14.35	15.38	17.08	20.50
10' 4"	13' 9 3/8"	14' 5 5/8"	15' 6"	17' 2 5/8"	20' 8"	10.33	13.78	14.47	15.50	17.22	20.67
10' 5"	13' 10 5/8"	14' 7"	15' 7 1/2"	17' 4 3/8"	20' 10"	10.42	13.89	14.58	15.63	17.36	20.83
10' 6"	14' 0"	14' 8 3/8"	15' 9"	17' 6"	21' 0"	10.50	14.00	14.70	15.75	17.50	21.00
10' 7"	14' 1 3/8"	14' 9 3/4"	15' 10 1/2"	17' 7 5/8"	21' 2"	10.58	14.11	14.82	15.87	17.64	21.17
10' 8"	14' 2 5/8"	14' 11 1/4"	16' 0"	17' 9 3/8"	21' 4"	10.67	14.22	14.93	16.00	17.78	21.33
10' 9"	14' 4"	15' 5/8"	16' 1 1/2"	17' 11"	21' 6"	10.75	14.33	15.05	16.13	17.92	21.50
10' 10"	14' 5 3/8"	15' 2"	16' 3"	18' 5/8"	21' 8"	10.83	14.44	15.17	16.25	18.06	21.67
10' 11"	14' 6 5/8"	15' 3 3/8"	16' 4 1/2"	18' 2 3/8"	21' 10"	10.92	14.56	15.28	16.38	18.19	21.83
11' 0"	14' 8"	15' 4 3/4"	16' 6"	18' 4"	22' 0"	11.00	14.67	15.40	16.50	18.33	22.00
11' 1"	14' 9 3/8"	15' 6 1/4"	16' 7 1/2"	18' 5 5/8"	22' 2"	11.08	14.78	15.52	16.63	18.47	22.17
11' 2"	14' 10 5/8"	15' 7 5/8"	16' 9"	18' 7 3/8"	22' 4"	11.17	14.89	15.63	16.75	18.61	22.33
11' 3"	15' 0"	15' 9"	16' 10 1/2"	18' 9"	22' 6"	11.25	15.00	15.75	16.88	18.75	22.50
11' 4"	15' 1 3/8"	15' 10 3/8"	17' 0"	18' 10 5/8"	22' 8"	11.33	15.11	15.87	17.00	18.89	22.67
11' 5"	15' 2 5/8"	15' 11 3/4"	17' 1 1/2"	19' 3/8"	22' 10"	11.42	15.22	15.98	17.13	19.03	22.83
11' 6"	15' 4"	16' 1 1/4"	17' 3"	19' 2"	23' 0"	11.50	15.33	16.10	17.25	19.17	23.00
11' 7"	15' 5 3/8"	16' 2 5/8"	17' 4 1/2"	19' 3 5/8"	23' 2"	11.58	15.44	16.22	17.37	19.31	23.17
11' 8"	15' 6 5/8"	16' 4"	17' 6"	19' 5 3/8"	23' 4"	11.67	15.56	16.33	17.50	19.44	23.33
11' 9"	15' 8"	16' 5 3/8"	17' 7 1/2"	19' 7"	23' 6"	11.75	15.67	16.45	17.63	19.58	23.50
11' 10"	15' 9 3/8"	16' 6 3/4"	17' 9"	19' 8 5/8"	23' 8"	11.83	15.78	16.57	17.75	19.72	23.67
11' 11"	15' 10 5/8"	16' 8 1/4"	17' 10 1/2"	19' 10 3/8"	23' 10"	11.92	15.89	16.68	17.88	19.86	23.83
12' 0"	16' 0"	16' 9 5/8"	18' 0"	20' 0"	24' 0"	12.00	16.00	16.80	18.00	20.00	24.00
12' 1"	16' 1 3/8"	16' 11"	18' 1 1/2"	20' 1 5/8"	24' 2"	12.08	16.11	16.92	18.13	20.14	24.17
12' 2"	16' 2 5/8"	17' 3/8"	18' 3"	20' 3 3/8"	24' 4"	12.17	16.22	17.03	18.25	20.28	24.33
12' 3"	16' 4"	17' 1 3/4"	18' 4 1/2"	20' 5"	24' 6"	12.25	16.33	17.15	18.38	20.42	24.50
12' 4"	16' 5 3/8"	17' 3 1/4"	18' 6"	20' 6 5/8"	24' 8"	12.33	16.44	17.27	18.50	20.56	24.67
12' 5"	16' 6 5/8"	17' 4 5/8"	18' 7 1/2"	20' 8 3/8"	24' 10"	12.42	16.56	17.38	18.63	20.69	24.83
12' 6"	16' 8"	17' 6"	18' 9"	20' 10"	25' 0"	12.50	16.67	17.50	18.75	20.83	25.00
12' 7"	16' 9 3/8"	17' 7 3/8"	18' 10 1/2"	20' 11 5/8"	25' 2"	12.58	16.78	17.62	18.87	20.97	25.17
12' 8"	16' 10 5/8"	17' 8 3/4"	19' 0"	21' 1 3/8"	25' 4"	12.67	16.89	17.73	19.00	21.11	25.33
12' 9"	17' 0"	17' 10 1/4"	19' 1 1/2"	21' 3"	25' 6"	12.75	17.00	17.85	19.13	21.25	25.50
12' 10"	17' 1 3/8"	17' 11 5/8"	19' 3"	21' 4 5/8"	25' 8"	12.83	17.11	17.97	19.25	21.39	25.67
12' 11"	17' 2 5/8"	18' 1"	19' 4 1/2"	21' 6 3/8"	25' 10"	12.92	17.22	18.08	19.38	21.53	25.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
9' 0"	6' 9"	6' 5 1/8"	6' 0"	5' 4 3/4"	4' 6"	**9.00**	6.75	6.43	6.00	5.40	4.50
9' 1"	6' 9 3/4"	6' 5 7/8"	6' 5/8"	5' 5 3/8"	4' 6 1/2"	**9.08**	6.81	6.49	6.06	5.45	4.54
9' 2"	6' 10 1/2"	6' 6 5/8"	6' 1 3/8"	5' 6"	4' 7"	**9.17**	6.87	6.55	6.11	5.50	4.58
9' 3"	6' 11 1/4"	6' 7 1/4"	6' 2"	5' 6 5/8"	4' 7 1/2"	**9.25**	6.94	6.61	6.17	5.55	4.63
9' 4"	7' 0"	6' 8"	6' 2 5/8"	5' 7 1/4"	4' 8"	**9.33**	7.00	6.67	6.22	5.60	4.67
9' 5"	7' 3/4"	6' 8 3/4"	6' 3 3/8"	5' 7 3/4"	4' 8 1/2"	**9.42**	7.06	6.73	6.28	5.65	4.71
9' 6"	7' 1 1/2"	6' 9 3/8"	6' 4"	5' 8 3/8"	4' 9"	**9.50**	7.13	6.79	6.33	5.70	4.75
9' 7"	7' 2 1/4"	6' 10 1/8"	6' 4 5/8"	5' 9"	4' 9 1/2"	**9.58**	7.19	6.85	6.39	5.75	4.79
9' 8"	7' 3"	6' 10 7/8"	6' 5 3/8"	5' 9 5/8"	4' 10"	**9.67**	7.25	6.90	6.44	5.80	4.83
9' 9"	7' 3 3/4"	6' 11 5/8"	6' 6"	5' 10 1/4"	4' 10 1/2"	**9.75**	7.31	6.96	6.50	5.85	4.88
9' 10"	7' 4 1/2"	7' 1/4"	6' 6 5/8"	5' 10 3/4"	4' 11"	**9.83**	7.37	7.02	6.56	5.90	4.92
9' 11"	7' 5 1/4"	7' 1"	6' 7 3/8"	5' 11 3/8"	4' 11 1/2"	**9.92**	7.44	7.08	6.61	5.95	4.96
10' 0"	7' 6"	7' 1 3/4"	6' 8"	6' 0"	5' 0"	**10.00**	7.50	7.14	6.67	6.00	5.00
10' 1"	7' 6 3/4"	7' 2 3/8"	6' 8 5/8"	6' 5/8"	5' 1/2"	**10.08**	7.56	7.20	6.72	6.05	5.04
10' 2"	7' 7 1/2"	7' 3 1/8"	6' 9 3/8"	6' 1 1/4"	5' 1"	**10.17**	7.62	7.26	6.78	6.10	5.08
10' 3"	7' 8 1/4"	7' 3 7/8"	6' 10"	6' 1 3/4"	5' 1 1/2"	**10.25**	7.69	7.32	6.83	6.15	5.13
10' 4"	7' 9"	7' 4 5/8"	6' 10 5/8"	6' 2 3/8"	5' 2"	**10.33**	7.75	7.38	6.89	6.20	5.17
10' 5"	7' 9 3/4"	7' 5 1/4"	6' 11 3/8"	6' 3"	5' 2 1/2"	**10.42**	7.81	7.44	6.94	6.25	5.21
10' 6"	7' 10 1/2"	7' 6"	7' 0"	6' 3 5/8"	5' 3"	**10.50**	7.88	7.50	7.00	6.30	5.25
10' 7"	7' 11 1/4"	7' 6 3/4"	7' 5/8"	6' 4 1/4"	5' 3 1/2"	**10.58**	7.94	7.56	7.06	6.35	5.29
10' 8"	8' 0"	7' 7 3/8"	7' 1 3/8"	6' 4 3/4"	5' 4"	**10.67**	8.00	7.62	7.11	6.40	5.33
10' 9"	8' 3/4"	7' 8 1/8"	7' 2"	6' 5 3/8"	5' 4 1/2"	**10.75**	8.06	7.68	7.17	6.45	5.38
10' 10"	8' 1 1/2"	7' 8 7/8"	7' 2 5/8"	6' 6"	5' 5"	**10.83**	8.12	7.74	7.22	6.50	5.42
10' 11"	8' 2 1/4"	7' 9 5/8"	7' 3 3/8"	6' 6 5/8"	5' 5 1/2"	**10.92**	8.19	7.80	7.28	6.55	5.46
11' 0"	8' 3"	7' 10 1/4"	7' 4"	6' 7 1/4"	5' 6"	**11.00**	8.25	7.86	7.33	6.60	5.50
11' 1"	8' 3 3/4"	7' 11"	7' 4 5/8"	6' 7 3/4"	5' 6 1/2"	**11.08**	8.31	7.92	7.39	6.65	5.54
11' 2"	8' 4 1/2"	7' 11 3/4"	7' 5 3/8"	6' 8 3/8"	5' 7"	**11.17**	8.37	7.98	7.44	6.70	5.58
11' 3"	8' 5 1/4"	8' 3/8"	7' 6"	6' 9"	5' 7 1/2"	**11.25**	8.44	8.04	7.50	6.75	5.63
11' 4"	8' 6"	8' 1 1/8"	7' 6 5/8"	6' 9 5/8"	5' 8"	**11.33**	8.50	8.10	7.56	6.80	5.67
11' 5"	8' 6 3/4"	8' 1 7/8"	7' 7 3/8"	6' 10 1/4"	5' 8 1/2"	**11.42**	8.56	8.15	7.61	6.85	5.71
11' 6"	8' 7 1/2"	8' 2 5/8"	7' 8"	6' 10 3/4"	5' 9"	**11.50**	8.63	8.21	7.67	6.90	5.75
11' 7"	8' 8 1/4"	8' 3 1/4"	7' 8 5/8"	6' 11 3/8"	5' 9 1/2"	**11.58**	8.69	8.27	7.72	6.95	5.79
11' 8"	8' 9"	8' 4"	7' 9 3/8"	7' 0"	5' 10"	**11.67**	8.75	8.33	7.78	7.00	5.83
11' 9"	8' 9 3/4"	8' 4 3/4"	7' 10"	7' 5/8"	5' 10 1/2"	**11.75**	8.81	8.39	7.83	7.05	5.88
11' 10"	8' 10 1/2"	8' 5 3/8"	7' 10 5/8"	7' 1 1/4"	5' 11"	**11.83**	8.87	8.45	7.89	7.10	5.92
11' 11"	8' 11 1/4"	8' 6 1/8"	7' 11 3/8"	7' 1 3/4"	5' 11 1/2"	**11.92**	8.94	8.51	7.94	7.15	5.96
12' 0"	9' 0"	8' 6 7/8"	8' 0"	7' 2 3/8"	6' 0"	**12.00**	9.00	8.57	8.00	7.20	6.00
12' 1"	9' 3/4"	8' 7 5/8"	8' 5/8"	7' 3"	6' 1/2"	**12.08**	9.06	8.63	8.06	7.25	6.04
12' 2"	9' 1 1/2"	8' 8 1/4"	8' 1 3/8"	7' 3 5/8"	6' 1"	**12.17**	9.12	8.69	8.11	7.30	6.08
12' 3"	9' 2 1/4"	8' 9"	8' 2"	7' 4 1/4"	6' 1 1/2"	**12.25**	9.19	8.75	8.17	7.35	6.13
12' 4"	9' 3"	8' 9 3/4"	8' 2 5/8"	7' 4 3/4"	6' 2"	**12.33**	9.25	8.81	8.22	7.40	6.17
12' 5"	9' 3 3/4"	8' 10 3/8"	8' 3 3/8"	7' 5 3/8"	6' 2 1/2"	**12.42**	9.31	8.87	8.28	7.45	6.21
12' 6"	9' 4 1/2"	8' 11 1/8"	8' 4"	7' 6"	6' 3"	**12.50**	9.38	8.93	8.33	7.50	6.25
12' 7"	9' 5 1/4"	8' 11 7/8"	8' 4 5/8"	7' 6 5/8"	6' 3 1/2"	**12.58**	9.44	8.99	8.39	7.55	6.29
12' 8"	9' 6"	9' 5/8"	8' 5 3/8"	7' 7 1/4"	6' 4"	**12.67**	9.50	9.05	8.44	7.60	6.33
12' 9"	9' 6 3/4"	9' 1 1/4"	8' 6"	7' 7 3/4"	6' 4 1/2"	**12.75**	9.56	9.11	8.50	7.65	6.38
12' 10"	9' 7 1/2"	9' 2"	8' 6 5/8"	7' 8 3/8"	6' 5"	**12.83**	9.62	9.17	8.56	7.70	6.42
12' 11"	9' 8 1/4"	9' 2 3/4"	8' 7 3/8"	7' 9"	6' 5 1/2"	**12.92**	9.69	9.23	8.61	7.75	6.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
13' 0"	17' 4"	18' 2 3/8"	19' 6"	21' 8"	26' 0"	**13.00**	17.33	18.20	19.50	21.67	26.00
13' 1"	17' 5 3/8"	18' 3 3/4"	19' 7 1/2"	21' 9 5/8"	26' 2"	**13.08**	17.44	18.32	19.63	21.81	26.17
13' 2"	17' 6 5/8"	18' 5 1/4"	19' 9"	21' 11 3/8"	26' 4"	**13.17**	17.56	18.43	19.75	21.94	26.33
13' 3"	17' 8"	18' 6 5/8"	19' 10 1/2"	22' 1"	26' 6"	**13.25**	17.67	18.55	19.88	22.08	26.50
13' 4"	17' 9 3/8"	18' 8"	20' 0"	22' 2 5/8"	26' 8"	**13.33**	17.78	18.67	20.00	22.22	26.67
13' 5"	17' 10 5/8"	18' 9 3/8"	20' 1 1/2"	22' 4 3/8"	26' 10"	**13.42**	17.89	18.78	20.13	22.36	26.83
13' 6"	18' 0"	18' 10 3/4"	20' 3"	22' 6"	27' 0"	**13.50**	18.00	18.90	20.25	22.50	27.00
13' 7"	18' 1 3/8"	19' 1/4"	20' 4 1/2"	22' 7 5/8"	27' 2"	**13.58**	18.11	19.02	20.37	22.64	27.17
13' 8"	18' 2 5/8"	19' 1 5/8"	20' 6"	22' 9 3/8"	27' 4"	**13.67**	18.22	19.13	20.50	22.78	27.33
13' 9"	18' 4"	19' 3"	20' 7 1/2"	22' 11"	27' 6"	**13.75**	18.33	19.25	20.63	22.92	27.50
13' 10"	18' 5 3/8"	19' 4 3/8"	20' 9"	23' 5/8"	27' 8"	**13.83**	18.44	19.37	20.75	23.06	27.67
13' 11"	18' 6 5/8"	19' 5 3/4"	20' 10 1/2"	23' 2 3/8"	27' 10"	**13.92**	18.56	19.48	20.88	23.19	27.83
14' 0"	18' 8"	19' 7 1/4"	21' 0"	23' 4"	28' 0"	**14.00**	18.67	19.60	21.00	23.33	28.00
14' 1"	18' 9 3/8"	19' 8 5/8"	21' 1 1/2"	23' 5 5/8"	28' 2"	**14.08**	18.78	19.72	21.13	23.47	28.17
14' 2"	18' 10 5/8"	19' 10"	21' 3"	23' 7 3/8"	28' 4"	**14.17**	18.89	19.83	21.25	23.61	28.33
14' 3"	19' 0"	19' 11 3/8"	21' 4 1/2"	23' 9"	28' 6"	**14.25**	19.00	19.95	21.38	23.75	28.50
14' 4"	19' 1 3/8"	20' 3/4"	21' 6"	23' 10 5/8"	28' 8"	**14.33**	19.11	20.07	21.50	23.89	28.67
14' 5"	19' 2 5/8"	20' 2 1/4"	21' 7 1/2"	24' 3/8"	28' 10"	**14.42**	19.22	20.18	21.63	24.03	28.83
14' 6"	19' 4"	20' 3 5/8"	21' 9"	24' 2"	29' 0"	**14.50**	19.33	20.30	21.75	24.17	29.00
14' 7"	19' 5 3/8"	20' 5"	21' 10 1/2"	24' 3 5/8"	29' 2"	**14.58**	19.44	20.42	21.87	24.31	29.17
14' 8"	19' 6 5/8"	20' 6 3/8"	22' 0"	24' 5 3/8"	29' 4"	**14.67**	19.56	20.53	22.00	24.44	29.33
14' 9"	19' 8"	20' 7 3/4"	22' 1 1/2"	24' 7"	29' 6"	**14.75**	19.67	20.65	22.13	24.58	29.50
14' 10"	19' 9 3/8"	20' 9 1/4"	22' 3"	24' 8 5/8"	29' 8"	**14.83**	19.78	20.77	22.25	24.72	29.67
14' 11"	19' 10 5/8"	20' 10 5/8"	22' 4 1/2"	24' 10 3/8"	29' 10"	**14.92**	19.89	20.88	22.38	24.86	29.83
15' 0"	20' 0"	21' 0"	22' 6"	25' 0"	30' 0"	**15.00**	20.00	21.00	22.50	25.00	30.00
15' 1"	20' 1 3/8"	21' 1 3/8"	22' 7 1/2"	25' 1 5/8"	30' 2"	**15.08**	20.11	21.12	22.63	25.14	30.17
15' 2"	20' 2 5/8"	21' 2 3/4"	22' 9"	25' 3 3/8"	30' 4"	**15.17**	20.22	21.23	22.75	25.28	30.33
15' 3"	20' 4"	21' 4 1/4"	22' 10 1/2"	25' 5"	30' 6"	**15.25**	20.33	21.35	22.88	25.42	30.50
15' 4"	20' 5 3/8"	21' 5 5/8"	23' 0"	25' 6 5/8"	30' 8"	**15.33**	20.44	21.47	23.00	25.56	30.67
15' 5"	20' 6 5/8"	21' 7"	23' 1 1/2"	25' 8 3/8"	30' 10"	**15.42**	20.56	21.58	23.13	25.69	30.83
15' 6"	20' 8"	21' 8 3/8"	23' 3"	25' 10"	31' 0"	**15.50**	20.67	21.70	23.25	25.83	31.00
15' 7"	20' 9 3/8"	21' 9 3/4"	23' 4 1/2"	25' 11 5/8"	31' 2"	**15.58**	20.78	21.82	23.37	25.97	31.17
15' 8"	20' 10 5/8"	21' 11 1/4"	23' 6"	26' 1 3/8"	31' 4"	**15.67**	20.89	21.93	23.50	26.11	31.33
15' 9"	21' 0"	22' 5/8"	23' 7 1/2"	26' 3"	31' 6"	**15.75**	21.00	22.05	23.63	26.25	31.50
15' 10"	21' 1 3/8"	22' 2"	23' 9"	26' 4 5/8"	31' 8"	**15.83**	21.11	22.17	23.75	26.39	31.67
15' 11"	21' 2 5/8"	22' 3 3/8"	23' 10 1/2"	26' 6 3/8"	31' 10"	**15.92**	21.22	22.28	23.88	26.53	31.83
16' 0"	21' 4"	22' 4 3/4"	24' 0"	26' 8"	32' 0"	**16.00**	21.33	22.40	24.00	26.67	32.00
16' 1"	21' 5 3/8"	22' 6 1/4"	24' 1 1/2"	26' 9 5/8"	32' 2"	**16.08**	21.44	22.52	24.13	26.81	32.17
16' 2"	21' 6 5/8"	22' 7 5/8"	24' 3"	26' 11 3/8"	32' 4"	**16.17**	21.56	22.63	24.25	26.94	32.33
16' 3"	21' 8"	22' 9"	24' 4 1/2"	27' 1"	32' 6"	**16.25**	21.67	22.75	24.38	27.08	32.50
16' 4"	21' 9 3/8"	22' 10 3/8"	24' 6"	27' 2 5/8"	32' 8"	**16.33**	21.78	22.87	24.50	27.22	32.67
16' 5"	21' 10 5/8"	22' 11 3/4"	24' 7 1/2"	27' 4 3/8"	32' 10"	**16.42**	21.89	22.98	24.63	27.36	32.83
16' 6"	22' 0"	23' 1 1/4"	24' 9"	27' 6"	33' 0"	**16.50**	22.00	23.10	24.75	27.50	33.00
16' 7"	22' 1 3/8"	23' 2 5/8"	24' 10 1/2"	27' 7 5/8"	33' 2"	**16.58**	22.11	23.22	24.87	27.64	33.17
16' 8"	22' 2 5/8"	23' 4"	25' 0"	27' 9 3/8"	33' 4"	**16.67**	22.22	23.33	25.00	27.78	33.33
16' 9"	22' 4"	23' 5 3/8"	25' 1 1/2"	27' 11"	33' 6"	**16.75**	22.33	23.45	25.13	27.92	33.50
16' 10"	22' 5 3/8"	23' 6 3/4"	25' 3"	28' 5/8"	33' 8"	**16.83**	22.44	23.57	25.25	28.06	33.67
16' 11"	22' 6 5/8"	23' 8 1/4"	25' 4 1/2"	28' 2 3/8"	33' 10"	**16.92**	22.56	23.68	25.38	28.19	33.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
13' 0"	9' 9"	9' 3 3/8"	8' 8"	7' 9 5/8"	6' 6"	**13.00**	9.75	9.29	8.67	7.80	6.50
13' 1"	9' 9 3/4"	9' 4 1/8"	8' 8 5/8"	7' 10 1/4"	6' 6 1/2"	**13.08**	9.81	9.35	8.72	7.85	6.54
13' 2"	9' 10 1/2"	9' 4 7/8"	8' 9 3/8"	7' 10 3/4"	6' 7"	**13.17**	9.87	9.40	8.78	7.90	6.58
13' 3"	9' 11 1/4"	9' 5 5/8"	8' 10"	7' 11 3/8"	6' 7 1/2"	**13.25**	9.94	9.46	8.83	7.95	6.63
13' 4"	10' 0"	9' 6 1/4"	8' 10 5/8"	8' 0"	6' 8"	**13.33**	10.00	9.52	8.89	8.00	6.67
13' 5"	10' 3/4"	9' 7"	8' 11 3/8"	8' 5/8"	6' 8 1/2"	**13.42**	10.06	9.58	8.94	8.05	6.71
13' 6"	10' 1 1/2"	9' 7 3/4"	9' 0"	8' 1 1/4"	6' 9"	**13.50**	10.13	9.64	9.00	8.10	6.75
13' 7"	10' 2 1/4"	9' 8 3/8"	9' 5/8"	8' 1 3/4"	6' 9 1/2"	**13.58**	10.19	9.70	9.06	8.15	6.79
13' 8"	10' 3"	9' 9 1/8"	9' 1 3/8"	8' 2 3/8"	6' 10"	**13.67**	10.25	9.76	9.11	8.20	6.83
13' 9"	10' 3 3/4"	9' 9 7/8"	9' 2"	8' 3"	6' 10 1/2"	**13.75**	10.31	9.82	9.17	8.25	6.88
13' 10"	10' 4 1/2"	9' 10 5/8"	9' 2 5/8"	8' 3 5/8"	6' 11"	**13.83**	10.37	9.88	9.22	8.30	6.92
13' 11"	10' 5 1/4"	9' 11 1/4"	9' 3 3/8"	8' 4 1/4"	6' 11 1/2"	**13.92**	10.44	9.94	9.28	8.35	6.96
14' 0"	10' 6"	10' 0"	9' 4"	8' 4 3/4"	7' 0"	**14.00**	10.50	10.00	9.33	8.40	7.00
14' 1"	10' 6 3/4"	10' 3/4"	9' 4 5/8"	8' 5 3/8"	7' 1/2"	**14.08**	10.56	10.06	9.39	8.45	7.04
14' 2"	10' 7 1/2"	10' 1 3/8"	9' 5 3/8"	8' 6"	7' 1"	**14.17**	10.62	10.12	9.44	8.50	7.08
14' 3"	10' 8 1/4"	10' 2 1/8"	9' 6"	8' 6 5/8"	7' 1 1/2"	**14.25**	10.69	10.18	9.50	8.55	7.13
14' 4"	10' 9"	10' 2 7/8"	9' 6 5/8"	8' 7 1/4"	7' 2"	**14.33**	10.75	10.24	9.56	8.60	7.17
14' 5"	10' 9 3/4"	10' 3 5/8"	9' 7 3/8"	8' 7 3/4"	7' 2 1/2"	**14.42**	10.81	10.30	9.61	8.65	7.21
14' 6"	10' 10 1/2"	10' 4 1/4"	9' 8"	8' 8 3/8"	7' 3"	**14.50**	10.88	10.36	9.67	8.70	7.25
14' 7"	10' 11 1/4"	10' 5"	9' 8 5/8"	8' 9"	7' 3 1/2"	**14.58**	10.94	10.42	9.72	8.75	7.29
14' 8"	11' 0"	10' 5 3/4"	9' 9 3/8"	8' 9 5/8"	7' 4"	**14.67**	11.00	10.48	9.78	8.80	7.33
14' 9"	11' 3/4"	10' 6 3/8"	9' 10"	8' 10 1/4"	7' 4 1/2"	**14.75**	11.06	10.54	9.83	8.85	7.38
14' 10"	11' 1 1/2"	10' 7 1/8"	9' 10 5/8"	8' 10 3/4"	7' 5"	**14.83**	11.12	10.60	9.89	8.90	7.42
14' 11"	11' 2 1/4"	10' 7 7/8"	9' 11 3/8"	8' 11 3/8"	7' 5 1/2"	**14.92**	11.19	10.65	9.94	8.95	7.46
15' 0"	11' 3"	10' 8 5/8"	10' 0"	9' 0"	7' 6"	**15.00**	11.25	10.71	10.00	9.00	7.50
15' 1"	11' 3 3/4"	10' 9 1/4"	10' 5/8"	9' 5/8"	7' 6 1/2"	**15.08**	11.31	10.77	10.06	9.05	7.54
15' 2"	11' 4 1/2"	10' 10"	10' 1 3/8"	9' 1 1/4"	7' 7"	**15.17**	11.37	10.83	10.11	9.10	7.58
15' 3"	11' 5 1/4"	10' 10 3/4"	10' 2"	9' 1 3/4"	7' 7 1/2"	**15.25**	11.44	10.89	10.17	9.15	7.63
15' 4"	11' 6"	10' 11 3/8"	10' 2 5/8"	9' 2 3/8"	7' 8"	**15.33**	11.50	10.95	10.22	9.20	7.67
15' 5"	11' 6 3/4"	11' 1/8"	10' 3 3/8"	9' 3"	7' 8 1/2"	**15.42**	11.56	11.01	10.28	9.25	7.71
15' 6"	11' 7 1/2"	11' 7/8"	10' 4"	9' 3 5/8"	7' 9"	**15.50**	11.63	11.07	10.33	9.30	7.75
15' 7"	11' 8 1/4"	11' 1 5/8"	10' 4 5/8"	9' 4 1/4"	7' 9 1/2"	**15.58**	11.69	11.13	10.39	9.35	7.79
15' 8"	11' 9"	11' 2 1/4"	10' 5 3/8"	9' 4 3/4"	7' 10"	**15.67**	11.75	11.19	10.44	9.40	7.83
15' 9"	11' 9 3/4"	11' 3"	10' 6"	9' 5 3/8"	7' 10 1/2"	**15.75**	11.81	11.25	10.50	9.45	7.88
15' 10"	11' 10 1/2"	11' 3 3/4"	10' 6 5/8"	9' 6"	7' 11"	**15.83**	11.87	11.31	10.56	9.50	7.92
15' 11"	11' 11 1/4"	11' 4 3/8"	10' 7 3/8"	9' 6 5/8"	7' 11 1/2"	**15.92**	11.94	11.37	10.61	9.55	7.96
16' 0"	12' 0"	11' 5 1/8"	10' 8"	9' 7 1/4"	8' 0"	**16.00**	12.00	11.43	10.67	9.60	8.00
16' 1"	12' 3/4"	11' 5 7/8"	10' 8 5/8"	9' 7 3/4"	8' 1/2"	**16.08**	12.06	11.49	10.72	9.65	8.04
16' 2"	12' 1 1/2"	11' 6 5/8"	10' 9 3/8"	9' 8 3/8"	8' 1"	**16.17**	12.12	11.55	10.78	9.70	8.08
16' 3"	12' 2 1/4"	11' 7 1/4"	10' 10"	9' 9"	8' 1 1/2"	**16.25**	12.19	11.61	10.83	9.75	8.13
16' 4"	12' 3"	11' 8"	10' 10 5/8"	9' 9 5/8"	8' 2"	**16.33**	12.25	11.67	10.89	9.80	8.17
16' 5"	12' 3 3/4"	11' 8 3/4"	10' 11 3/8"	9' 10 1/4"	8' 2 1/2"	**16.42**	12.31	11.73	10.94	9.85	8.21
16' 6"	12' 4 1/2"	11' 9 3/8"	11' 0"	9' 10 3/4"	8' 3"	**16.50**	12.38	11.79	11.00	9.90	8.25
16' 7"	12' 5 1/4"	11' 10 1/8"	11' 5/8"	9' 11 3/8"	8' 3 1/2"	**16.58**	12.44	11.85	11.06	9.95	8.29
16' 8"	12' 6"	11' 10 7/8"	11' 1 3/8"	10' 0"	8' 4"	**16.67**	12.50	11.90	11.11	10.00	8.33
16' 9"	12' 6 3/4"	11' 11 5/8"	11' 2"	10' 5/8"	8' 4 1/2"	**16.75**	12.56	11.96	11.17	10.05	8.38
16' 10"	12' 7 1/2"	12' 1/4"	11' 2 5/8"	10' 1 1/4"	8' 5"	**16.83**	12.62	12.02	11.22	10.10	8.42
16' 11"	12' 8 1/4"	12' 1"	11' 3 3/8"	10' 1 3/4"	8' 5 1/2"	**16.92**	12.69	12.08	11.28	10.15	8.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
17' 0"	22' 8"	23' 9 5/8"	25' 6"	28' 4"	34' 0"	**17.00**	22.67	23.80	25.50	28.33	34.00
17' 1"	22' 9 3/8"	23' 11"	25' 7 1/2"	28' 5 5/8"	34' 2"	**17.08**	22.78	23.92	25.63	28.47	34.17
17' 2"	22' 10 5/8"	24' 3/8"	25' 9"	28' 7 3/8"	34' 4"	**17.17**	22.89	24.03	25.75	28.61	34.33
17' 3"	23' 0"	24' 1 3/4"	25' 10 1/2"	28' 9"	34' 6"	**17.25**	23.00	24.15	25.88	28.75	34.50
17' 4"	23' 1 3/8"	24' 3 1/4"	26' 0"	28' 10 5/8"	34' 8"	**17.33**	23.11	24.27	26.00	28.89	34.67
17' 5"	23' 2 5/8"	24' 4 5/8"	26' 1 1/2"	29' 3/8"	34' 10"	**17.42**	23.22	24.38	26.13	29.03	34.83
17' 6"	23' 4"	24' 6"	26' 3"	29' 2"	35' 0"	**17.50**	23.33	24.50	26.25	29.17	35.00
17' 7"	23' 5 3/8"	24' 7 3/8"	26' 4 1/2"	29' 3 5/8"	35' 2"	**17.58**	23.44	24.62	26.37	29.31	35.17
17' 8"	23' 6 5/8"	24' 8 3/4"	26' 6"	29' 5 3/8"	35' 4"	**17.67**	23.56	24.73	26.50	29.44	35.33
17' 9"	23' 8"	24' 10 1/4"	26' 7 1/2"	29' 7"	35' 6"	**17.75**	23.67	24.85	26.63	29.58	35.50
17' 10"	23' 9 3/8"	24' 11 5/8"	26' 9"	29' 8 5/8"	35' 8"	**17.83**	23.78	24.97	26.75	29.72	35.67
17' 11"	23' 10 5/8"	25' 1"	26' 10 1/2"	29' 10 3/8"	35' 10"	**17.92**	23.89	25.08	26.88	29.86	35.83
18' 0"	24' 0"	25' 2 3/8"	27' 0"	30' 0"	36' 0"	**18.00**	24.00	25.20	27.00	30.00	36.00
18' 1"	24' 1 3/8"	25' 3 3/4"	27' 1 1/2"	30' 1 5/8"	36' 2"	**18.08**	24.11	25.32	27.13	30.14	36.17
18' 2"	24' 2 5/8"	25' 5 1/4"	27' 3"	30' 3 3/8"	36' 4"	**18.17**	24.22	25.43	27.25	30.28	36.33
18' 3"	24' 4"	25' 6 5/8"	27' 4 1/2"	30' 5"	36' 6"	**18.25**	24.33	25.55	27.38	30.42	36.50
18' 4"	24' 5 3/8"	25' 8"	27' 6"	30' 6 5/8"	36' 8"	**18.33**	24.44	25.67	27.50	30.56	36.67
18' 5"	24' 6 5/8"	25' 9 3/8"	27' 7 1/2"	30' 8 3/8"	36' 10"	**18.42**	24.56	25.78	27.63	30.69	36.83
18' 6"	24' 8"	25' 10 3/4"	27' 9"	30' 10"	37' 0"	**18.50**	24.67	25.90	27.75	30.83	37.00
18' 7"	24' 9 3/8"	26' 1/4"	27' 10 1/2"	30' 11 5/8"	37' 2"	**18.58**	24.78	26.02	27.87	30.97	37.17
18' 8"	24' 10 5/8"	26' 1 5/8"	28' 0"	31' 1 3/8"	37' 4"	**18.67**	24.89	26.13	28.00	31.11	37.33
18' 9"	25' 0"	26' 3"	28' 1 1/2"	31' 3"	37' 6"	**18.75**	25.00	26.25	28.13	31.25	37.50
18' 10"	25' 1 3/8"	26' 4 3/8"	28' 3"	31' 4 5/8"	37' 8"	**18.83**	25.11	26.37	28.25	31.39	37.67
18' 11"	25' 2 5/8"	26' 5 3/4"	28' 4 1/2"	31' 6 3/8"	37' 10"	**18.92**	25.22	26.48	28.38	31.53	37.83
19' 0"	25' 4"	26' 7 1/4"	28' 6"	31' 8"	38' 0"	**19.00**	25.33	26.60	28.50	31.67	38.00
19' 1"	25' 5 3/8"	26' 8 5/8"	28' 7 1/2"	31' 9 5/8"	38' 2"	**19.08**	25.44	26.72	28.63	31.81	38.17
19' 2"	25' 6 5/8"	26' 10"	28' 9"	31' 11 3/8"	38' 4"	**19.17**	25.56	26.83	28.75	31.94	38.33
19' 3"	25' 8"	26' 11 3/8"	28' 10 1/2"	32' 1"	38' 6"	**19.25**	25.67	26.95	28.88	32.08	38.50
19' 4"	25' 9 3/8"	27' 3/4"	29' 0"	32' 2 5/8"	38' 8"	**19.33**	25.78	27.07	29.00	32.22	38.67
19' 5"	25' 10 5/8"	27' 2 1/4"	29' 1 1/2"	32' 4 3/8"	38' 10"	**19.42**	25.89	27.18	29.13	32.36	38.83
19' 6"	26' 0"	27' 3 5/8"	29' 3"	32' 6"	39' 0"	**19.50**	26.00	27.30	29.25	32.50	39.00
19' 7"	26' 1 3/8"	27' 5"	29' 4 1/2"	32' 7 5/8"	39' 2"	**19.58**	26.11	27.42	29.37	32.64	39.17
19' 8"	26' 2 5/8"	27' 6 3/8"	29' 6"	32' 9 3/8"	39' 4"	**19.67**	26.22	27.53	29.50	32.78	39.33
19' 9"	26' 4"	27' 7 3/4"	29' 7 1/2"	32' 11"	39' 6"	**19.75**	26.33	27.65	29.63	32.92	39.50
19' 10"	26' 5 3/8"	27' 9 1/4"	29' 9"	33' 5/8"	39' 8"	**19.83**	26.44	27.77	29.75	33.06	39.67
19' 11"	26' 6 5/8"	27' 10 5/8"	29' 10 1/2"	33' 2 3/8"	39' 10"	**19.92**	26.56	27.88	29.88	33.19	39.83
20' 0"	26' 8"	28' 0"	30' 0"	33' 4"	40' 0"	**20.00**	26.67	28.00	30.00	33.33	40.00
20' 1"	26' 9 3/8"	28' 1 3/8"	30' 1 1/2"	33' 5 5/8"	40' 2"	**20.08**	26.78	28.12	30.13	33.47	40.17
20' 2"	26' 10 5/8"	28' 2 3/4"	30' 3"	33' 7 3/8"	40' 4"	**20.17**	26.89	28.23	30.25	33.61	40.33
20' 3"	27' 0"	28' 4 1/4"	30' 4 1/2"	33' 9"	40' 6"	**20.25**	27.00	28.35	30.38	33.75	40.50
20' 4"	27' 1 3/8"	28' 5 5/8"	30' 6"	33' 10 5/8"	40' 8"	**20.33**	27.11	28.47	30.50	33.89	40.67
20' 5"	27' 2 5/8"	28' 7"	30' 7 1/2"	34' 3/8"	40' 10"	**20.42**	27.22	28.58	30.63	34.03	40.83
20' 6"	27' 4"	28' 8 3/8"	30' 9"	34' 2"	41' 0"	**20.50**	27.33	28.70	30.75	34.17	41.00
20' 7"	27' 5 3/8"	28' 9 3/4"	30' 10 1/2"	34' 3 5/8"	41' 2"	**20.58**	27.44	28.82	30.87	34.31	41.17
20' 8"	27' 6 5/8"	28' 11 1/4"	31' 0"	34' 5 3/8"	41' 4"	**20.67**	27.56	28.93	31.00	34.44	41.33
20' 9"	27' 8"	29' 5/8"	31' 1 1/2"	34' 7"	41' 6"	**20.75**	27.67	29.05	31.13	34.58	41.50
20' 10"	27' 9 3/8"	29' 2"	31' 3"	34' 8 5/8"	41' 8"	**20.83**	27.78	29.17	31.25	34.72	41.67
20' 11"	27' 10 5/8"	29' 3 3/8"	31' 4 1/2"	34' 10 3/8"	41' 10"	**20.92**	27.89	29.28	31.38	34.86	41.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
17' 0"	12' 9"	12' 1 3/4"	11' 4"	10' 2 3/8"	8' 6"	**17.00**	12.75	12.14	11.33	10.20	8.50
17' 1"	12' 9 3/4"	12' 2 3/8"	11' 4 5/8"	10' 3"	8' 6 1/2"	**17.08**	12.81	12.20	11.39	10.25	8.54
17' 2"	12' 10 1/2"	12' 3 1/8"	11' 5 3/8"	10' 3 5/8"	8' 7"	**17.17**	12.87	12.26	11.44	10.30	8.58
17' 3"	12' 11 1/4"	12' 3 7/8"	11' 6"	10' 4 1/4"	8' 7 1/2"	**17.25**	12.94	12.32	11.50	10.35	8.63
17' 4"	13' 0"	12' 4 5/8"	11' 6 5/8"	10' 4 3/4"	8' 8"	**17.33**	13.00	12.38	11.56	10.40	8.67
17' 5"	13' 3/4"	12' 5 1/4"	11' 7 3/8"	10' 5 3/8"	8' 8 1/2"	**17.42**	13.06	12.44	11.61	10.45	8.71
17' 6"	13' 1 1/2"	12' 6"	11' 8"	10' 6"	8' 9"	**17.50**	13.13	12.50	11.67	10.50	8.75
17' 7"	13' 2 1/4"	12' 6 3/4"	11' 8 5/8"	10' 6 5/8"	8' 9 1/2"	**17.58**	13.19	12.56	11.72	10.55	8.79
17' 8"	13' 3"	12' 7 3/8"	11' 9 3/8"	10' 7 1/4"	8' 10"	**17.67**	13.25	12.62	11.78	10.60	8.83
17' 9"	13' 3 3/4"	12' 8 1/8"	11' 10"	10' 7 3/4"	8' 10 1/2"	**17.75**	13.31	12.68	11.83	10.65	8.88
17' 10"	13' 4 1/2"	12' 8 7/8"	11' 10 5/8"	10' 8 3/8"	8' 11"	**17.83**	13.37	12.74	11.89	10.70	8.92
17' 11"	13' 5 1/4"	12' 9 5/8"	11' 11 3/8"	10' 9"	8' 11 1/2"	**17.92**	13.44	12.80	11.94	10.75	8.96
18' 0"	13' 6"	12' 10 1/4"	12' 0"	10' 9 5/8"	9' 0"	**18.00**	13.50	12.86	12.00	10.80	9.00
18' 1"	13' 6 3/4"	12' 11"	12' 5/8"	10' 10 1/4"	9' 1/2"	**18.08**	13.56	12.92	12.06	10.85	9.04
18' 2"	13' 7 1/2"	12' 11 3/4"	12' 1 3/8"	10' 10 3/4"	9' 1"	**18.17**	13.62	12.98	12.11	10.90	9.08
18' 3"	13' 8 1/4"	13' 3/8"	12' 2"	10' 11 3/8"	9' 1 1/2"	**18.25**	13.69	13.04	12.17	10.95	9.13
18' 4"	13' 9"	13' 1 1/8"	12' 2 5/8"	11' 0"	9' 2"	**18.33**	13.75	13.10	12.22	11.00	9.17
18' 5"	13' 9 3/4"	13' 1 7/8"	12' 3 3/8"	11' 5/8"	9' 2 1/2"	**18.42**	13.81	13.15	12.28	11.05	9.21
18' 6"	13' 10 1/2"	13' 2 5/8"	12' 4"	11' 1 1/4"	9' 3"	**18.50**	13.88	13.21	12.33	11.10	9.25
18' 7"	13' 11 1/4"	13' 3 1/4"	12' 4 5/8"	11' 1 3/4"	9' 3 1/2"	**18.58**	13.94	13.27	12.39	11.15	9.29
18' 8"	14' 0"	13' 4"	12' 5 3/8"	11' 2 3/8"	9' 4"	**18.67**	14.00	13.33	12.44	11.20	9.33
18' 9"	14' 3/4"	13' 4 3/4"	12' 6"	11' 3"	9' 4 1/2"	**18.75**	14.06	13.39	12.50	11.25	9.38
18' 10"	14' 1 1/2"	13' 5 3/8"	12' 6 5/8"	11' 3 5/8"	9' 5"	**18.83**	14.12	13.45	12.56	11.30	9.42
18' 11"	14' 2 1/4"	13' 6 1/8"	12' 7 3/8"	11' 4 1/4"	9' 5 1/2"	**18.92**	14.19	13.51	12.61	11.35	9.46
19' 0"	14' 3"	13' 6 7/8"	12' 8"	11' 4 3/4"	9' 6"	**19.00**	14.25	13.57	12.67	11.40	9.50
19' 1"	14' 3 3/4"	13' 7 5/8"	12' 8 5/8"	11' 5 3/8"	9' 6 1/2"	**19.08**	14.31	13.63	12.72	11.45	9.54
19' 2"	14' 4 1/2"	13' 8 1/4"	12' 9 3/8"	11' 6"	9' 7"	**19.17**	14.37	13.69	12.78	11.50	9.58
19' 3"	14' 5 1/4"	13' 9"	12' 10"	11' 6 5/8"	9' 7 1/2"	**19.25**	14.44	13.75	12.83	11.55	9.63
19' 4"	14' 6"	13' 9 3/4"	12' 10 5/8"	11' 7 1/4"	9' 8"	**19.33**	14.50	13.81	12.89	11.60	9.67
19' 5"	14' 6 3/4"	13' 10 3/8"	12' 11 3/8"	11' 7 3/4"	9' 8 1/2"	**19.42**	14.56	13.87	12.94	11.65	9.71
19' 6"	14' 7 1/2"	13' 11 1/8"	13' 0"	11' 8 3/8"	9' 9"	**19.50**	14.63	13.93	13.00	11.70	9.75
19' 7"	14' 8 1/4"	13' 11 7/8"	13' 5/8"	11' 9"	9' 9 1/2"	**19.58**	14.69	13.99	13.06	11.75	9.79
19' 8"	14' 9"	14' 5/8"	13' 1 3/8"	11' 9 5/8"	9' 10"	**19.67**	14.75	14.05	13.11	11.80	9.83
19' 9"	14' 9 3/4"	14' 1 1/4"	13' 2"	11' 10 1/4"	9' 10 1/2"	**19.75**	14.81	14.11	13.17	11.85	9.88
19' 10"	14' 10 1/2"	14' 2"	13' 2 5/8"	11' 10 3/4"	9' 11"	**19.83**	14.87	14.17	13.22	11.90	9.92
19' 11"	14' 11 1/4"	14' 2 3/4"	13' 3 3/8"	11' 11 3/8"	9' 11 1/2"	**19.92**	14.94	14.23	13.28	11.95	9.96
20' 0"	15' 0"	14' 3 3/8"	13' 4"	12' 0"	10' 0"	**20.00**	15.00	14.29	13.33	12.00	10.00
20' 1"	15' 3/4"	14' 4 1/8"	13' 4 5/8"	12' 5/8"	10' 1/2"	**20.08**	15.06	14.35	13.39	12.05	10.04
20' 2"	15' 1 1/2"	14' 4 7/8"	13' 5 3/8"	12' 1 1/4"	10' 1"	**20.17**	15.12	14.40	13.44	12.10	10.08
20' 3"	15' 2 1/4"	14' 5 5/8"	13' 6"	12' 1 3/4"	10' 1 1/2"	**20.25**	15.19	14.46	13.50	12.15	10.13
20' 4"	15' 3"	14' 6 1/4"	13' 6 5/8"	12' 2 3/8"	10' 2"	**20.33**	15.25	14.52	13.56	12.20	10.17
20' 5"	15' 3 3/4"	14' 7"	13' 7 3/8"	12' 3"	10' 2 1/2"	**20.42**	15.31	14.58	13.61	12.25	10.21
20' 6"	15' 4 1/2"	14' 7 3/4"	13' 8"	12' 3 5/8"	10' 3"	**20.50**	15.38	14.64	13.67	12.30	10.25
20' 7"	15' 5 1/4"	14' 8 3/8"	13' 8 5/8"	12' 4 1/4"	10' 3 1/2"	**20.58**	15.44	14.70	13.72	12.35	10.29
20' 8"	15' 6"	14' 9 1/8"	13' 9 3/8"	12' 4 3/4"	10' 4"	**20.67**	15.50	14.76	13.78	12.40	10.33
20' 9"	15' 6 3/4"	14' 9 7/8"	13' 10"	12' 5 3/8"	10' 4 1/2"	**20.75**	15.56	14.82	13.83	12.45	10.38
20' 10"	15' 7 1/2"	14' 10 5/8"	13' 10 5/8"	12' 6"	10' 5"	**20.83**	15.62	14.88	13.89	12.50	10.42
20' 11"	15' 8 1/4"	14' 11 1/4"	13' 11 3/8"	12' 6 5/8"	10' 5 1/2"	**20.92**	15.69	14.94	13.94	12.55	10.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
21' 0"	28' 0"	29' 4 3/4"	31' 6"	35' 0"	42' 0"	**21.00**	28.00	29.40	31.50	35.00	42.00
21' 1"	28' 1 3/8"	29' 6 1/4"	31' 7 1/2"	35' 1 5/8"	42' 2"	**21.08**	28.11	29.52	31.63	35.14	42.17
21' 2"	28' 2 5/8"	29' 7 5/8"	31' 9"	35' 3 3/8"	42' 4"	**21.17**	28.22	29.63	31.75	35.28	42.33
21' 3"	28' 4"	29' 9"	31' 10 1/2"	35' 5"	42' 6"	**21.25**	28.33	29.75	31.88	35.42	42.50
21' 4"	28' 5 3/8"	29' 10 3/8"	32' 0"	35' 6 5/8"	42' 8"	**21.33**	28.44	29.87	32.00	35.56	42.67
21' 5"	28' 6 5/8"	29' 11 3/4"	32' 1 1/2"	35' 8 3/8"	42' 10"	**21.42**	28.56	29.98	32.13	35.69	42.83
21' 6"	28' 8"	30' 1 1/4"	32' 3"	35' 10"	43' 0"	**21.50**	28.67	30.10	32.25	35.83	43.00
21' 7"	28' 9 3/8"	30' 2 5/8"	32' 4 1/2"	35' 11 5/8"	43' 2"	**21.58**	28.78	30.22	32.37	35.97	43.17
21' 8"	28' 10 5/8"	30' 4"	32' 6"	36' 1 3/8"	43' 4"	**21.67**	28.89	30.33	32.50	36.11	43.33
21' 9"	29' 0"	30' 5 3/8"	32' 7 1/2"	36' 3"	43' 6"	**21.75**	29.00	30.45	32.63	36.25	43.50
21' 10"	29' 1 3/8"	30' 6 3/4"	32' 9"	36' 4 5/8"	43' 8"	**21.83**	29.11	30.57	32.75	36.39	43.67
21' 11"	29' 2 5/8"	30' 8 1/4"	32' 10 1/2"	36' 6 3/8"	43' 10"	**21.92**	29.22	30.68	32.88	36.53	43.83
22' 0"	29' 4"	30' 9 5/8"	33' 0"	36' 8"	44' 0"	**22.00**	29.33	30.80	33.00	36.67	44.00
22' 1"	29' 5 3/8"	30' 11"	33' 1 1/2"	36' 9 5/8"	44' 2"	**22.08**	29.44	30.92	33.13	36.81	44.17
22' 2"	29' 6 5/8"	31' 3/8"	33' 3"	36' 11 3/8"	44' 4"	**22.17**	29.56	31.03	33.25	36.94	44.33
22' 3"	29' 8"	31' 1 3/4"	33' 4 1/2"	37' 1"	44' 6"	**22.25**	29.67	31.15	33.38	37.08	44.50
22' 4"	29' 9 3/8"	31' 3 1/4"	33' 6"	37' 2 5/8"	44' 8"	**22.33**	29.78	31.27	33.50	37.22	44.67
22' 5"	29' 10 5/8"	31' 4 5/8"	33' 7 1/2"	37' 4 3/8"	44' 10"	**22.42**	29.89	31.38	33.63	37.36	44.83
22' 6"	30' 0"	31' 6"	33' 9"	37' 6"	45' 0"	**22.50**	30.00	31.50	33.75	37.50	45.00
22' 7"	30' 1 3/8"	31' 7 3/8"	33' 10 1/2"	37' 7 5/8"	45' 2"	**22.58**	30.11	31.62	33.87	37.64	45.17
22' 8"	30' 2 5/8"	31' 8 3/4"	34' 0"	37' 9 3/8"	45' 4"	**22.67**	30.22	31.73	34.00	37.78	45.33
22' 9"	30' 4"	31' 10 1/4"	34' 1 1/2"	37' 11"	45' 6"	**22.75**	30.33	31.85	34.13	37.92	45.50
22' 10"	30' 5 3/8"	31' 11 5/8"	34' 3"	38' 5/8"	45' 8"	**22.83**	30.44	31.97	34.25	38.06	45.67
22' 11"	30' 6 5/8"	32' 1"	34' 4 1/2"	38' 2 3/8"	45' 10"	**22.92**	30.56	32.08	34.38	38.19	45.83
23' 0"	30' 8"	32' 2 3/8"	34' 6"	38' 4"	46' 0"	**23.00**	30.67	32.20	34.50	38.33	46.00
23' 1"	30' 9 3/8"	32' 3 3/4"	34' 7 1/2"	38' 5 5/8"	46' 2"	**23.08**	30.78	32.32	34.63	38.47	46.17
23' 2"	30' 10 5/8"	32' 5 1/4"	34' 9"	38' 7 3/8"	46' 4"	**23.17**	30.89	32.43	34.75	38.61	46.33
23' 3"	31' 0"	32' 6 5/8"	34' 10 1/2"	38' 9"	46' 6"	**23.25**	31.00	32.55	34.88	38.75	46.50
23' 4"	31' 1 3/8"	32' 8"	35' 0"	38' 10 5/8"	46' 8"	**23.33**	31.11	32.67	35.00	38.89	46.67
23' 5"	31' 2 5/8"	32' 9 3/8"	35' 1 1/2"	39' 3/8"	46' 10"	**23.42**	31.22	32.78	35.13	39.03	46.83
23' 6"	31' 4"	32' 10 3/4"	35' 3"	39' 2"	47' 0"	**23.50**	31.33	32.90	35.25	39.17	47.00
23' 7"	31' 5 3/8"	33' 1/4"	35' 4 1/2"	39' 3 5/8"	47' 2"	**23.58**	31.44	33.02	35.37	39.31	47.17
23' 8"	31' 6 5/8"	33' 1 5/8"	35' 6"	39' 5 3/8"	47' 4"	**23.67**	31.56	33.13	35.50	39.44	47.33
23' 9"	31' 8"	33' 3"	35' 7 1/2"	39' 7"	47' 6"	**23.75**	31.67	33.25	35.63	39.58	47.50
23' 10"	31' 9 3/8"	33' 4 3/8"	35' 9"	39' 8 5/8"	47' 8"	**23.83**	31.78	33.37	35.75	39.72	47.67
23' 11"	31' 10 5/8"	33' 5 3/4"	35' 10 1/2"	39' 10 3/8"	47' 10"	**23.92**	31.89	33.48	35.88	39.86	47.83
24' 0"	32' 0"	33' 7 1/4"	36' 0"	40' 0"	48' 0"	**24.00**	32.00	33.60	36.00	40.00	48.00
24' 1"	32' 1 3/8"	33' 8 5/8"	36' 1 1/2"	40' 1 5/8"	48' 2"	**24.08**	32.11	33.72	36.13	40.14	48.17
24' 2"	32' 2 5/8"	33' 10"	36' 3"	40' 3 3/8"	48' 4"	**24.17**	32.22	33.83	36.25	40.28	48.33
24' 3"	32' 4"	33' 11 3/8"	36' 4 1/2"	40' 5"	48' 6"	**24.25**	32.33	33.95	36.38	40.42	48.50
24' 4"	32' 5 3/8"	34' 3/4"	36' 6"	40' 6 5/8"	48' 8"	**24.33**	32.44	34.07	36.50	40.56	48.67
24' 5"	32' 6 5/8"	34' 2 1/4"	36' 7 1/2"	40' 8 3/8"	48' 10"	**24.42**	32.56	34.18	36.63	40.69	48.83
24' 6"	32' 8"	34' 3 5/8"	36' 9"	40' 10"	49' 0"	**24.50**	32.67	34.30	36.75	40.83	49.00
24' 7"	32' 9 3/8"	34' 5"	36' 10 1/2"	40' 11 5/8"	49' 2"	**24.58**	32.78	34.42	36.87	40.97	49.17
24' 8"	32' 10 5/8"	34' 6 3/8"	37' 0"	41' 1 3/8"	49' 4"	**24.67**	32.89	34.53	37.00	41.11	49.33
24' 9"	33' 0"	34' 7 3/4"	37' 1 1/2"	41' 3"	49' 6"	**24.75**	33.00	34.65	37.13	41.25	49.50
24' 10"	33' 1 3/8"	34' 9 1/4"	37' 3"	41' 4 5/8"	49' 8"	**24.83**	33.11	34.77	37.25	41.39	49.67
24' 11"	33' 2 5/8"	34' 10 5/8"	37' 4 1/2"	41' 6 3/8"	49' 10"	**24.92**	33.22	34.88	37.38	41.53	49.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
21' 0"	15' 9"	15' 0"	14' 0"	12' 7 1/4"	10' 6"	21.00	15.75	15.00	14.00	12.60	10.50
21' 1"	15' 9 3/4"	15' 3/4"	14' 5/8"	12' 7 3/4"	10' 6 1/2"	21.08	15.81	15.06	14.06	12.65	10.54
21' 2"	15' 10 1/2"	15' 1 3/8"	14' 1 3/8"	12' 8 3/8"	10' 7"	21.17	15.87	15.12	14.11	12.70	10.58
21' 3"	15' 11 1/4"	15' 2 1/8"	14' 2"	12' 9"	10' 7 1/2"	21.25	15.94	15.18	14.17	12.75	10.63
21' 4"	16' 0"	15' 2 7/8"	14' 2 5/8"	12' 9 5/8"	10' 8"	21.33	16.00	15.24	14.22	12.80	10.67
21' 5"	16' 3/4"	15' 3 5/8"	14' 3 3/8"	12' 10 1/4"	10' 8 1/2"	21.42	16.06	15.30	14.28	12.85	10.71
21' 6"	16' 1 1/2"	15' 4 1/4"	14' 4"	12' 10 3/4"	10' 9"	21.50	16.13	15.36	14.33	12.90	10.75
21' 7"	16' 2 1/4"	15' 5"	14' 4 5/8"	12' 11 3/8"	10' 9 1/2"	21.58	16.19	15.42	14.39	12.95	10.79
21' 8"	16' 3"	15' 5 3/4"	14' 5 3/8"	13' 0"	10' 10"	21.67	16.25	15.48	14.44	13.00	10.83
21' 9"	16' 3 3/4"	15' 6 3/8"	14' 6"	13' 5/8"	10' 10 1/2"	21.75	16.31	15.54	14.50	13.05	10.88
21' 10"	16' 4 1/2"	15' 7 1/8"	14' 6 5/8"	13' 1 1/4"	10' 11"	21.83	16.37	15.60	14.56	13.10	10.92
21' 11"	16' 5 1/4"	15' 7 7/8"	14' 7 3/8"	13' 1 3/4"	10' 11 1/2"	21.92	16.44	15.65	14.61	13.15	10.96
22' 0"	16' 6"	15' 8 5/8"	14' 8"	13' 2 3/8"	11' 0"	22.00	16.50	15.71	14.67	13.20	11.00
22' 1"	16' 6 3/4"	15' 9 1/4"	14' 8 5/8"	13' 3"	11' 1/2"	22.08	16.56	15.77	14.72	13.25	11.04
22' 2"	16' 7 1/2"	15' 10"	14' 9 3/8"	13' 3 5/8"	11' 1"	22.17	16.62	15.83	14.78	13.30	11.08
22' 3"	16' 8 1/4"	15' 10 3/4"	14' 10"	13' 4 1/4"	11' 1 1/2"	22.25	16.69	15.89	14.83	13.35	11.13
22' 4"	16' 9"	15' 11 3/8"	14' 10 5/8"	13' 4 3/4"	11' 2"	22.33	16.75	15.95	14.89	13.40	11.17
22' 5"	16' 9 3/4"	16' 1/8"	14' 11 3/8"	13' 5 3/8"	11' 2 1/2"	22.42	16.81	16.01	14.94	13.45	11.21
22' 6"	16' 10 1/2"	16' 7/8"	15' 0"	13' 6"	11' 3"	22.50	16.88	16.07	15.00	13.50	11.25
22' 7"	16' 11 1/4"	16' 1 5/8"	15' 5/8"	13' 6 5/8"	11' 3 1/2"	22.58	16.94	16.13	15.06	13.55	11.29
22' 8"	17' 0"	16' 2 1/4"	15' 1 3/8"	13' 7 1/4"	11' 4"	22.67	17.00	16.19	15.11	13.60	11.33
22' 9"	17' 3/4"	16' 3"	15' 2"	13' 7 3/4"	11' 4 1/2"	22.75	17.06	16.25	15.17	13.65	11.38
22' 10"	17' 1 1/2"	16' 3 3/4"	15' 2 5/8"	13' 8 3/8"	11' 5"	22.83	17.12	16.31	15.22	13.70	11.42
22' 11"	17' 2 1/4"	16' 4 3/8"	15' 3 3/8"	13' 9"	11' 5 1/2"	22.92	17.19	16.37	15.28	13.75	11.46
23' 0"	17' 3"	16' 5 1/8"	15' 4"	13' 9 5/8"	11' 6"	23.00	17.25	16.43	15.33	13.80	11.50
23' 1"	17' 3 3/4"	16' 5 7/8"	15' 4 5/8"	13' 10 1/4"	11' 6 1/2"	23.08	17.31	16.49	15.39	13.85	11.54
23' 2"	17' 4 1/2"	16' 6 5/8"	15' 5 3/8"	13' 10 3/4"	11' 7"	23.17	17.37	16.55	15.44	13.90	11.58
23' 3"	17' 5 1/4"	16' 7 1/4"	15' 6"	13' 11 3/8"	11' 7 1/2"	23.25	17.44	16.61	15.50	13.95	11.63
23' 4"	17' 6"	16' 8"	15' 6 5/8"	14' 0"	11' 8"	23.33	17.50	16.67	15.56	14.00	11.67
23' 5"	17' 6 3/4"	16' 8 3/4"	15' 7 3/8"	14' 5/8"	11' 8 1/2"	23.42	17.56	16.73	15.61	14.05	11.71
23' 6"	17' 7 1/2"	16' 9 3/8"	15' 8"	14' 1 1/4"	11' 9"	23.50	17.63	16.79	15.67	14.10	11.75
23' 7"	17' 8 1/4"	16' 10 1/8"	15' 8 5/8"	14' 1 3/4"	11' 9 1/2"	23.58	17.69	16.85	15.72	14.15	11.79
23' 8"	17' 9"	16' 10 7/8"	15' 9 3/8"	14' 2 3/8"	11' 10"	23.67	17.75	16.90	15.78	14.20	11.83
23' 9"	17' 9 3/4"	16' 11 5/8"	15' 10"	14' 3"	11' 10 1/2"	23.75	17.81	16.96	15.83	14.25	11.88
23' 10"	17' 10 1/2"	17' 1/4"	15' 10 5/8"	14' 3 5/8"	11' 11"	23.83	17.87	17.02	15.89	14.30	11.92
23' 11"	17' 11 1/4"	17' 1"	15' 11 3/8"	14' 4 1/4"	11' 11 1/2"	23.92	17.94	17.08	15.94	14.35	11.96
24' 0"	18' 0"	17' 1 3/4"	16' 0"	14' 4 3/4"	12' 0"	24.00	18.00	17.14	16.00	14.40	12.00
24' 1"	18' 3/4"	17' 2 3/8"	16' 5/8"	14' 5 3/8"	12' 1/2"	24.08	18.06	17.20	16.06	14.45	12.04
24' 2"	18' 1 1/2"	17' 3 1/8"	16' 1 3/8"	14' 6"	12' 1"	24.17	18.12	17.26	16.11	14.50	12.08
24' 3"	18' 2 1/4"	17' 3 7/8"	16' 2"	14' 6 5/8"	12' 1 1/2"	24.25	18.19	17.32	16.17	14.55	12.13
24' 4"	18' 3"	17' 4 5/8"	16' 2 5/8"	14' 7 1/4"	12' 2"	24.33	18.25	17.38	16.22	14.60	12.17
24' 5"	18' 3 3/4"	17' 5 1/4"	16' 3 3/8"	14' 7 3/4"	12' 2 1/2"	24.42	18.31	17.44	16.28	14.65	12.21
24' 6"	18' 4 1/2"	17' 6"	16' 4"	14' 8 3/8"	12' 3"	24.50	18.38	17.50	16.33	14.70	12.25
24' 7"	18' 5 1/4"	17' 6 3/4"	16' 4 5/8"	14' 9"	12' 3 1/2"	24.58	18.44	17.56	16.39	14.75	12.29
24' 8"	18' 6"	17' 7 3/8"	16' 5 3/8"	14' 9 5/8"	12' 4"	24.67	18.50	17.62	16.44	14.80	12.33
24' 9"	18' 6 3/4"	17' 8 1/8"	16' 6"	14' 10 1/4"	12' 4 1/2"	24.75	18.56	17.68	16.50	14.85	12.38
24' 10"	18' 7 1/2"	17' 8 7/8"	16' 6 5/8"	14' 10 3/4"	12' 5"	24.83	18.62	17.74	16.56	14.90	12.42
24' 11"	18' 8 1/4"	17' 9 5/8"	16' 7 3/8"	14' 11 3/8"	12' 5 1/2"	24.92	18.69	17.80	16.61	14.95	12.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
25' 0"	33' 4"	35' 0"	37' 6"	41' 8"	50' 0"	25.00	33.33	35.00	37.50	41.67	50.00
25' 1"	33' 5 3/8"	35' 1 3/8"	37' 7 1/2"	41' 9 5/8"	50' 2"	25.08	33.44	35.12	37.63	41.81	50.17
25' 2"	33' 6 5/8"	35' 2 3/4"	37' 9"	41' 11 3/8"	50' 4"	25.17	33.56	35.23	37.75	41.94	50.33
25' 3"	33' 8"	35' 4 1/4"	37' 10 1/2"	42' 1"	50' 6"	25.25	33.67	35.35	37.88	42.08	50.50
25' 4"	33' 9 3/8"	35' 5 5/8"	38' 0"	42' 2 5/8"	50' 8"	25.33	33.78	35.47	38.00	42.22	50.67
25' 5"	33' 10 5/8"	35' 7"	38' 1 1/2"	42' 4 3/8"	50' 10"	25.42	33.89	35.58	38.13	42.36	50.83
25' 6"	34' 0"	35' 8 3/8"	38' 3"	42' 6"	51' 0"	25.50	34.00	35.70	38.25	42.50	51.00
25' 7"	34' 1 3/8"	35' 9 3/4"	38' 4 1/2"	42' 7 5/8"	51' 2"	25.58	34.11	35.82	38.37	42.64	51.17
25' 8"	34' 2 5/8"	35' 11 1/4"	38' 6"	42' 9 3/8"	51' 4"	25.67	34.22	35.93	38.50	42.78	51.33
25' 9"	34' 4"	36' 5/8"	38' 7 1/2"	42' 11"	51' 6"	25.75	34.33	36.05	38.63	42.92	51.50
25' 10"	34' 5 3/8"	36' 2"	38' 9"	43' 5/8"	51' 8"	25.83	34.44	36.17	38.75	43.06	51.67
25' 11"	34' 6 5/8"	36' 3 3/8"	38' 10 1/2"	43' 2 3/8"	51' 10"	25.92	34.56	36.28	38.88	43.19	51.83
26' 0"	34' 8"	36' 4 3/4"	39' 0"	43' 4"	52' 0"	26.00	34.67	36.40	39.00	43.33	52.00
26' 1"	34' 9 3/8"	36' 6 1/4"	39' 1 1/2"	43' 5 5/8"	52' 2"	26.08	34.78	36.52	39.13	43.47	52.17
26' 2"	34' 10 5/8"	36' 7 5/8"	39' 3"	43' 7 3/8"	52' 4"	26.17	34.89	36.63	39.25	43.61	52.33
26' 3"	35' 0"	36' 9"	39' 4 1/2"	43' 9"	52' 6"	26.25	35.00	36.75	39.38	43.75	52.50
26' 4"	35' 1 3/8"	36' 10 3/8"	39' 6"	43' 10 5/8"	52' 8"	26.33	35.11	36.87	39.50	43.89	52.67
26' 5"	35' 2 5/8"	36' 11 3/4"	39' 7 1/2"	44' 3/8"	52' 10"	26.42	35.22	36.98	39.63	44.03	52.83
26' 6"	35' 4"	37' 1 1/4"	39' 9"	44' 2"	53' 0"	26.50	35.33	37.10	39.75	44.17	53.00
26' 7"	35' 5 3/8"	37' 2 5/8"	39' 10 1/2"	44' 3 5/8"	53' 2"	26.58	35.44	37.22	39.87	44.31	53.17
26' 8"	35' 6 5/8"	37' 4"	40' 0"	44' 5 3/8"	53' 4"	26.67	35.56	37.33	40.00	44.44	53.33
26' 9"	35' 8"	37' 5 3/8"	40' 1 1/2"	44' 7"	53' 6"	26.75	35.67	37.45	40.13	44.58	53.50
26' 10"	35' 9 3/8"	37' 6 3/4"	40' 3"	44' 8 5/8"	53' 8"	26.83	35.78	37.57	40.25	44.72	53.67
26' 11"	35' 10 5/8"	37' 8 1/4"	40' 4 1/2"	44' 10 3/8"	53' 10"	26.92	35.89	37.68	40.38	44.86	53.83
27' 0"	36' 0"	37' 9 5/8"	40' 6"	45' 0"	54' 0"	27.00	36.00	37.80	40.50	45.00	54.00
27' 1"	36' 1 3/8"	37' 11"	40' 7 1/2"	45' 1 5/8"	54' 2"	27.08	36.11	37.92	40.63	45.14	54.17
27' 2"	36' 2 5/8"	38' 3/8"	40' 9"	45' 3 3/8"	54' 4"	27.17	36.22	38.03	40.75	45.28	54.33
27' 3"	36' 4"	38' 1 3/4"	40' 10 1/2"	45' 5"	54' 6"	27.25	36.33	38.15	40.88	45.42	54.50
27' 4"	36' 5 3/8"	38' 3 1/4"	41' 0"	45' 6 5/8"	54' 8"	27.33	36.44	38.27	41.00	45.56	54.67
27' 5"	36' 6 5/8"	38' 4 5/8"	41' 1 1/2"	45' 8 3/8"	54' 10"	27.42	36.56	38.38	41.13	45.69	54.83
27' 6"	36' 8"	38' 6"	41' 3"	45' 10"	55' 0"	27.50	36.67	38.50	41.25	45.83	55.00
27' 7"	36' 9 3/8"	38' 7 3/8"	41' 4 1/2"	45' 11 5/8"	55' 2"	27.58	36.78	38.62	41.37	45.97	55.17
27' 8"	36' 10 5/8"	38' 8 3/4"	41' 6"	46' 1 3/8"	55' 4"	27.67	36.89	38.73	41.50	46.11	55.33
27' 9"	37' 0"	38' 10 1/4"	41' 7 1/2"	46' 3"	55' 6"	27.75	37.00	38.85	41.63	46.25	55.50
27' 10"	37' 1 3/8"	38' 11 5/8"	41' 9"	46' 4 5/8"	55' 8"	27.83	37.11	38.97	41.75	46.39	55.67
27' 11"	37' 2 5/8"	39' 1"	41' 10 1/2"	46' 6 3/8"	55' 10"	27.92	37.22	39.08	41.88	46.53	55.83
28' 0"	37' 4"	39' 2 3/8"	42' 0"	46' 8"	56' 0"	28.00	37.33	39.20	42.00	46.67	56.00
28' 1"	37' 5 3/8"	39' 3 3/4"	42' 1 1/2"	46' 9 5/8"	56' 2"	28.08	37.44	39.32	42.13	46.81	56.17
28' 2"	37' 6 5/8"	39' 5 1/4"	42' 3"	46' 11 3/8"	56' 4"	28.17	37.56	39.43	42.25	46.94	56.33
28' 3"	37' 8"	39' 6 5/8"	42' 4 1/2"	47' 1"	56' 6"	28.25	37.67	39.55	42.38	47.08	56.50
28' 4"	37' 9 3/8"	39' 8"	42' 6"	47' 2 5/8"	56' 8"	28.33	37.78	39.67	42.50	47.22	56.67
28' 5"	37' 10 5/8"	39' 9 3/8"	42' 7 1/2"	47' 4 3/8"	56' 10"	28.42	37.89	39.78	42.63	47.36	56.83
28' 6"	38' 0"	39' 10 3/4"	42' 9"	47' 6"	57' 0"	28.50	38.00	39.90	42.75	47.50	57.00
28' 7"	38' 1 3/8"	40' 1/4"	42' 10 1/2"	47' 7 5/8"	57' 2"	28.58	38.11	40.02	42.87	47.64	57.17
28' 8"	38' 2 5/8"	40' 1 5/8"	43' 0"	47' 9 3/8"	57' 4"	28.67	38.22	40.13	43.00	47.78	57.33
28' 9"	38' 4"	40' 3"	43' 1 1/2"	47' 11"	57' 6"	28.75	38.33	40.25	43.13	47.92	57.50
28' 10"	38' 5 3/8"	40' 4 3/8"	43' 3"	48' 5/8"	57' 8"	28.83	38.44	40.37	43.25	48.06	57.67
28' 11"	38' 6 5/8"	40' 5 3/4"	43' 4 1/2"	48' 2 3/8"	57' 10"	28.92	38.56	40.48	43.38	48.19	57.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
25' 0"	18' 9"	17' 10 1/4"	16' 8"	15' 0"	12' 6"	**25.00**	18.75	17.86	16.67	15.00	12.50
25' 1"	18' 9 3/4"	17' 11"	16' 8 5/8"	15' 5/8"	12' 6 1/2"	**25.08**	18.81	17.92	16.72	15.05	12.54
25' 2"	18' 10 1/2"	17' 11 3/4"	16' 9 3/8"	15' 1 1/4"	12' 7"	**25.17**	18.87	17.98	16.78	15.10	12.58
25' 3"	18' 11 1/4"	18' 3/8"	16' 10"	15' 1 3/4"	12' 7 1/2"	**25.25**	18.94	18.04	16.83	15.15	12.63
25' 4"	19' 0"	18' 1 1/8"	16' 10 5/8"	15' 2 3/8"	12' 8"	**25.33**	19.00	18.10	16.89	15.20	12.67
25' 5"	19' 3/4"	18' 1 7/8"	16' 11 3/8"	15' 3"	12' 8 1/2"	**25.42**	19.06	18.15	16.94	15.25	12.71
25' 6"	19' 1 1/2"	18' 2 5/8"	17' 0"	15' 3 5/8"	12' 9"	**25.50**	19.13	18.21	17.00	15.30	12.75
25' 7"	19' 2 1/4"	18' 3 1/4"	17' 5/8"	15' 4 1/4"	12' 9 1/2"	**25.58**	19.19	18.27	17.06	15.35	12.79
25' 8"	19' 3"	18' 4"	17' 1 3/8"	15' 4 3/4"	12' 10"	**25.67**	19.25	18.33	17.11	15.40	12.83
25' 9"	19' 3 3/4"	18' 4 3/4"	17' 2"	15' 5 3/8"	12' 10 1/2"	**25.75**	19.31	18.39	17.17	15.45	12.88
25' 10"	19' 4 1/2"	18' 5 3/8"	17' 2 5/8"	15' 6"	12' 11"	**25.83**	19.37	18.45	17.22	15.50	12.92
25' 11"	19' 5 1/4"	18' 6 1/8"	17' 3 3/8"	15' 6 5/8"	12' 11 1/2"	**25.92**	19.44	18.51	17.28	15.55	12.96
26' 0"	19' 6"	18' 6 7/8"	17' 4"	15' 7 1/4"	13' 0"	**26.00**	19.50	18.57	17.33	15.60	13.00
26' 1"	19' 6 3/4"	18' 7 5/8"	17' 4 5/8"	15' 7 3/4"	13' 1/2"	**26.08**	19.56	18.63	17.39	15.65	13.04
26' 2"	19' 7 1/2"	18' 8 1/4"	17' 5 3/8"	15' 8 3/8"	13' 1"	**26.17**	19.62	18.69	17.44	15.70	13.08
26' 3"	19' 8 1/4"	18' 9"	17' 6"	15' 9"	13' 1 1/2"	**26.25**	19.69	18.75	17.50	15.75	13.13
26' 4"	19' 9"	18' 9 3/4"	17' 6 5/8"	15' 9 5/8"	13' 2"	**26.33**	19.75	18.81	17.56	15.80	13.17
26' 5"	19' 9 3/4"	18' 10 3/8"	17' 7 3/8"	15' 10 1/4"	13' 2 1/2"	**26.42**	19.81	18.87	17.61	15.85	13.21
26' 6"	19' 10 1/2"	18' 11 1/8"	17' 8"	15' 10 3/4"	13' 3"	**26.50**	19.88	18.93	17.67	15.90	13.25
26' 7"	19' 11 1/4"	18' 11 7/8"	17' 8 5/8"	15' 11 3/8"	13' 3 1/2"	**26.58**	19.94	18.99	17.72	15.95	13.29
26' 8"	20' 0"	19' 5/8"	17' 9 3/8"	16' 0"	13' 4"	**26.67**	20.00	19.05	17.78	16.00	13.33
26' 9"	20' 3/4"	19' 1 1/4"	17' 10"	16' 5/8"	13' 4 1/2"	**26.75**	20.06	19.11	17.83	16.05	13.38
26' 10"	20' 1 1/2"	19' 2"	17' 10 5/8"	16' 1 1/4"	13' 5"	**26.83**	20.12	19.17	17.89	16.10	13.42
26' 11"	20' 2 1/4"	19' 2 3/4"	17' 11 3/8"	16' 1 3/4"	13' 5 1/2"	**26.92**	20.19	19.23	17.94	16.15	13.46
27' 0"	20' 3"	19' 3 3/8"	18' 0"	16' 2 3/8"	13' 6"	**27.00**	20.25	19.29	18.00	16.20	13.50
27' 1"	20' 3 3/4"	19' 4 1/8"	18' 5/8"	16' 3"	13' 6 1/2"	**27.08**	20.31	19.35	18.06	16.25	13.54
27' 2"	20' 4 1/2"	19' 4 7/8"	18' 1 3/8"	16' 3 5/8"	13' 7"	**27.17**	20.37	19.40	18.11	16.30	13.58
27' 3"	20' 5 1/4"	19' 5 5/8"	18' 2"	16' 4 1/4"	13' 7 1/2"	**27.25**	20.44	19.46	18.17	16.35	13.63
27' 4"	20' 6"	19' 6 1/4"	18' 2 5/8"	16' 4 3/4"	13' 8"	**27.33**	20.50	19.52	18.22	16.40	13.67
27' 5"	20' 6 3/4"	19' 7"	18' 3 3/8"	16' 5 3/8"	13' 8 1/2"	**27.42**	20.56	19.58	18.28	16.45	13.71
27' 6"	20' 7 1/2"	19' 7 3/4"	18' 4"	16' 6"	13' 9"	**27.50**	20.63	19.64	18.33	16.50	13.75
27' 7"	20' 8 1/4"	19' 8 3/8"	18' 4 5/8"	16' 6 5/8"	13' 9 1/2"	**27.58**	20.69	19.70	18.39	16.55	13.79
27' 8"	20' 9"	19' 9 1/8"	18' 5 3/8"	16' 7 1/4"	13' 10"	**27.67**	20.75	19.76	18.44	16.60	13.83
27' 9"	20' 9 3/4"	19' 9 7/8"	18' 6"	16' 7 3/4"	13' 10 1/2"	**27.75**	20.81	19.82	18.50	16.65	13.88
27' 10"	20' 10 1/2"	19' 10 5/8"	18' 6 5/8"	16' 8 3/8"	13' 11"	**27.83**	20.87	19.88	18.56	16.70	13.92
27' 11"	20' 11 1/4"	19' 11 1/4"	18' 7 3/8"	16' 9"	13' 11 1/2"	**27.92**	20.94	19.94	18.61	16.75	13.96
28' 0"	21' 0"	20' 0"	18' 8"	16' 9 5/8"	14' 0"	**28.00**	21.00	20.00	18.67	16.80	14.00
28' 1"	21' 3/4"	20' 3/4"	18' 8 5/8"	16' 10 1/4"	14' 1/2"	**28.08**	21.06	20.06	18.72	16.85	14.04
28' 2"	21' 1 1/2"	20' 1 3/8"	18' 9 3/8"	16' 10 3/4"	14' 1"	**28.17**	21.12	20.12	18.78	16.90	14.08
28' 3"	21' 2 1/4"	20' 2 1/8"	18' 10"	16' 11 3/8"	14' 1 1/2"	**28.25**	21.19	20.18	18.83	16.95	14.13
28' 4"	21' 3"	20' 2 7/8"	18' 10 5/8"	17' 0"	14' 2"	**28.33**	21.25	20.24	18.89	17.00	14.17
28' 5"	21' 3 3/4"	20' 3 5/8"	18' 11 3/8"	17' 5/8"	14' 2 1/2"	**28.42**	21.31	20.30	18.94	17.05	14.21
28' 6"	21' 4 1/2"	20' 4 1/4"	19' 0"	17' 1 1/4"	14' 3"	**28.50**	21.38	20.36	19.00	17.10	14.25
28' 7"	21' 5 1/4"	20' 5"	19' 5/8"	17' 1 3/4"	14' 3 1/2"	**28.58**	21.44	20.42	19.06	17.15	14.29
28' 8"	21' 6"	20' 5 3/4"	19' 1 3/8"	17' 2 3/8"	14' 4"	**28.67**	21.50	20.48	19.11	17.20	14.33
28' 9"	21' 6 3/4"	20' 6 3/8"	19' 2"	17' 3"	14' 4 1/2"	**28.75**	21.56	20.54	19.17	17.25	14.38
28' 10"	21' 7 1/2"	20' 7 1/8"	19' 2 5/8"	17' 3 5/8"	14' 5"	**28.83**	21.62	20.60	19.22	17.30	14.42
28' 11"	21' 8 1/4"	20' 7 7/8"	19' 3 3/8"	17' 4 1/4"	14' 5 1/2"	**28.92**	21.69	20.65	19.28	17.35	14.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
29' 0"	38' 8"	40' 7 1/4"	43' 6"	48' 4"	58' 0"	**29.00**	38.67	40.60	43.50	48.33	58.00
29' 1"	38' 9 3/8"	40' 8 5/8"	43' 7 1/2"	48' 5 5/8"	58' 2"	**29.08**	38.78	40.72	43.63	48.47	58.17
29' 2"	38' 10 5/8"	40' 10"	43' 9"	48' 7 3/8"	58' 4"	**29.17**	38.89	40.83	43.75	48.61	58.33
29' 3"	39' 0"	40' 11 3/8"	43' 10 1/2"	48' 9"	58' 6"	**29.25**	39.00	40.95	43.88	48.75	58.50
29' 4"	39' 1 3/8"	41' 3/4"	44' 0"	48' 10 5/8"	58' 8"	**29.33**	39.11	41.07	44.00	48.89	58.67
29' 5"	39' 2 5/8"	41' 2 1/4"	44' 1 1/2"	49' 3/8"	58' 10"	**29.42**	39.22	41.18	44.13	49.03	58.83
29' 6"	39' 4"	41' 3 5/8"	44' 3"	49' 2"	59' 0"	**29.50**	39.33	41.30	44.25	49.17	59.00
29' 7"	39' 5 3/8"	41' 5"	44' 4 1/2"	49' 3 5/8"	59' 2"	**29.58**	39.44	41.42	44.37	49.31	59.17
29' 8"	39' 6 5/8"	41' 6 3/8"	44' 6"	49' 5 3/8"	59' 4"	**29.67**	39.56	41.53	44.50	49.44	59.33
29' 9"	39' 8"	41' 7 3/4"	44' 7 1/2"	49' 7"	59' 6"	**29.75**	39.67	41.65	44.63	49.58	59.50
29' 10"	39' 9 3/8"	41' 9 1/4"	44' 9"	49' 8 5/8"	59' 8"	**29.83**	39.78	41.77	44.75	49.72	59.67
29' 11"	39' 10 5/8"	41' 10 5/8"	44' 10 1/2"	49' 10 3/8"	59' 10"	**29.92**	39.89	41.88	44.88	49.86	59.83
30' 0"	40' 0"	42' 0"	45' 0"	50' 0"	60' 0"	**30.00**	40.00	42.00	45.00	50.00	60.00
30' 1"	40' 1 3/8"	42' 1 3/8"	45' 1 1/2"	50' 1 5/8"	60' 2"	**30.08**	40.11	42.12	45.13	50.14	60.17
30' 2"	40' 2 5/8"	42' 2 3/4"	45' 3"	50' 3 3/8"	60' 4"	**30.17**	40.22	42.23	45.25	50.28	60.33
30' 3"	40' 4"	42' 4 1/4"	45' 4 1/2"	50' 5"	60' 6"	**30.25**	40.33	42.35	45.38	50.42	60.50
30' 4"	40' 5 3/8"	42' 5 5/8"	45' 6"	50' 6 5/8"	60' 8"	**30.33**	40.44	42.47	45.50	50.56	60.67
30' 5"	40' 6 5/8"	42' 7"	45' 7 1/2"	50' 8 3/8"	60' 10"	**30.42**	40.56	42.58	45.63	50.69	60.83
30' 6"	40' 8"	42' 8 3/8"	45' 9"	50' 10"	61' 0"	**30.50**	40.67	42.70	45.75	50.83	61.00
30' 7"	40' 9 3/8"	42' 9 3/4"	45' 10 1/2"	50' 11 5/8"	61' 2"	**30.58**	40.78	42.82	45.87	50.97	61.17
30' 8"	40' 10 5/8"	42' 11 1/4"	46' 0"	51' 1 3/8"	61' 4"	**30.67**	40.89	42.93	46.00	51.11	61.33
30' 9"	41' 0"	43' 5/8"	46' 1 1/2"	51' 3"	61' 6"	**30.75**	41.00	43.05	46.13	51.25	61.50
30' 10"	41' 1 3/8"	43' 2"	46' 3"	51' 4 5/8"	61' 8"	**30.83**	41.11	43.17	46.25	51.39	61.67
30' 11"	41' 2 5/8"	43' 3 3/8"	46' 4 1/2"	51' 6 3/8"	61' 10"	**30.92**	41.22	43.28	46.38	51.53	61.83
31' 0"	41' 4"	43' 4 3/4"	46' 6"	51' 8"	62' 0"	**31.00**	41.33	43.40	46.50	51.67	62.00
31' 1"	41' 5 3/8"	43' 6 1/4"	46' 7 1/2"	51' 9 5/8"	62' 2"	**31.08**	41.44	43.52	46.63	51.81	62.17
31' 2"	41' 6 5/8"	43' 7 5/8"	46' 9"	51' 11 3/8"	62' 4"	**31.17**	41.56	43.63	46.75	51.94	62.33
31' 3"	41' 8"	43' 9"	46' 10 1/2"	52' 1"	62' 6"	**31.25**	41.67	43.75	46.88	52.08	62.50
31' 4"	41' 9 3/8"	43' 10 3/8"	47' 0"	52' 2 5/8"	62' 8"	**31.33**	41.78	43.87	47.00	52.22	62.67
31' 5"	41' 10 5/8"	43' 11 3/4"	47' 1 1/2"	52' 4 3/8"	62' 10"	**31.42**	41.89	43.98	47.13	52.36	62.83
31' 6"	42' 0"	44' 1 1/4"	47' 3"	52' 6"	63' 0"	**31.50**	42.00	44.10	47.25	52.50	63.00
31' 7"	42' 1 3/8"	44' 2 5/8"	47' 4 1/2"	52' 7 5/8"	63' 2"	**31.58**	42.11	44.22	47.37	52.64	63.17
31' 8"	42' 2 5/8"	44' 4"	47' 6"	52' 9 3/8"	63' 4"	**31.67**	42.22	44.33	47.50	52.78	63.33
31' 9"	42' 4"	44' 5 3/8"	47' 7 1/2"	52' 11"	63' 6"	**31.75**	42.33	44.45	47.63	52.92	63.50
31' 10"	42' 5 3/8"	44' 6 3/4"	47' 9"	53' 5/8"	63' 8"	**31.83**	42.44	44.57	47.75	53.06	63.67
31' 11"	42' 6 5/8"	44' 8 1/4"	47' 10 1/2"	53' 2 3/8"	63' 10"	**31.92**	42.56	44.68	47.88	53.19	63.83
32' 0"	42' 8"	44' 9 5/8"	48' 0"	53' 4"	64' 0"	**32.00**	42.67	44.80	48.00	53.33	64.00
32' 1"	42' 9 3/8"	44' 11"	48' 1 1/2"	53' 5 5/8"	64' 2"	**32.08**	42.78	44.92	48.13	53.47	64.17
32' 2"	42' 10 5/8"	45' 3/8"	48' 3"	53' 7 3/8"	64' 4"	**32.17**	42.89	45.03	48.25	53.61	64.33
32' 3"	43' 0"	45' 1 3/4"	48' 4 1/2"	53' 9"	64' 6"	**32.25**	43.00	45.15	48.38	53.75	64.50
32' 4"	43' 1 3/8"	45' 3 1/4"	48' 6"	53' 10 5/8"	64' 8"	**32.33**	43.11	45.27	48.50	53.89	64.67
32' 5"	43' 2 5/8"	45' 4 5/8"	48' 7 1/2"	54' 3/8"	64' 10"	**32.42**	43.22	45.38	48.63	54.03	64.83
32' 6"	43' 4"	45' 6"	48' 9"	54' 2"	65' 0"	**32.50**	43.33	45.50	48.75	54.17	65.00
32' 7"	43' 5 3/8"	45' 7 3/8"	48' 10 1/2"	54' 3 5/8"	65' 2"	**32.58**	43.44	45.62	48.87	54.31	65.17
32' 8"	43' 6 5/8"	45' 8 3/4"	49' 0"	54' 5 3/8"	65' 4"	**32.67**	43.56	45.73	49.00	54.44	65.33
32' 9"	43' 8"	45' 10 1/4"	49' 1 1/2"	54' 7"	65' 6"	**32.75**	43.67	45.85	49.13	54.58	65.50
32' 10"	43' 9 3/8"	45' 11 5/8"	49' 3"	54' 8 5/8"	65' 8"	**32.83**	43.78	45.97	49.25	54.72	65.67
32' 11"	43' 10 5/8"	46' 1"	49' 4 1/2"	54' 10 3/8"	65' 10"	**32.92**	43.89	46.08	49.38	54.86	65.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
29' 0"	21' 9"	20' 8 5/8"	19' 4"	17' 4 3/4"	14' 6"	**29.00**	21.75	20.71	19.33	17.40	14.50
29' 1"	21' 9 3/4"	20' 9 1/4"	19' 4 5/8"	17' 5 3/8"	14' 6 1/2"	**29.08**	21.81	20.77	19.39	17.45	14.54
29' 2"	21' 10 1/2"	20' 10"	19' 5 3/8"	17' 6"	14' 7"	**29.17**	21.87	20.83	19.44	17.50	14.58
29' 3"	21' 11 1/4"	20' 10 3/4"	19' 6"	17' 6 5/8"	14' 7 1/2"	**29.25**	21.94	20.89	19.50	17.55	14.63
29' 4"	22' 0"	20' 11 3/8"	19' 6 5/8"	17' 7 1/4"	14' 8"	**29.33**	22.00	20.95	19.56	17.60	14.67
29' 5"	22' 3/4"	21' 1/8"	19' 7 3/8"	17' 7 3/4"	14' 8 1/2"	**29.42**	22.06	21.01	19.61	17.65	14.71
29' 6"	22' 1 1/2"	21' 7/8"	19' 8"	17' 8 3/8"	14' 9"	**29.50**	22.13	21.07	19.67	17.70	14.75
29' 7"	22' 2 1/4"	21' 1 5/8"	19' 8 5/8"	17' 9"	14' 9 1/2"	**29.58**	22.19	21.13	19.72	17.75	14.79
29' 8"	22' 3"	21' 2 1/4"	19' 9 3/8"	17' 9 5/8"	14' 10"	**29.67**	22.25	21.19	19.78	17.80	14.83
29' 9"	22' 3 3/4"	21' 3"	19' 10"	17' 10 1/4"	14' 10 1/2"	**29.75**	22.31	21.25	19.83	17.85	14.88
29' 10"	22' 4 1/2"	21' 3 3/4"	19' 10 5/8"	17' 10 3/4"	14' 11"	**29.83**	22.37	21.31	19.89	17.90	14.92
29' 11"	22' 5 1/4"	21' 4 3/8"	19' 11 3/8"	17' 11 3/8"	14' 11 1/2"	**29.92**	22.44	21.37	19.94	17.95	14.96
30' 0"	22' 6"	21' 5 1/8"	20' 0"	18' 0"	15' 0"	**30.00**	22.50	21.43	20.00	18.00	15.00
30' 1"	22' 6 3/4"	21' 5 7/8"	20' 5/8"	18' 5/8"	15' 1/2"	**30.08**	22.56	21.49	20.06	18.05	15.04
30' 2"	22' 7 1/2"	21' 6 5/8"	20' 1 3/8"	18' 1 1/4"	15' 1"	**30.17**	22.62	21.55	20.11	18.10	15.08
30' 3"	22' 8 1/4"	21' 7 1/4"	20' 2"	18' 1 3/4"	15' 1 1/2"	**30.25**	22.69	21.61	20.17	18.15	15.13
30' 4"	22' 9"	21' 8"	20' 2 5/8"	18' 2 3/8"	15' 2"	**30.33**	22.75	21.67	20.22	18.20	15.17
30' 5"	22' 9 3/4"	21' 8 3/4"	20' 3 3/8"	18' 3"	15' 2 1/2"	**30.42**	22.81	21.73	20.28	18.25	15.21
30' 6"	22' 10 1/2"	21' 9 3/8"	20' 4"	18' 3 5/8"	15' 3"	**30.50**	22.88	21.79	20.33	18.30	15.25
30' 7"	22' 11 1/4"	21' 10 1/8"	20' 4 5/8"	18' 4 1/4"	15' 3 1/2"	**30.58**	22.94	21.85	20.39	18.35	15.29
30' 8"	23' 0"	21' 10 7/8"	20' 5 3/8"	18' 4 3/4"	15' 4"	**30.67**	23.00	21.90	20.44	18.40	15.33
30' 9"	23' 3/4"	21' 11 5/8"	20' 6"	18' 5 3/8"	15' 4 1/2"	**30.75**	23.06	21.96	20.50	18.45	15.38
30' 10"	23' 1 1/2"	22' 1/4"	20' 6 5/8"	18' 6"	15' 5"	**30.83**	23.12	22.02	20.56	18.50	15.42
30' 11"	23' 2 1/4"	22' 1"	20' 7 3/8"	18' 6 5/8"	15' 5 1/2"	**30.92**	23.19	22.08	20.61	18.55	15.46
31' 0"	23' 3"	22' 1 3/4"	20' 8"	18' 7 1/4"	15' 6"	**31.00**	23.25	22.14	20.67	18.60	15.50
31' 1"	23' 3 3/4"	22' 2 3/8"	20' 8 5/8"	18' 7 3/4"	15' 6 1/2"	**31.08**	23.31	22.20	20.72	18.65	15.54
31' 2"	23' 4 1/2"	22' 3 1/8"	20' 9 3/8"	18' 8 3/8"	15' 7"	**31.17**	23.37	22.26	20.78	18.70	15.58
31' 3"	23' 5 1/4"	22' 3 7/8"	20' 10"	18' 9"	15' 7 1/2"	**31.25**	23.44	22.32	20.83	18.75	15.63
31' 4"	23' 6"	22' 4 5/8"	20' 10 5/8"	18' 9 5/8"	15' 8"	**31.33**	23.50	22.38	20.89	18.80	15.67
31' 5"	23' 6 3/4"	22' 5 1/4"	20' 11 3/8"	18' 10 1/4"	15' 8 1/2"	**31.42**	23.56	22.44	20.94	18.85	15.71
31' 6"	23' 7 1/2"	22' 6"	21' 0"	18' 10 3/4"	15' 9"	**31.50**	23.63	22.50	21.00	18.90	15.75
31' 7"	23' 8 1/4"	22' 6 3/4"	21' 5/8"	18' 11 3/8"	15' 9 1/2"	**31.58**	23.69	22.56	21.06	18.95	15.79
31' 8"	23' 9"	22' 7 3/8"	21' 1 3/8"	19' 0"	15' 10"	**31.67**	23.75	22.62	21.11	19.00	15.83
31' 9"	23' 9 3/4"	22' 8 1/8"	21' 2"	19' 5/8"	15' 10 1/2"	**31.75**	23.81	22.68	21.17	19.05	15.88
31' 10"	23' 10 1/2"	22' 8 7/8"	21' 2 5/8"	19' 1 1/4"	15' 11"	**31.83**	23.87	22.74	21.22	19.10	15.92
31' 11"	23' 11 1/4"	22' 9 5/8"	21' 3 3/8"	19' 1 3/4"	15' 11 1/2"	**31.92**	23.94	22.80	21.28	19.15	15.96
32' 0"	24' 0"	22' 10 1/4"	21' 4"	19' 2 3/8"	16' 0"	**32.00**	24.00	22.86	21.33	19.20	16.00
32' 1"	24' 3/4"	22' 11"	21' 4 5/8"	19' 3"	16' 1/2"	**32.08**	24.06	22.92	21.39	19.25	16.04
32' 2"	24' 1 1/2"	22' 11 3/4"	21' 5 3/8"	19' 3 5/8"	16' 1"	**32.17**	24.12	22.98	21.44	19.30	16.08
32' 3"	24' 2 1/4"	23' 3/8"	21' 6"	19' 4 1/4"	16' 1 1/2"	**32.25**	24.19	23.04	21.50	19.35	16.13
32' 4"	24' 3"	23' 1 1/8"	21' 6 5/8"	19' 4 3/4"	16' 2"	**32.33**	24.25	23.10	21.56	19.40	16.17
32' 5"	24' 3 3/4"	23' 1 7/8"	21' 7 3/8"	19' 5 3/8"	16' 2 1/2"	**32.42**	24.31	23.15	21.61	19.45	16.21
32' 6"	24' 4 1/2"	23' 2 5/8"	21' 8"	19' 6"	16' 3"	**32.50**	24.38	23.21	21.67	19.50	16.25
32' 7"	24' 5 1/4"	23' 3 1/4"	21' 8 5/8"	19' 6 5/8"	16' 3 1/2"	**32.58**	24.44	23.27	21.72	19.55	16.29
32' 8"	24' 6"	23' 4"	21' 9 3/8"	19' 7 1/4"	16' 4"	**32.67**	24.50	23.33	21.78	19.60	16.33
32' 9"	24' 6 3/4"	23' 4 3/4"	21' 10"	19' 7 3/4"	16' 4 1/2"	**32.75**	24.56	23.39	21.83	19.65	16.38
32' 10"	24' 7 1/2"	23' 5 3/8"	21' 10 5/8"	19' 8 3/8"	16' 5"	**32.83**	24.62	23.45	21.89	19.70	16.42
32' 11"	24' 8 1/4"	23' 6 1/8"	21' 11 3/8"	19' 9"	16' 5 1/2"	**32.92**	24.69	23.51	21.94	19.75	16.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
33' 0"	44' 0"	46' 2 3/8"	49' 6"	55' 0"	66' 0"	33.00	44.00	46.20	49.50	55.00	66.00
33' 1"	44' 1 3/8"	46' 3 3/4"	49' 7 1/2"	55' 1 5/8"	66' 2"	33.08	44.11	46.32	49.63	55.14	66.17
33' 2"	44' 2 5/8"	46' 5 1/4"	49' 9"	55' 3 3/8"	66' 4"	33.17	44.22	46.43	49.75	55.28	66.33
33' 3"	44' 4"	46' 6 5/8"	49' 10 1/2"	55' 5"	66' 6"	33.25	44.33	46.55	49.88	55.42	66.50
33' 4"	44' 5 3/8"	46' 8"	50' 0"	55' 6 5/8"	66' 8"	33.33	44.44	46.67	50.00	55.56	66.67
33' 5"	44' 6 5/8"	46' 9 3/8"	50' 1 1/2"	55' 8 3/8"	66' 10"	33.42	44.56	46.78	50.13	55.69	66.83
33' 6"	44' 8"	46' 10 3/4"	50' 3"	55' 10"	67' 0"	33.50	44.67	46.90	50.25	55.83	67.00
33' 7"	44' 9 3/8"	47' 1/4"	50' 4 1/2"	55' 11 5/8"	67' 2"	33.58	44.78	47.02	50.37	55.97	67.17
33' 8"	44' 10 5/8"	47' 1 5/8"	50' 6"	56' 1 3/8"	67' 4"	33.67	44.89	47.13	50.50	56.11	67.33
33' 9"	45' 0"	47' 3"	50' 7 1/2"	56' 3"	67' 6"	33.75	45.00	47.25	50.63	56.25	67.50
33' 10"	45' 1 3/8"	47' 4 3/8"	50' 9"	56' 4 5/8"	67' 8"	33.83	45.11	47.37	50.75	56.39	67.67
33' 11"	45' 2 5/8"	47' 5 3/4"	50' 10 1/2"	56' 6 3/8"	67' 10"	33.92	45.22	47.48	50.88	56.53	67.83
34' 0"	45' 4"	47' 7 1/4"	51' 0"	56' 8"	68' 0"	34.00	45.33	47.60	51.00	56.67	68.00
34' 1"	45' 5 3/8"	47' 8 5/8"	51' 1 1/2"	56' 9 5/8"	68' 2"	34.08	45.44	47.72	51.13	56.81	68.17
34' 2"	45' 6 5/8"	47' 10"	51' 3"	56' 11 3/8"	68' 4"	34.17	45.56	47.83	51.25	56.94	68.33
34' 3"	45' 8"	47' 11 3/8"	51' 4 1/2"	57' 1"	68' 6"	34.25	45.67	47.95	51.38	57.08	68.50
34' 4"	45' 9 3/8"	48' 3/4"	51' 6"	57' 2 5/8"	68' 8"	34.33	45.78	48.07	51.50	57.22	68.67
34' 5"	45' 10 5/8"	48' 2 1/4"	51' 7 1/2"	57' 4 3/8"	68' 10"	34.42	45.89	48.18	51.63	57.36	68.83
34' 6"	46' 0"	48' 3 5/8"	51' 9"	57' 6"	69' 0"	34.50	46.00	48.30	51.75	57.50	69.00
34' 7"	46' 1 3/8"	48' 5"	51' 10 1/2"	57' 7 5/8"	69' 2"	34.58	46.11	48.42	51.87	57.64	69.17
34' 8"	46' 2 5/8"	48' 6 3/8"	52' 0"	57' 9 3/8"	69' 4"	34.67	46.22	48.53	52.00	57.78	69.33
34' 9"	46' 4"	48' 7 3/4"	52' 1 1/2"	57' 11"	69' 6"	34.75	46.33	48.65	52.13	57.92	69.50
34' 10"	46' 5 3/8"	48' 9 1/4"	52' 3"	58' 5/8"	69' 8"	34.83	46.44	48.77	52.25	58.06	69.67
34' 11"	46' 6 5/8"	48' 10 5/8"	52' 4 1/2"	58' 2 3/8"	69' 10"	34.92	46.56	48.88	52.38	58.19	69.83
35' 0"	46' 8"	49' 0"	52' 6"	58' 4"	70' 0"	35.00	46.67	49.00	52.50	58.33	70.00
35' 1"	46' 9 3/8"	49' 1 3/8"	52' 7 1/2"	58' 5 5/8"	70' 2"	35.08	46.78	49.12	52.63	58.47	70.17
35' 2"	46' 10 5/8"	49' 2 3/4"	52' 9"	58' 7 3/8"	70' 4"	35.17	46.89	49.23	52.75	58.61	70.33
35' 3"	47' 0"	49' 4 1/4"	52' 10 1/2"	58' 9"	70' 6"	35.25	47.00	49.35	52.88	58.75	70.50
35' 4"	47' 1 3/8"	49' 5 5/8"	53' 0"	58' 10 5/8"	70' 8"	35.33	47.11	49.47	53.00	58.89	70.67
35' 5"	47' 2 5/8"	49' 7"	53' 1 1/2"	59' 3/8"	70' 10"	35.42	47.22	49.58	53.13	59.03	70.83
35' 6"	47' 4"	49' 8 3/8"	53' 3"	59' 2"	71' 0"	35.50	47.33	49.70	53.25	59.17	71.00
35' 7"	47' 5 3/8"	49' 9 3/4"	53' 4 1/2"	59' 3 5/8"	71' 2"	35.58	47.44	49.82	53.37	59.31	71.17
35' 8"	47' 6 5/8"	49' 11 1/4"	53' 6"	59' 5 3/8"	71' 4"	35.67	47.56	49.93	53.50	59.44	71.33
35' 9"	47' 8"	50' 5/8"	53' 7 1/2"	59' 7"	71' 6"	35.75	47.67	50.05	53.63	59.58	71.50
35' 10"	47' 9 3/8"	50' 2"	53' 9"	59' 8 5/8"	71' 8"	35.83	47.78	50.17	53.75	59.72	71.67
35' 11"	47' 10 5/8"	50' 3 3/8"	53' 10 1/2"	59' 10 3/8"	71' 10"	35.92	47.89	50.28	53.88	59.86	71.83
36' 0"	48' 0"	50' 4 3/4"	54' 0"	60' 0"	72' 0"	36.00	48.00	50.40	54.00	60.00	72.00
36' 1"	48' 1 3/8"	50' 6 1/4"	54' 1 1/2"	60' 1 5/8"	72' 2"	36.08	48.11	50.52	54.13	60.14	72.17
36' 2"	48' 2 5/8"	50' 7 5/8"	54' 3"	60' 3 3/8"	72' 4"	36.17	48.22	50.63	54.25	60.28	72.33
36' 3"	48' 4"	50' 9"	54' 4 1/2"	60' 5"	72' 6"	36.25	48.33	50.75	54.38	60.42	72.50
36' 4"	48' 5 3/8"	50' 10 3/8"	54' 6"	60' 6 5/8"	72' 8"	36.33	48.44	50.87	54.50	60.56	72.67
36' 5"	48' 6 5/8"	50' 11 3/4"	54' 7 1/2"	60' 8 3/8"	72' 10"	36.42	48.56	50.98	54.63	60.69	72.83
36' 6"	48' 8"	51' 1 1/4"	54' 9"	60' 10"	73' 0"	36.50	48.67	51.10	54.75	60.83	73.00
36' 7"	48' 9 3/8"	51' 2 5/8"	54' 10 1/2"	60' 11 5/8"	73' 2"	36.58	48.78	51.22	54.87	60.97	73.17
36' 8"	48' 10 5/8"	51' 4"	55' 0"	61' 1 3/8"	73' 4"	36.67	48.89	51.33	55.00	61.11	73.33
36' 9"	49' 0"	51' 5 3/8"	55' 1 1/2"	61' 3"	73' 6"	36.75	49.00	51.45	55.13	61.25	73.50
36' 10"	49' 1 3/8"	51' 6 3/4"	55' 3"	61' 4 5/8"	73' 8"	36.83	49.11	51.57	55.25	61.39	73.67
36' 11"	49' 2 5/8"	51' 8 1/4"	55' 4 1/2"	61' 6 3/8"	73' 10"	36.92	49.22	51.68	55.38	61.53	73.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
33' 0"	24' 9"	23' 6 7/8"	22' 0"	19' 9 5/8"	16' 6"	33.00	24.75	23.57	22.00	19.80	16.50
33' 1"	24' 9 3/4"	23' 7 5/8"	22' 5/8"	19' 10 1/4"	16' 6 1/2"	33.08	24.81	23.63	22.06	19.85	16.54
33' 2"	24' 10 1/2"	23' 8 1/4"	22' 1 3/8"	19' 10 3/4"	16' 7"	33.17	24.87	23.69	22.11	19.90	16.58
33' 3"	24' 11 1/4"	23' 9"	22' 2"	19' 11 3/8"	16' 7 1/2"	33.25	24.94	23.75	22.17	19.95	16.63
33' 4"	25' 0"	23' 9 3/4"	22' 2 5/8"	20' 0"	16' 8"	33.33	25.00	23.81	22.22	20.00	16.67
33' 5"	25' 3/4"	23' 10 3/8"	22' 3 3/8"	20' 5/8"	16' 8 1/2"	33.42	25.06	23.87	22.28	20.05	16.71
33' 6"	25' 1 1/2"	23' 11 1/8"	22' 4"	20' 1 1/4"	16' 9"	33.50	25.13	23.93	22.33	20.10	16.75
33' 7"	25' 2 1/4"	23' 11 7/8"	22' 4 5/8"	20' 1 3/4"	16' 9 1/2"	33.58	25.19	23.99	22.39	20.15	16.79
33' 8"	25' 3"	24' 5/8"	22' 5 3/8"	20' 2 3/8"	16' 10"	33.67	25.25	24.05	22.44	20.20	16.83
33' 9"	25' 3 3/4"	24' 1 1/4"	22' 6"	20' 3"	16' 10 1/2"	33.75	25.31	24.11	22.50	20.25	16.88
33' 10"	25' 4 1/2"	24' 2"	22' 6 5/8"	20' 3 5/8"	16' 11"	33.83	25.37	24.17	22.56	20.30	16.92
33' 11"	25' 5 1/4"	24' 2 3/4"	22' 7 3/8"	20' 4 1/4"	16' 11 1/2"	33.92	25.44	24.23	22.61	20.35	16.96
34' 0"	25' 6"	24' 3 3/8"	22' 8"	20' 4 3/4"	17' 0"	34.00	25.50	24.29	22.67	20.40	17.00
34' 1"	25' 6 3/4"	24' 4 1/8"	22' 8 5/8"	20' 5 3/8"	17' 1/2"	34.08	25.56	24.35	22.72	20.45	17.04
34' 2"	25' 7 1/2"	24' 4 7/8"	22' 9 3/8"	20' 6"	17' 1"	34.17	25.62	24.40	22.78	20.50	17.08
34' 3"	25' 8 1/4"	24' 5 5/8"	22' 10"	20' 6 5/8"	17' 1 1/2"	34.25	25.69	24.46	22.83	20.55	17.13
34' 4"	25' 9"	24' 6 1/4"	22' 10 5/8"	20' 7 1/4"	17' 2"	34.33	25.75	24.52	22.89	20.60	17.17
34' 5"	25' 9 3/4"	24' 7"	22' 11 3/8"	20' 7 3/4"	17' 2 1/2"	34.42	25.81	24.58	22.94	20.65	17.21
34' 6"	25' 10 1/2"	24' 7 3/4"	23' 0"	20' 8 3/8"	17' 3"	34.50	25.88	24.64	23.00	20.70	17.25
34' 7"	25' 11 1/4"	24' 8 3/8"	23' 5/8"	20' 9"	17' 3 1/2"	34.58	25.94	24.70	23.06	20.75	17.29
34' 8"	26' 0"	24' 9 1/8"	23' 1 3/8"	20' 9 5/8"	17' 4"	34.67	26.00	24.76	23.11	20.80	17.33
34' 9"	26' 3/4"	24' 9 7/8"	23' 2"	20' 10 1/4"	17' 4 1/2"	34.75	26.06	24.82	23.17	20.85	17.38
34' 10"	26' 1 1/2"	24' 10 5/8"	23' 2 5/8"	20' 10 3/4"	17' 5"	34.83	26.12	24.88	23.22	20.90	17.42
34' 11"	26' 2 1/4"	24' 11 1/4"	23' 3 3/8"	20' 11 3/8"	17' 5 1/2"	34.92	26.19	24.94	23.28	20.95	17.46
35' 0"	26' 3"	25' 0"	23' 4"	21' 0"	17' 6"	35.00	26.25	25.00	23.33	21.00	17.50
35' 1"	26' 3 3/4"	25' 3/4"	23' 4 5/8"	21' 5/8"	17' 6 1/2"	35.08	26.31	25.06	23.39	21.05	17.54
35' 2"	26' 4 1/2"	25' 1 3/8"	23' 5 3/8"	21' 1 1/4"	17' 7"	35.17	26.37	25.12	23.44	21.10	17.58
35' 3"	26' 5 1/4"	25' 2 1/8"	23' 6"	21' 1 3/4"	17' 7 1/2"	35.25	26.44	25.18	23.50	21.15	17.63
35' 4"	26' 6"	25' 2 7/8"	23' 6 5/8"	21' 2 3/8"	17' 8"	35.33	26.50	25.24	23.56	21.20	17.67
35' 5"	26' 6 3/4"	25' 3 5/8"	23' 7 3/8"	21' 3"	17' 8 1/2"	35.42	26.56	25.30	23.61	21.25	17.71
35' 6"	26' 7 1/2"	25' 4 1/4"	23' 8"	21' 3 5/8"	17' 9"	35.50	26.63	25.36	23.67	21.30	17.75
35' 7"	26' 8 1/4"	25' 5"	23' 8 5/8"	21' 4 1/4"	17' 9 1/2"	35.58	26.69	25.42	23.72	21.35	17.79
35' 8"	26' 9"	25' 5 3/4"	23' 9 3/8"	21' 4 3/4"	17' 10"	35.67	26.75	25.48	23.78	21.40	17.83
35' 9"	26' 9 3/4"	25' 6 3/8"	23' 10"	21' 5 3/8"	17' 10 1/2"	35.75	26.81	25.54	23.83	21.45	17.88
35' 10"	26' 10 1/2"	25' 7 1/8"	23' 10 5/8"	21' 6"	17' 11"	35.83	26.87	25.60	23.89	21.50	17.92
35' 11"	26' 11 1/4"	25' 7 7/8"	23' 11 3/8"	21' 6 5/8"	17' 11 1/2"	35.92	26.94	25.65	23.94	21.55	17.96
36' 0"	27' 0"	25' 8 5/8"	24' 0"	21' 7 1/4"	18' 0"	36.00	27.00	25.71	24.00	21.60	18.00
36' 1"	27' 3/4"	25' 9 1/4"	24' 5/8"	21' 7 3/4"	18' 1/2"	36.08	27.06	25.77	24.06	21.65	18.04
36' 2"	27' 1 1/2"	25' 10"	24' 1 3/8"	21' 8 3/8"	18' 1"	36.17	27.12	25.83	24.11	21.70	18.08
36' 3"	27' 2 1/4"	25' 10 3/4"	24' 2"	21' 9"	18' 1 1/2"	36.25	27.19	25.89	24.17	21.75	18.13
36' 4"	27' 3"	25' 11 3/8"	24' 2 5/8"	21' 9 5/8"	18' 2"	36.33	27.25	25.95	24.22	21.80	18.17
36' 5"	27' 3 3/4"	26' 1/8"	24' 3 3/8"	21' 10 1/4"	18' 2 1/2"	36.42	27.31	26.01	24.28	21.85	18.21
36' 6"	27' 4 1/2"	26' 7/8"	24' 4"	21' 10 3/4"	18' 3"	36.50	27.38	26.07	24.33	21.90	18.25
36' 7"	27' 5 1/4"	26' 1 5/8"	24' 4 5/8"	21' 11 3/8"	18' 3 1/2"	36.58	27.44	26.13	24.39	21.95	18.29
36' 8"	27' 6"	26' 2 1/4"	24' 5 3/8"	22' 0"	18' 4"	36.67	27.50	26.19	24.44	22.00	18.33
36' 9"	27' 6 3/4"	26' 3"	24' 6"	22' 5/8"	18' 4 1/2"	36.75	27.56	26.25	24.50	22.05	18.38
36' 10"	27' 7 1/2"	26' 3 3/4"	24' 6 5/8"	22' 1 1/4"	18' 5"	36.83	27.62	26.31	24.56	22.10	18.42
36' 11"	27' 8 1/4"	26' 4 3/8"	24' 7 3/8"	22' 1 3/4"	18' 5 1/2"	36.92	27.69	26.37	24.61	22.15	18.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
37' 0"	49' 4"	51' 9 5/8"	55' 6"	61' 8"	74' 0"	37.00	49.33	51.80	55.50	61.67	74.00
37' 1"	49' 5 3/8"	51' 11"	55' 7 1/2"	61' 9 5/8"	74' 2"	37.08	49.44	51.92	55.63	61.81	74.17
37' 2"	49' 6 5/8"	52' 3/8"	55' 9"	61' 11 3/8"	74' 4"	37.17	49.56	52.03	55.75	61.94	74.33
37' 3"	49' 8"	52' 1 3/4"	55' 10 1/2"	62' 1"	74' 6"	37.25	49.67	52.15	55.88	62.08	74.50
37' 4"	49' 9 3/8"	52' 3 1/4"	56' 0"	62' 2 5/8"	74' 8"	37.33	49.78	52.27	56.00	62.22	74.67
37' 5"	49' 10 5/8"	52' 4 5/8"	56' 1 1/2"	62' 4 3/8"	74' 10"	37.42	49.89	52.38	56.13	62.36	74.83
37' 6"	50' 0"	52' 6"	56' 3"	62' 6"	75' 0"	37.50	50.00	52.50	56.25	62.50	75.00
37' 7"	50' 1 3/8"	52' 7 3/8"	56' 4 1/2"	62' 7 5/8"	75' 2"	37.58	50.11	52.62	56.37	62.64	75.17
37' 8"	50' 2 5/8"	52' 8 3/4"	56' 6"	62' 9 3/8"	75' 4"	37.67	50.22	52.73	56.50	62.78	75.33
37' 9"	50' 4"	52' 10 1/4"	56' 7 1/2"	62' 11"	75' 6"	37.75	50.33	52.85	56.63	62.92	75.50
37' 10"	50' 5 3/8"	52' 11 5/8"	56' 9"	63' 5/8"	75' 8"	37.83	50.44	52.97	56.75	63.06	75.67
37' 11"	50' 6 5/8"	53' 1"	56' 10 1/2"	63' 2 3/8"	75' 10"	37.92	50.56	53.08	56.88	63.19	75.83
38' 0"	50' 8"	53' 2 3/8"	57' 0"	63' 4"	76' 0"	38.00	50.67	53.20	57.00	63.33	76.00
38' 1"	50' 9 3/8"	53' 3 3/4"	57' 1 1/2"	63' 5 5/8"	76' 2"	38.08	50.78	53.32	57.13	63.47	76.17
38' 2"	50' 10 5/8"	53' 5 1/4"	57' 3"	63' 7 3/8"	76' 4"	38.17	50.89	53.43	57.25	63.61	76.33
38' 3"	51' 0"	53' 6 5/8"	57' 4 1/2"	63' 9"	76' 6"	38.25	51.00	53.55	57.38	63.75	76.50
38' 4"	51' 1 3/8"	53' 8"	57' 6"	63' 10 5/8"	76' 8"	38.33	51.11	53.67	57.50	63.89	76.67
38' 5"	51' 2 5/8"	53' 9 3/8"	57' 7 1/2"	64' 3/8"	76' 10"	38.42	51.22	53.78	57.63	64.03	76.83
38' 6"	51' 4"	53' 10 3/4"	57' 9"	64' 2"	77' 0"	38.50	51.33	53.90	57.75	64.17	77.00
38' 7"	51' 5 3/8"	54' 1/4"	57' 10 1/2"	64' 3 5/8"	77' 2"	38.58	51.44	54.02	57.87	64.31	77.17
38' 8"	51' 6 5/8"	54' 1 5/8"	58' 0"	64' 5 3/8"	77' 4"	38.67	51.56	54.13	58.00	64.44	77.33
38' 9"	51' 8"	54' 3"	58' 1 1/2"	64' 7"	77' 6"	38.75	51.67	54.25	58.13	64.58	77.50
38' 10"	51' 9 3/8"	54' 4 3/8"	58' 3"	64' 8 5/8"	77' 8"	38.83	51.78	54.37	58.25	64.72	77.67
38' 11"	51' 10 5/8"	54' 5 3/4"	58' 4 1/2"	64' 10 3/8"	77' 10"	38.92	51.89	54.48	58.38	64.86	77.83
39' 0"	52' 0"	54' 7 1/4"	58' 6"	65' 0"	78' 0"	39.00	52.00	54.60	58.50	65.00	78.00
39' 1"	52' 1 3/8"	54' 8 5/8"	58' 7 1/2"	65' 1 5/8"	78' 2"	39.08	52.11	54.72	58.63	65.14	78.17
39' 2"	52' 2 5/8"	54' 10"	58' 9"	65' 3 3/8"	78' 4"	39.17	52.22	54.83	58.75	65.28	78.33
39' 3"	52' 4"	54' 11 3/8"	58' 10 1/2"	65' 5"	78' 6"	39.25	52.33	54.95	58.88	65.42	78.50
39' 4"	52' 5 3/8"	55' 3/4"	59' 0"	65' 6 5/8"	78' 8"	39.33	52.44	55.07	59.00	65.56	78.67
39' 5"	52' 6 5/8"	55' 2 1/4"	59' 1 1/2"	65' 8 3/8"	78' 10"	39.42	52.56	55.18	59.13	65.69	78.83
39' 6"	52' 8"	55' 3 5/8"	59' 3"	65' 10"	79' 0"	39.50	52.67	55.30	59.25	65.83	79.00
39' 7"	52' 9 3/8"	55' 5"	59' 4 1/2"	65' 11 5/8"	79' 2"	39.58	52.78	55.42	59.37	65.97	79.17
39' 8"	52' 10 5/8"	55' 6 3/8"	59' 6"	66' 1 3/8"	79' 4"	39.67	52.89	55.53	59.50	66.11	79.33
39' 9"	53' 0"	55' 7 3/4"	59' 7 1/2"	66' 3"	79' 6"	39.75	53.00	55.65	59.63	66.25	79.50
39' 10"	53' 1 3/8"	55' 9 1/4"	59' 9"	66' 4 5/8"	79' 8"	39.83	53.11	55.77	59.75	66.39	79.67
39' 11"	53' 2 5/8"	55' 10 5/8"	59' 10 1/2"	66' 6 3/8"	79' 10"	39.92	53.22	55.88	59.88	66.53	79.83
40' 0"	53' 4"	56' 0"	60' 0"	66' 8"	80' 0"	40.00	53.33	56.00	60.00	66.67	80.00
40' 1"	53' 5 3/8"	56' 1 3/8"	60' 1 1/2"	66' 9 5/8"	80' 2"	40.08	53.44	56.12	60.13	66.81	80.17
40' 2"	53' 6 5/8"	56' 2 3/4"	60' 3"	66' 11 3/8"	80' 4"	40.17	53.56	56.23	60.25	66.94	80.33
40' 3"	53' 8"	56' 4 1/4"	60' 4 1/2"	67' 1"	80' 6"	40.25	53.67	56.35	60.38	67.08	80.50
40' 4"	53' 9 3/8"	56' 5 5/8"	60' 6"	67' 2 5/8"	80' 8"	40.33	53.78	56.47	60.50	67.22	80.67
40' 5"	53' 10 5/8"	56' 7"	60' 7 1/2"	67' 4 3/8"	80' 10"	40.42	53.89	56.58	60.63	67.36	80.83
40' 6"	54' 0"	56' 8 3/8"	60' 9"	67' 6"	81' 0"	40.50	54.00	56.70	60.75	67.50	81.00
40' 7"	54' 1 3/8"	56' 9 3/4"	60' 10 1/2"	67' 7 5/8"	81' 2"	40.58	54.11	56.82	60.87	67.64	81.17
40' 8"	54' 2 5/8"	56' 11 1/4"	61' 0"	67' 9 3/8"	81' 4"	40.67	54.22	56.93	61.00	67.78	81.33
40' 9"	54' 4"	57' 5/8"	61' 1 1/2"	67' 11"	81' 6"	40.75	54.33	57.05	61.13	67.92	81.50
40' 10"	54' 5 3/8"	57' 2"	61' 3"	68' 5/8"	81' 8"	40.83	54.44	57.17	61.25	68.06	81.67
40' 11"	54' 6 5/8"	57' 3 3/8"	61' 4 1/2"	68' 2 3/8"	81' 10"	40.92	54.56	57.28	61.38	68.19	81.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
37' 0"	27' 9"	26' 5 1/8"	24' 8"	22' 2 3/8"	18' 6"	**37.00**	27.75	26.43	24.67	22.20	18.50
37' 1"	27' 9 3/4"	26' 5 7/8"	24' 8 5/8"	22' 3"	18' 6 1/2"	**37.08**	27.81	26.49	24.72	22.25	18.54
37' 2"	27' 10 1/2"	26' 6 5/8"	24' 9 3/8"	22' 3 5/8"	18' 7"	**37.17**	27.87	26.55	24.78	22.30	18.58
37' 3"	27' 11 1/4"	26' 7 1/4"	24' 10"	22' 4 1/4"	18' 7 1/2"	**37.25**	27.94	26.61	24.83	22.35	18.63
37' 4"	28' 0"	26' 8"	24' 10 5/8"	22' 4 3/4"	18' 8"	**37.33**	28.00	26.67	24.89	22.40	18.67
37' 5"	28' 3/4"	26' 8 3/4"	24' 11 3/8"	22' 5 3/8"	18' 8 1/2"	**37.42**	28.06	26.73	24.94	22.45	18.71
37' 6"	28' 1 1/2"	26' 9 3/8"	25' 0"	22' 6"	18' 9"	**37.50**	28.13	26.79	25.00	22.50	18.75
37' 7"	28' 2 1/4"	26' 10 1/8"	25' 5/8"	22' 6 5/8"	18' 9 1/2"	**37.58**	28.19	26.85	25.06	22.55	18.79
37' 8"	28' 3"	26' 10 7/8"	25' 1 3/8"	22' 7 1/4"	18' 10"	**37.67**	28.25	26.90	25.11	22.60	18.83
37' 9"	28' 3 3/4"	26' 11 5/8"	25' 2"	22' 7 3/4"	18' 10 1/2"	**37.75**	28.31	26.96	25.17	22.65	18.88
37' 10"	28' 4 1/2"	27' 1/4"	25' 2 5/8"	22' 8 3/8"	18' 11"	**37.83**	28.37	27.02	25.22	22.70	18.92
37' 11"	28' 5 1/4"	27' 1"	25' 3 3/8"	22' 9"	18' 11 1/2"	**37.92**	28.44	27.08	25.28	22.75	18.96
38' 0"	28' 6"	27' 1 3/4"	25' 4"	22' 9 5/8"	19' 0"	**38.00**	28.50	27.14	25.33	22.80	19.00
38' 1"	28' 6 3/4"	27' 2 3/8"	25' 4 5/8"	22' 10 1/4"	19' 1/2"	**38.08**	28.56	27.20	25.39	22.85	19.04
38' 2"	28' 7 1/2"	27' 3 1/8"	25' 5 3/8"	22' 10 3/4"	19' 1"	**38.17**	28.62	27.26	25.44	22.90	19.08
38' 3"	28' 8 1/4"	27' 3 7/8"	25' 6"	22' 11 3/8"	19' 1 1/2"	**38.25**	28.69	27.32	25.50	22.95	19.13
38' 4"	28' 9"	27' 4 5/8"	25' 6 5/8"	23' 0"	19' 2"	**38.33**	28.75	27.38	25.56	23.00	19.17
38' 5"	28' 9 3/4"	27' 5 1/4"	25' 7 3/8"	23' 5/8"	19' 2 1/2"	**38.42**	28.81	27.44	25.61	23.05	19.21
38' 6"	28' 10 1/2"	27' 6"	25' 8"	23' 1 1/4"	19' 3"	**38.50**	28.88	27.50	25.67	23.10	19.25
38' 7"	28' 11 1/4"	27' 6 3/4"	25' 8 5/8"	23' 1 3/4"	19' 3 1/2"	**38.58**	28.94	27.56	25.72	23.15	19.29
38' 8"	29' 0"	27' 7 3/8"	25' 9 3/8"	23' 2 3/8"	19' 4"	**38.67**	29.00	27.62	25.78	23.20	19.33
38' 9"	29' 3/4"	27' 8 1/8"	25' 10"	23' 3"	19' 4 1/2"	**38.75**	29.06	27.68	25.83	23.25	19.38
38' 10"	29' 1 1/2"	27' 8 7/8"	25' 10 5/8"	23' 3 5/8"	19' 5"	**38.83**	29.12	27.74	25.89	23.30	19.42
38' 11"	29' 2 1/4"	27' 9 5/8"	25' 11 3/8"	23' 4 1/4"	19' 5 1/2"	**38.92**	29.19	27.80	25.94	23.35	19.46
39' 0"	29' 3"	27' 10 1/4"	26' 0"	23' 4 3/4"	19' 6"	**39.00**	29.25	27.86	26.00	23.40	19.50
39' 1"	29' 3 3/4"	27' 11"	26' 5/8"	23' 5 3/8"	19' 6 1/2"	**39.08**	29.31	27.92	26.06	23.45	19.54
39' 2"	29' 4 1/2"	27' 11 3/4"	26' 1 3/8"	23' 6"	19' 7"	**39.17**	29.37	27.98	26.11	23.50	19.58
39' 3"	29' 5 1/4"	28' 3/8"	26' 2"	23' 6 5/8"	19' 7 1/2"	**39.25**	29.44	28.04	26.17	23.55	19.63
39' 4"	29' 6"	28' 1 1/8"	26' 2 5/8"	23' 7 1/4"	19' 8"	**39.33**	29.50	28.10	26.22	23.60	19.67
39' 5"	29' 6 3/4"	28' 1 7/8"	26' 3 3/8"	23' 7 3/4"	19' 8 1/2"	**39.42**	29.56	28.15	26.28	23.65	19.71
39' 6"	29' 7 1/2"	28' 2 5/8"	26' 4"	23' 8 3/8"	19' 9"	**39.50**	29.63	28.21	26.33	23.70	19.75
39' 7"	29' 8 1/4"	28' 3 1/4"	26' 4 5/8"	23' 9"	19' 9 1/2"	**39.58**	29.69	28.27	26.39	23.75	19.79
39' 8"	29' 9"	28' 4"	26' 5 3/8"	23' 9 5/8"	19' 10"	**39.67**	29.75	28.33	26.44	23.80	19.83
39' 9"	29' 9 3/4"	28' 4 3/4"	26' 6"	23' 10 1/4"	19' 10 1/2"	**39.75**	29.81	28.39	26.50	23.85	19.88
39' 10"	29' 10 1/2"	28' 5 3/8"	26' 6 5/8"	23' 10 3/4"	19' 11"	**39.83**	29.87	28.45	26.56	23.90	19.92
39' 11"	29' 11 1/4"	28' 6 1/8"	26' 7 3/8"	23' 11 3/8"	19' 11 1/2"	**39.92**	29.94	28.51	26.61	23.95	19.96
40' 0"	30' 0"	28' 6 7/8"	26' 8"	24' 0"	20' 0"	**40.00**	30.00	28.57	26.67	24.00	20.00
40' 1"	30' 3/4"	28' 7 5/8"	26' 8 5/8"	24' 5/8"	20' 1/2"	**40.08**	30.06	28.63	26.72	24.05	20.04
40' 2"	30' 1 1/2"	28' 8 1/4"	26' 9 3/8"	24' 1 1/4"	20' 1"	**40.17**	30.12	28.69	26.78	24.10	20.08
40' 3"	30' 2 1/4"	28' 9"	26' 10"	24' 1 3/4"	20' 1 1/2"	**40.25**	30.19	28.75	26.83	24.15	20.13
40' 4"	30' 3"	28' 9 3/4"	26' 10 5/8"	24' 2 3/8"	20' 2"	**40.33**	30.25	28.81	26.89	24.20	20.17
40' 5"	30' 3 3/4"	28' 10 3/8"	26' 11 3/8"	24' 3"	20' 2 1/2"	**40.42**	30.31	28.87	26.94	24.25	20.21
40' 6"	30' 4 1/2"	28' 11 1/8"	27' 0"	24' 3 5/8"	20' 3"	**40.50**	30.38	28.93	27.00	24.30	20.25
40' 7"	30' 5 1/4"	28' 11 7/8"	27' 5/8"	24' 4 1/4"	20' 3 1/2"	**40.58**	30.44	28.99	27.06	24.35	20.29
40' 8"	30' 6"	29' 5/8"	27' 1 3/8"	24' 4 3/4"	20' 4"	**40.67**	30.50	29.05	27.11	24.40	20.33
40' 9"	30' 6 3/4"	29' 1 1/4"	27' 2"	24' 5 3/8"	20' 4 1/2"	**40.75**	30.56	29.11	27.17	24.45	20.38
40' 10"	30' 7 1/2"	29' 2"	27' 2 5/8"	24' 6"	20' 5"	**40.83**	30.62	29.17	27.22	24.50	20.42
40' 11"	30' 8 1/4"	29' 2 3/4"	27' 3 3/8"	24' 6 5/8"	20' 5 1/2"	**40.92**	30.69	29.23	27.28	24.55	20.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
41' 0"	54' 8"	57' 4 3/4"	61' 6"	68' 4"	82' 0"	**41.00**	54.67	57.40	61.50	68.33	82.00
41' 1"	54' 9 3/8"	57' 6 1/4"	61' 7 1/2"	68' 5 5/8"	82' 2"	**41.08**	54.78	57.52	61.63	68.47	82.17
41' 2"	54' 10 5/8"	57' 7 5/8"	61' 9"	68' 7 3/8"	82' 4"	**41.17**	54.89	57.63	61.75	68.61	82.33
41' 3"	55' 0"	57' 9"	61' 10 1/2"	68' 9"	82' 6"	**41.25**	55.00	57.75	61.88	68.75	82.50
41' 4"	55' 1 3/8"	57' 10 3/8"	62' 0"	68' 10 5/8"	82' 8"	**41.33**	55.11	57.87	62.00	68.89	82.67
41' 5"	55' 2 5/8"	57' 11 3/4"	62' 1 1/2"	69' 3/8"	82' 10"	**41.42**	55.22	57.98	62.13	69.03	82.83
41' 6"	55' 4"	58' 1 1/4"	62' 3"	69' 2"	83' 0"	**41.50**	55.33	58.10	62.25	69.17	83.00
41' 7"	55' 5 3/8"	58' 2 5/8"	62' 4 1/2"	69' 3 5/8"	83' 2"	**41.58**	55.44	58.22	62.37	69.31	83.17
41' 8"	55' 6 5/8"	58' 4"	62' 6"	69' 5 3/8"	83' 4"	**41.67**	55.56	58.33	62.50	69.44	83.33
41' 9"	55' 8"	58' 5 3/8"	62' 7 1/2"	69' 7"	83' 6"	**41.75**	55.67	58.45	62.63	69.58	83.50
41' 10"	55' 9 3/8"	58' 6 3/4"	62' 9"	69' 8 5/8"	83' 8"	**41.83**	55.78	58.57	62.75	69.72	83.67
41' 11"	55' 10 5/8"	58' 8 1/4"	62' 10 1/2"	69' 10 3/8"	83' 10"	**41.92**	55.89	58.68	62.88	69.86	83.83
42' 0"	56' 0"	58' 9 5/8"	63' 0"	70' 0"	84' 0"	**42.00**	56.00	58.80	63.00	70.00	84.00
42' 1"	56' 1 3/8"	58' 11"	63' 1 1/2"	70' 1 5/8"	84' 2"	**42.08**	56.11	58.92	63.13	70.14	84.17
42' 2"	56' 2 5/8"	59' 3/8"	63' 3"	70' 3 3/8"	84' 4"	**42.17**	56.22	59.03	63.25	70.28	84.33
42' 3"	56' 4"	59' 1 3/4"	63' 4 1/2"	70' 5"	84' 6"	**42.25**	56.33	59.15	63.38	70.42	84.50
42' 4"	56' 5 3/8"	59' 3 1/4"	63' 6"	70' 6 5/8"	84' 8"	**42.33**	56.44	59.27	63.50	70.56	84.67
42' 5"	56' 6 5/8"	59' 4 5/8"	63' 7 1/2"	70' 8 3/8"	84' 10"	**42.42**	56.56	59.38	63.63	70.69	84.83
42' 6"	56' 8"	59' 6"	63' 9"	70' 10"	85' 0"	**42.50**	56.67	59.50	63.75	70.83	85.00
42' 7"	56' 9 3/8"	59' 7 3/8"	63' 10 1/2"	70' 11 5/8"	85' 2"	**42.58**	56.78	59.62	63.87	70.97	85.17
42' 8"	56' 10 5/8"	59' 8 3/4"	64' 0"	71' 1 3/8"	85' 4"	**42.67**	56.89	59.73	64.00	71.11	85.33
42' 9"	57' 0"	59' 10 1/4"	64' 1 1/2"	71' 3"	85' 6"	**42.75**	57.00	59.85	64.13	71.25	85.50
42' 10"	57' 1 3/8"	59' 11 5/8"	64' 3"	71' 4 5/8"	85' 8"	**42.83**	57.11	59.97	64.25	71.39	85.67
42' 11"	57' 2 5/8"	60' 1"	64' 4 1/2"	71' 6 3/8"	85' 10"	**42.92**	57.22	60.08	64.38	71.53	85.83
43' 0"	57' 4"	60' 2 3/8"	64' 6"	71' 8"	86' 0"	**43.00**	57.33	60.20	64.50	71.67	86.00
43' 1"	57' 5 3/8"	60' 3 3/4"	64' 7 1/2"	71' 9 5/8"	86' 2"	**43.08**	57.44	60.32	64.62	71.81	86.17
43' 2"	57' 6 5/8"	60' 5 1/4"	64' 9"	71' 11 3/8"	86' 4"	**43.17**	57.56	60.43	64.75	71.94	86.33
43' 3"	57' 8"	60' 6 5/8"	64' 10 1/2"	72' 1"	86' 6"	**43.25**	57.67	60.55	64.88	72.08	86.50
43' 4"	57' 9 3/8"	60' 8"	65' 0"	72' 2 5/8"	86' 8"	**43.33**	57.78	60.67	65.00	72.22	86.67
43' 5"	57' 10 5/8"	60' 9 3/8"	65' 1 1/2"	72' 4 3/8"	86' 10"	**43.42**	57.89	60.78	65.13	72.36	86.83
43' 6"	58' 0"	60' 10 3/4"	65' 3"	72' 6"	87' 0"	**43.50**	58.00	60.90	65.25	72.50	87.00
43' 7"	58' 1 3/8"	61' 1/4"	65' 4 1/2"	72' 7 5/8"	87' 2"	**43.58**	58.11	61.02	65.37	72.64	87.17
43' 8"	58' 2 5/8"	61' 1 5/8"	65' 6"	72' 9 3/8"	87' 4"	**43.67**	58.22	61.13	65.50	72.78	87.33
43' 9"	58' 4"	61' 3"	65' 7 1/2"	72' 11"	87' 6"	**43.75**	58.33	61.25	65.63	72.92	87.50
43' 10"	58' 5 3/8"	61' 4 3/8"	65' 9"	73' 5/8"	87' 8"	**43.83**	58.44	61.37	65.75	73.06	87.67
43' 11"	58' 6 5/8"	61' 5 3/4"	65' 10 1/2"	73' 2 3/8"	87' 10"	**43.92**	58.56	61.48	65.88	73.19	87.83
44' 0"	58' 8"	61' 7 1/4"	66' 0"	73' 4"	88' 0"	**44.00**	58.67	61.60	66.00	73.33	88.00
44' 1"	58' 9 3/8"	61' 8 5/8"	66' 1 1/2"	73' 5 5/8"	88' 2"	**44.08**	58.78	61.72	66.12	73.47	88.17
44' 2"	58' 10 5/8"	61' 10"	66' 3"	73' 7 3/8"	88' 4"	**44.17**	58.89	61.83	66.25	73.61	88.33
44' 3"	59' 0"	61' 11 3/8"	66' 4 1/2"	73' 9"	88' 6"	**44.25**	59.00	61.95	66.38	73.75	88.50
44' 4"	59' 1 3/8"	62' 3/4"	66' 6"	73' 10 5/8"	88' 8"	**44.33**	59.11	62.07	66.50	73.89	88.67
44' 5"	59' 2 5/8"	62' 2 1/4"	66' 7 1/2"	74' 3/8"	88' 10"	**44.42**	59.22	62.18	66.63	74.03	88.83
44' 6"	59' 4"	62' 3 5/8"	66' 9"	74' 2"	89' 0"	**44.50**	59.33	62.30	66.75	74.17	89.00
44' 7"	59' 5 3/8"	62' 5"	66' 10 1/2"	74' 3 5/8"	89' 2"	**44.58**	59.44	62.42	66.87	74.31	89.17
44' 8"	59' 6 5/8"	62' 6 3/8"	67' 0"	74' 5 3/8"	89' 4"	**44.67**	59.56	62.53	67.00	74.44	89.33
44' 9"	59' 8"	62' 7 3/4"	67' 1 1/2"	74' 7"	89' 6"	**44.75**	59.67	62.65	67.13	74.58	89.50
44' 10"	59' 9 3/8"	62' 9 1/4"	67' 3"	74' 8 5/8"	89' 8"	**44.83**	59.78	62.77	67.25	74.72	89.67
44' 11"	59' 10 5/8"	62' 10 5/8"	67' 4 1/2"	74' 10 3/8"	89' 10"	**44.92**	59.89	62.88	67.38	74.86	89.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
41' 0"	30' 9"	29' 3 3/8"	27' 4"	24' 7 1/4"	20' 6"	**41.00**	30.75	29.29	27.33	24.60	20.50
41' 1"	30' 9 3/4"	29' 4 1/8"	27' 4 5/8"	24' 7 3/4"	20' 6 1/2"	**41.08**	30.81	29.35	27.39	24.65	20.54
41' 2"	30' 10 1/2"	29' 4 7/8"	27' 5 3/8"	24' 8 3/8"	20' 7"	**41.17**	30.87	29.40	27.44	24.70	20.58
41' 3"	30' 11 1/4"	29' 5 5/8"	27' 6"	24' 9"	20' 7 1/2"	**41.25**	30.94	29.46	27.50	24.75	20.63
41' 4"	31' 0"	29' 6 1/4"	27' 6 5/8"	24' 9 5/8"	20' 8"	**41.33**	31.00	29.52	27.56	24.80	20.67
41' 5"	31' 3/4"	29' 7"	27' 7 3/8"	24' 10 1/4"	20' 8 1/2"	**41.42**	31.06	29.58	27.61	24.85	20.71
41' 6"	31' 1 1/2"	29' 7 3/4"	27' 8"	24' 10 3/4"	20' 9"	**41.50**	31.13	29.64	27.67	24.90	20.75
41' 7"	31' 2 1/4"	29' 8 3/8"	27' 8 5/8"	24' 11 3/8"	20' 9 1/2"	**41.58**	31.19	29.70	27.72	24.95	20.79
41' 8"	31' 3"	29' 9 1/8"	27' 9 3/8"	25' 0"	20' 10"	**41.67**	31.25	29.76	27.78	25.00	20.83
41' 9"	31' 3 3/4"	29' 9 7/8"	27' 10"	25' 5/8"	20' 10 1/2"	**41.75**	31.31	29.82	27.83	25.05	20.88
41' 10"	31' 4 1/2"	29' 10 5/8"	27' 10 5/8"	25' 1 1/4"	20' 11"	**41.83**	31.37	29.88	27.89	25.10	20.92
41' 11"	31' 5 1/4"	29' 11 1/4"	27' 11 3/8"	25' 1 3/4"	20' 11 1/2"	**41.92**	31.44	29.94	27.94	25.15	20.96
42' 0"	31' 6"	30' 0"	28' 0"	25' 2 3/8"	21' 0"	**42.00**	31.50	30.00	28.00	25.20	21.00
42' 1"	31' 6 3/4"	30' 3/4"	28' 5/8"	25' 3"	21' 1/2"	**42.08**	31.56	30.06	28.06	25.25	21.04
42' 2"	31' 7 1/2"	30' 1 3/8"	28' 1 3/8"	25' 3 5/8"	21' 1"	**42.17**	31.62	30.12	28.11	25.30	21.08
42' 3"	31' 8 1/4"	30' 2 1/8"	28' 2"	25' 4 1/4"	21' 1 1/2"	**42.25**	31.69	30.18	28.17	25.35	21.13
42' 4"	31' 9"	30' 2 7/8"	28' 2 5/8"	25' 4 3/4"	21' 2"	**42.33**	31.75	30.24	28.22	25.40	21.17
42' 5"	31' 9 3/4"	30' 3 5/8"	28' 3 3/8"	25' 5 3/8"	21' 2 1/2"	**42.42**	31.81	30.30	28.28	25.45	21.21
42' 6"	31' 10 1/2"	30' 4 1/4"	28' 4"	25' 6"	21' 3"	**42.50**	31.88	30.36	28.33	25.50	21.25
42' 7"	31' 11 1/4"	30' 5"	28' 4 5/8"	25' 6 5/8"	21' 3 1/2"	**42.58**	31.94	30.42	28.39	25.55	21.29
42' 8"	32' 0"	30' 5 3/4"	28' 5 3/8"	25' 7 1/4"	21' 4"	**42.67**	32.00	30.48	28.44	25.60	21.33
42' 9"	32' 3/4"	30' 6 3/8"	28' 6"	25' 7 3/4"	21' 4 1/2"	**42.75**	32.06	30.54	28.50	25.65	21.38
42' 10"	32' 1 1/2"	30' 7 1/8"	28' 6 5/8"	25' 8 3/8"	21' 5"	**42.83**	32.12	30.60	28.56	25.70	21.42
42' 11"	32' 2 1/4"	30' 7 7/8"	28' 7 3/8"	25' 9"	21' 5 1/2"	**42.92**	32.19	30.65	28.61	25.75	21.46
43' 0"	32' 3"	30' 8 5/8"	28' 8"	25' 9 5/8"	21' 6"	**43.00**	32.25	30.71	28.67	25.80	21.50
43' 1"	32' 3 3/4"	30' 9 1/4"	28' 8 5/8"	25' 10 1/4"	21' 6 1/2"	**43.08**	32.31	30.77	28.72	25.85	21.54
43' 2"	32' 4 1/2"	30' 10"	28' 9 3/8"	25' 10 3/4"	21' 7"	**43.17**	32.37	30.83	28.78	25.90	21.58
43' 3"	32' 5 1/4"	30' 10 3/4"	28' 10"	25' 11 3/8"	21' 7 1/2"	**43.25**	32.44	30.89	28.83	25.95	21.63
43' 4"	32' 6"	30' 11 3/8"	28' 10 5/8"	26' 0"	21' 8"	**43.33**	32.50	30.95	28.89	26.00	21.67
43' 5"	32' 6 3/4"	31' 1/8"	28' 11 3/8"	26' 5/8"	21' 8 1/2"	**43.42**	32.56	31.01	28.94	26.05	21.71
43' 6"	32' 7 1/2"	31' 7/8"	29' 0"	26' 1 1/4"	21' 9"	**43.50**	32.63	31.07	29.00	26.10	21.75
43' 7"	32' 8 1/4"	31' 1 5/8"	29' 5/8"	26' 1 3/4"	21' 9 1/2"	**43.58**	32.69	31.13	29.06	26.15	21.79
43' 8"	32' 9"	31' 2 1/4"	29' 1 3/8"	26' 2 3/8"	21' 10"	**43.67**	32.75	31.19	29.11	26.20	21.83
43' 9"	32' 9 3/4"	31' 3"	29' 2"	26' 3"	21' 10 1/2"	**43.75**	32.81	31.25	29.17	26.25	21.88
43' 10"	32' 10 1/2"	31' 3 3/4"	29' 2 5/8"	26' 3 5/8"	21' 11"	**43.83**	32.87	31.31	29.22	26.30	21.92
43' 11"	32' 11 1/4"	31' 4 3/8"	29' 3 3/8"	26' 4 1/4"	21' 11 1/2"	**43.92**	32.94	31.37	29.28	26.35	21.96
44' 0"	33' 0"	31' 5 1/8"	29' 4"	26' 4 3/4"	22' 0"	44.00	33.00	31.43	29.33	26.40	22.00
44' 1"	33' 3/4"	31' 5 7/8"	29' 4 5/8"	26' 5 3/8"	22' 1/2"	**44.08**	33.06	31.49	29.39	26.45	22.04
44' 2"	33' 1 1/2"	31' 6 5/8"	29' 5 3/8"	26' 6"	22' 1"	**44.17**	33.12	31.55	29.44	26.50	22.08
44' 3"	33' 2 1/4"	31' 7 1/4"	29' 6"	26' 6 5/8"	22' 1 1/2"	**44.25**	33.19	31.61	29.50	26.55	22.13
44' 4"	33' 3"	31' 8"	29' 6 5/8"	26' 7 1/4"	22' 2"	**44.33**	33.25	31.67	29.56	26.60	22.17
44' 5"	33' 3 3/4"	31' 8 3/4"	29' 7 3/8"	26' 7 3/4"	22' 2 1/2"	**44.42**	33.31	31.73	29.61	26.65	22.21
44' 6"	33' 4 1/2"	31' 9 3/8"	29' 8"	26' 8 3/8"	22' 3"	**44.50**	33.38	31.79	29.67	26.70	22.25
44' 7"	33' 5 1/4"	31' 10 1/8"	29' 8 5/8"	26' 9"	22' 3 1/2"	**44.58**	33.44	31.85	29.72	26.75	22.29
44' 8"	33' 6"	31' 10 7/8"	29' 9 3/8"	26' 9 5/8"	22' 4"	**44.67**	33.50	31.90	29.78	26.80	22.33
44' 9"	33' 6 3/4"	31' 11 5/8"	29' 10"	26' 10 1/4"	22' 4 1/2"	**44.75**	33.56	31.96	29.83	26.85	22.38
44' 10"	33' 7 1/2"	32' 1/4"	29' 10 5/8"	26' 10 3/4"	22' 5"	**44.83**	33.62	32.02	29.89	26.90	22.42
44' 11"	33' 8 1/4"	32' 1"	29' 11 3/8"	26' 11 3/8"	22' 5 1/2"	**44.92**	33.69	32.08	29.94	26.95	22.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
45' 0"	60' 0"	63' 0"	67' 6"	75' 0"	90' 0"	**45.00**	60.00	63.00	67.50	75.00	90.00
45' 1"	60' 1 3/8"	63' 1 3/8"	67' 7 1/2"	75' 1 5/8"	90' 2"	**45.08**	60.11	63.12	67.62	75.14	90.17
45' 2"	60' 2 5/8"	63' 2 3/4"	67' 9"	75' 3 3/8"	90' 4"	**45.17**	60.22	63.23	67.75	75.28	90.33
45' 3"	60' 4"	63' 4 1/4"	67' 10 1/2"	75' 5"	90' 6"	**45.25**	60.33	63.35	67.88	75.42	90.50
45' 4"	60' 5 3/8"	63' 5 5/8"	68' 0"	75' 6 5/8"	90' 8"	**45.33**	60.44	63.47	68.00	75.56	90.67
45' 5"	60' 6 5/8"	63' 7"	68' 1 1/2"	75' 8 3/8"	90' 10"	**45.42**	60.56	63.58	68.13	75.69	90.83
45' 6"	60' 8"	63' 8 3/8"	68' 3"	75' 10"	91' 0"	**45.50**	60.67	63.70	68.25	75.83	91.00
45' 7"	60' 9 3/8"	63' 9 3/4"	68' 4 1/2"	75' 11 5/8"	91' 2"	**45.58**	60.78	63.82	68.37	75.97	91.17
45' 8"	60' 10 5/8"	63' 11 1/4"	68' 6"	76' 1 3/8"	91' 4"	**45.67**	60.89	63.93	68.50	76.11	91.33
45' 9"	61' 0"	64' 5/8"	68' 7 1/2"	76' 3"	91' 6"	**45.75**	61.00	64.05	68.63	76.25	91.50
45' 10"	61' 1 3/8"	64' 2"	68' 9"	76' 4 5/8"	91' 8"	**45.83**	61.11	64.17	68.75	76.39	91.67
45' 11"	61' 2 5/8"	64' 3 3/8"	68' 10 1/2"	76' 6 3/8"	91' 10"	**45.92**	61.22	64.28	68.88	76.53	91.83
46' 0"	61' 4"	64' 4 3/4"	69' 0"	76' 8"	92' 0"	**46.00**	61.33	64.40	69.00	76.67	92.00
46' 1"	61' 5 3/8"	64' 6 1/4"	69' 1 1/2"	76' 9 5/8"	92' 2"	**46.08**	61.44	64.52	69.12	76.81	92.17
46' 2"	61' 6 5/8"	64' 7 5/8"	69' 3"	76' 11 3/8"	92' 4"	**46.17**	61.56	64.63	69.25	76.94	92.33
46' 3"	61' 8"	64' 9"	69' 4 1/2"	77' 1"	92' 6"	**46.25**	61.67	64.75	69.38	77.08	92.50
46' 4"	61' 9 3/8"	64' 10 3/8"	69' 6"	77' 2 5/8"	92' 8"	**46.33**	61.78	64.87	69.50	77.22	92.67
46' 5"	61' 10 5/8"	64' 11 3/4"	69' 7 1/2"	77' 4 3/8"	92' 10"	**46.42**	61.89	64.98	69.63	77.36	92.83
46' 6"	62' 0"	65' 1 1/4"	69' 9"	77' 6"	93' 0"	**46.50**	62.00	65.10	69.75	77.50	93.00
46' 7"	62' 1 3/8"	65' 2 5/8"	69' 10 1/2"	77' 7 5/8"	93' 2"	**46.58**	62.11	65.22	69.87	77.64	93.17
46' 8"	62' 2 5/8"	65' 4"	70' 0"	77' 9 3/8"	93' 4"	**46.67**	62.22	65.33	70.00	77.78	93.33
46' 9"	62' 4"	65' 5 3/8"	70' 1 1/2"	77' 11"	93' 6"	**46.75**	62.33	65.45	70.13	77.92	93.50
46' 10"	62' 5 3/8"	65' 6 3/4"	70' 3"	78' 5/8"	93' 8"	**46.83**	62.44	65.57	70.25	78.06	93.67
46' 11"	62' 6 5/8"	65' 8 1/4"	70' 4 1/2"	78' 2 3/8"	93' 10"	**46.92**	62.56	65.68	70.38	78.19	93.83
47' 0"	62' 8"	65' 9 5/8"	70' 6"	78' 4"	94' 0"	**47.00**	62.67	65.80	70.50	78.33	94.00
47' 1"	62' 9 3/8"	65' 11"	70' 7 1/2"	78' 5 5/8"	94' 2"	**47.08**	62.78	65.92	70.62	78.47	94.17
47' 2"	62' 10 5/8"	66' 3/8"	70' 9"	78' 7 3/8"	94' 4"	**47.17**	62.89	66.03	70.75	78.61	94.33
47' 3"	63' 0"	66' 1 3/4"	70' 10 1/2"	78' 9"	94' 6"	**47.25**	63.00	66.15	70.88	78.75	94.50
47' 4"	63' 1 3/8"	66' 3 1/4"	71' 0"	78' 10 5/8"	94' 8"	**47.33**	63.11	66.27	71.00	78.89	94.67
47' 5"	63' 2 5/8"	66' 4 5/8"	71' 1 1/2"	79' 3/8"	94' 10"	**47.42**	63.22	66.38	71.13	79.03	94.83
47' 6"	63' 4"	66' 6"	71' 3"	79' 2"	95' 0"	**47.50**	63.33	66.50	71.25	79.17	95.00
47' 7"	63' 5 3/8"	66' 7 3/8"	71' 4 1/2"	79' 3 5/8"	95' 2"	**47.58**	63.44	66.62	71.37	79.31	95.17
47' 8"	63' 6 5/8"	66' 8 3/4"	71' 6"	79' 5 3/8"	95' 4"	**47.67**	63.56	66.73	71.50	79.44	95.33
47' 9"	63' 8"	66' 10 1/4"	71' 7 1/2"	79' 7"	95' 6"	**47.75**	63.67	66.85	71.63	79.58	95.50
47' 10"	63' 9 3/8"	66' 11 5/8"	71' 9"	79' 8 5/8"	95' 8"	**47.83**	63.78	66.97	71.75	79.72	95.67
47' 11"	63' 10 5/8"	67' 1"	71' 10 1/2"	79' 10 3/8"	95' 10"	**47.92**	63.89	67.08	71.88	79.86	95.83
48' 0"	64' 0"	67' 2 3/8"	72' 0"	80' 0"	96' 0"	**48.00**	64.00	67.20	72.00	80.00	96.00
48' 1"	64' 1 3/8"	67' 3 3/4"	72' 1 1/2"	80' 1 5/8"	96' 2"	**48.08**	64.11	67.32	72.12	80.14	96.17
48' 2"	64' 2 5/8"	67' 5 1/4"	72' 3"	80' 3 3/8"	96' 4"	**48.17**	64.22	67.43	72.25	80.28	96.33
48' 3"	64' 4"	67' 6 5/8"	72' 4 1/2"	80' 5"	96' 6"	**48.25**	64.33	67.55	72.38	80.42	96.50
48' 4"	64' 5 3/8"	67' 8"	72' 6"	80' 6 5/8"	96' 8"	**48.33**	64.44	67.67	72.50	80.56	96.67
48' 5"	64' 6 5/8"	67' 9 3/8"	72' 7 1/2"	80' 8 3/8"	96' 10"	**48.42**	64.56	67.78	72.63	80.69	96.83
48' 6"	64' 8"	67' 10 3/4"	72' 9"	80' 10"	97' 0"	**48.50**	64.67	67.90	72.75	80.83	97.00
48' 7"	64' 9 3/8"	68' 1/4"	72' 10 1/2"	80' 11 5/8"	97' 2"	**48.58**	64.78	68.02	72.87	80.97	97.17
48' 8"	64' 10 5/8"	68' 1 5/8"	73' 0"	81' 1 3/8"	97' 4"	**48.67**	64.89	68.13	73.00	81.11	97.33
48' 9"	65' 0"	68' 3"	73' 1 1/2"	81' 3"	97' 6"	**48.75**	65.00	68.25	73.13	81.25	97.50
48' 10"	65' 1 3/8"	68' 4 3/8"	73' 3"	81' 4 5/8"	97' 8"	**48.83**	65.11	68.37	73.25	81.39	97.67
48' 11"	65' 2 5/8"	68' 5 3/4"	73' 4 1/2"	81' 6 3/8"	97' 10"	**48.92**	65.22	68.48	73.38	81.53	97.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
45' 0"	33' 9"	32' 1 3/4"	30' 0"	27' 0"	22' 6"	**45.00**	33.75	32.14	30.00	27.00	22.50
45' 1"	33' 9 3/4"	32' 2 3/8"	30' 5/8"	27' 5/8"	22' 6 1/2"	**45.08**	33.81	32.20	30.06	27.05	22.54
45' 2"	33' 10 1/2"	32' 3 1/8"	30' 1 3/8"	27' 1 1/4"	22' 7"	**45.17**	33.87	32.26	30.11	27.10	22.58
45' 3"	33' 11 1/4"	32' 3 7/8"	30' 2"	27' 1 3/4"	22' 7 1/2"	**45.25**	33.94	32.32	30.17	27.15	22.63
45' 4"	34' 0"	32' 4 5/8"	30' 2 5/8"	27' 2 3/8"	22' 8"	**45.33**	34.00	32.38	30.22	27.20	22.67
45' 5"	34' 3/4"	32' 5 1/4"	30' 3 3/8"	27' 3"	22' 8 1/2"	**45.42**	34.06	32.44	30.28	27.25	22.71
45' 6"	34' 1 1/2"	32' 6"	30' 4"	27' 3 5/8"	22' 9"	**45.50**	34.13	32.50	30.33	27.30	22.75
45' 7"	34' 2 1/4"	32' 6 3/4"	30' 4 5/8"	27' 4 1/4"	22' 9 1/2"	**45.58**	34.19	32.56	30.39	27.35	22.79
45' 8"	34' 3"	32' 7 3/8"	30' 5 3/8"	27' 4 3/4"	22' 10"	**45.67**	34.25	32.62	30.44	27.40	22.83
45' 9"	34' 3 3/4"	32' 8 1/8"	30' 6"	27' 5 3/8"	22' 10 1/2"	**45.75**	34.31	32.68	30.50	27.45	22.88
45' 10"	34' 4 1/2"	32' 8 7/8"	30' 6 5/8"	27' 6"	22' 11"	**45.83**	34.37	32.74	30.56	27.50	22.92
45' 11"	34' 5 1/4"	32' 9 5/8"	30' 7 3/8"	27' 6 5/8"	22' 11 1/2"	**45.92**	34.44	32.80	30.61	27.55	22.96
46' 0"	34' 6"	32' 10 1/4"	30' 8"	27' 7 1/4"	23' 0"	**46.00**	34.50	32.86	30.67	27.60	23.00
46' 1"	34' 6 3/4"	32' 11"	30' 8 5/8"	27' 7 3/4"	23' 1/2"	**46.08**	34.56	32.92	30.72	27.65	23.04
46' 2"	34' 7 1/2"	32' 11 3/4"	30' 9 3/8"	27' 8 3/8"	23' 1"	**46.17**	34.62	32.98	30.78	27.70	23.08
46' 3"	34' 8 1/4"	33' 3/8"	30' 10"	27' 9"	23' 1 1/2"	**46.25**	34.69	33.04	30.83	27.75	23.13
46' 4"	34' 9"	33' 1 1/8"	30' 10 5/8"	27' 9 5/8"	23' 2"	**46.33**	34.75	33.10	30.89	27.80	23.17
46' 5"	34' 9 3/4"	33' 1 7/8"	30' 11 3/8"	27' 10 1/4"	23' 2 1/2"	**46.42**	34.81	33.15	30.94	27.85	23.21
46' 6"	34' 10 1/2"	33' 2 5/8"	31' 0"	27' 10 3/4"	23' 3"	**46.50**	34.88	33.21	31.00	27.90	23.25
46' 7"	34' 11 1/4"	33' 3 1/4"	31' 5/8"	27' 11 3/8"	23' 3 1/2"	**46.58**	34.94	33.27	31.06	27.95	23.29
46' 8"	35' 0"	33' 4"	31' 1 3/8"	28' 0"	23' 4"	**46.67**	35.00	33.33	31.11	28.00	23.33
46' 9"	35' 3/4"	33' 4 3/4"	31' 2"	28' 5/8"	23' 4 1/2"	**46.75**	35.06	33.39	31.17	28.05	23.38
46' 10"	35' 1 1/2"	33' 5 3/8"	31' 2 5/8"	28' 1 1/4"	23' 5"	**46.83**	35.12	33.45	31.22	28.10	23.42
46' 11"	35' 2 1/4"	33' 6 1/8"	31' 3 3/8"	28' 1 3/4"	23' 5 1/2"	**46.92**	35.19	33.51	31.28	28.15	23.46
47' 0"	35' 3"	33' 6 7/8"	31' 4"	28' 2 3/8"	23' 6"	**47.00**	35.25	33.57	31.33	28.20	23.50
47' 1"	35' 3 3/4"	33' 7 5/8"	31' 4 5/8"	28' 3"	23' 6 1/2"	**47.08**	35.31	33.63	31.39	28.25	23.54
47' 2"	35' 4 1/2"	33' 8 1/4"	31' 5 3/8"	28' 3 5/8"	23' 7"	**47.17**	35.37	33.69	31.44	28.30	23.58
47' 3"	35' 5 1/4"	33' 9"	31' 6"	28' 4 1/4"	23' 7 1/2"	**47.25**	35.44	33.75	31.50	28.35	23.63
47' 4"	35' 6"	33' 9 3/4"	31' 6 5/8"	28' 4 3/4"	23' 8"	**47.33**	35.50	33.81	31.56	28.40	23.67
47' 5"	35' 6 3/4"	33' 10 3/8"	31' 7 3/8"	28' 5 3/8"	23' 8 1/2"	**47.42**	35.56	33.87	31.61	28.45	23.71
47' 6"	35' 7 1/2"	33' 11 1/8"	31' 8"	28' 6"	23' 9"	**47.50**	35.63	33.93	31.67	28.50	23.75
47' 7"	35' 8 1/4"	33' 11 7/8"	31' 8 5/8"	28' 6 5/8"	23' 9 1/2"	**47.58**	35.69	33.99	31.72	28.55	23.79
47' 8"	35' 9"	34' 5/8"	31' 9 3/8"	28' 7 1/4"	23' 10"	**47.67**	35.75	34.05	31.78	28.60	23.83
47' 9"	35' 9 3/4"	34' 1 1/4"	31' 10"	28' 7 3/4"	23' 10 1/2"	**47.75**	35.81	34.11	31.83	28.65	23.88
47' 10"	35' 10 1/2"	34' 2"	31' 10 5/8"	28' 8 3/8"	23' 11"	**47.83**	35.87	34.17	31.89	28.70	23.92
47' 11"	35' 11 1/4"	34' 2 3/4"	31' 11 3/8"	28' 9"	23' 11 1/2"	**47.92**	35.94	34.23	31.94	28.75	23.96
48' 0"	36' 0"	34' 3 3/8"	32' 0"	28' 9 5/8"	24' 0"	**48.00**	36.00	34.29	32.00	28.80	24.00
48' 1"	36' 3/4"	34' 4 1/8"	32' 5/8"	28' 10 1/4"	24' 1/2"	**48.08**	36.06	34.35	32.06	28.85	24.04
48' 2"	36' 1 1/2"	34' 4 7/8"	32' 1 3/8"	28' 10 3/4"	24' 1"	**48.17**	36.12	34.40	32.11	28.90	24.08
48' 3"	36' 2 1/4"	34' 5 5/8"	32' 2"	28' 11 3/8"	24' 1 1/2"	**48.25**	36.19	34.46	32.17	28.95	24.13
48' 4"	36' 3"	34' 6 1/4"	32' 2 5/8"	29' 0"	24' 2"	**48.33**	36.25	34.52	32.22	29.00	24.17
48' 5"	36' 3 3/4"	34' 7"	32' 3 3/8"	29' 5/8"	24' 2 1/2"	**48.42**	36.31	34.58	32.28	29.05	24.21
48' 6"	36' 4 1/2"	34' 7 3/4"	32' 4"	29' 1 1/4"	24' 3"	**48.50**	36.38	34.64	32.33	29.10	24.25
48' 7"	36' 5 1/4"	34' 8 3/8"	32' 4 5/8"	29' 1 3/4"	24' 3 1/2"	**48.58**	36.44	34.70	32.39	29.15	24.29
48' 8"	36' 6"	34' 9 1/8"	32' 5 3/8"	29' 2 3/8"	24' 4"	**48.67**	36.50	34.76	32.44	29.20	24.33
48' 9"	36' 6 3/4"	34' 9 7/8"	32' 6"	29' 3"	24' 4 1/2"	**48.75**	36.56	34.82	32.50	29.25	24.38
48' 10"	36' 7 1/2"	34' 10 5/8"	32' 6 5/8"	29' 3 5/8"	24' 5"	**48.83**	36.62	34.88	32.56	29.30	24.42
48' 11"	36' 8 1/4"	34' 11 1/4"	32' 7 3/8"	29' 4 1/4"	24' 5 1/2"	**48.92**	36.69	34.94	32.61	29.35	24.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
-	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
49' 0"	65' 4"	68' 7 1/4"	73' 6"	81' 8"	98' 0"	**49.00**	65.33	68.60	73.50	81.67	98.00
49' 1"	65' 5 3/8"	68' 8 5/8"	73' 7 1/2"	81' 9 5/8"	98' 2"	**49.08**	65.44	68.72	73.62	81.81	98.17
49' 2"	65' 6 5/8"	68' 10"	73' 9"	81' 11 3/8"	98' 4"	**49.17**	65.56	68.83	73.75	81.94	98.33
49' 3"	65' 8"	68' 11 3/8"	73' 10 1/2"	82' 1"	98' 6"	**49.25**	65.67	68.95	73.88	82.08	98.50
49' 4"	65' 9 3/8"	69' 3/4"	74' 0"	82' 2 5/8"	98' 8"	**49.33**	65.78	69.07	74.00	82.22	98.67
49' 5"	65' 10 5/8"	69' 2 1/4"	74' 1 1/2"	82' 4 3/8"	98' 10"	**49.42**	65.89	69.18	74.13	82.36	98.83
49' 6"	66' 0"	69' 3 5/8"	74' 3"	82' 6"	99' 0"	**49.50**	66.00	69.30	74.25	82.50	99.00
49' 7"	66' 1 3/8"	69' 5"	74' 4 1/2"	82' 7 5/8"	99' 2"	**49.58**	66.11	69.42	74.37	82.64	99.17
49' 8"	66' 2 5/8"	69' 6 3/8"	74' 6"	82' 9 3/8"	99' 4"	**49.67**	66.22	69.53	74.50	82.78	99.33
49' 9"	66' 4"	69' 7 3/4"	74' 7 1/2"	82' 11"	99' 6"	**49.75**	66.33	69.65	74.63	82.92	99.50
49' 10"	66' 5 3/8"	69' 9 1/4"	74' 9"	83' 5/8"	99' 8"	**49.83**	66.44	69.77	74.75	83.06	99.67
49' 11"	66' 6 5/8"	69' 10 5/8"	74' 10 1/2"	83' 2 3/8"	99' 10"	**49.92**	66.56	69.88	74.88	83.19	99.83
50' 0"	66' 8"	70' 0"	75' 0"	83' 4"	100' 0"	**50.00**	66.67	70.00	75.00	83.33	100.00
50' 1"	66' 9 3/8"	70' 1 3/8"	75' 1 1/2"	83' 5 5/8"	100' 2"	**50.08**	66.78	70.12	75.12	83.47	100.17
50' 2"	66' 10 5/8"	70' 2 3/4"	75' 3"	83' 7 3/8"	100' 4"	**50.17**	66.89	70.23	75.25	83.61	100.33
50' 3"	67' 0"	70' 4 1/4"	75' 4 1/2"	83' 9"	100' 6"	**50.25**	67.00	70.35	75.38	83.75	100.50
50' 4"	67' 1 3/8"	70' 5 5/8"	75' 6"	83' 10 5/8"	100' 8"	**50.33**	67.11	70.47	75.50	83.89	100.67
50' 5"	67' 2 5/8"	70' 7"	75' 7 1/2"	84' 3/8"	100' 10"	**50.42**	67.22	70.58	75.63	84.03	100.83
50' 6"	67' 4"	70' 8 3/8"	75' 9"	84' 2"	101' 0"	**50.50**	67.33	70.70	75.75	84.17	101.00
50' 7"	67' 5 3/8"	70' 9 3/4"	75' 10 1/2"	84' 3 5/8"	101' 2"	**50.58**	67.44	70.82	75.87	84.31	101.17
50' 8"	67' 6 5/8"	70' 11 1/4"	76' 0"	84' 5 3/8"	101' 4"	**50.67**	67.56	70.93	76.00	84.44	101.33
50' 9"	67' 8"	71' 5/8"	76' 1 1/2"	84' 7"	101' 6"	**50.75**	67.67	71.05	76.13	84.58	101.50
50' 10"	67' 9 3/8"	71' 2"	76' 3"	84' 8 5/8"	101' 8"	**50.83**	67.78	71.17	76.25	84.72	101.67
50' 11"	67' 10 5/8"	71' 3 3/8"	76' 4 1/2"	84' 10 3/8"	101' 10"	**50.92**	67.89	71.28	76.38	84.86	101.83
51' 0"	68' 0"	71' 4 3/4"	76' 6"	85' 0"	102' 0"	**51.00**	68.00	71.40	76.50	85.00	102.00
51' 1"	68' 1 3/8"	71' 6 1/4"	76' 7 1/2"	85' 1 5/8"	102' 2"	**51.08**	68.11	71.52	76.62	85.14	102.17
51' 2"	68' 2 5/8"	71' 7 5/8"	76' 9"	85' 3 3/8"	102' 4"	**51.17**	68.22	71.63	76.75	85.28	102.33
51' 3"	68' 4"	71' 9"	76' 10 1/2"	85' 5"	102' 6"	**51.25**	68.33	71.75	76.88	85.42	102.50
51' 4"	68' 5 3/8"	71' 10 3/8"	77' 0"	85' 6 5/8"	102' 8"	**51.33**	68.44	71.87	77.00	85.56	102.67
51' 5"	68' 6 5/8"	71' 11 3/4"	77' 1 1/2"	85' 8 3/8"	102' 10"	**51.42**	68.56	71.98	77.13	85.69	102.83
51' 6"	68' 8"	72' 1 1/4"	77' 3"	85' 10"	103' 0"	**51.50**	68.67	72.10	77.25	85.83	103.00
51' 7"	68' 9 3/8"	72' 2 5/8"	77' 4 1/2"	85' 11 5/8"	103' 2"	**51.58**	68.78	72.22	77.37	85.97	103.17
51' 8"	68' 10 5/8"	72' 4"	77' 6"	86' 1 3/8"	103' 4"	**51.67**	68.89	72.33	77.50	86.11	103.33
51' 9"	69' 0"	72' 5 3/8"	77' 7 1/2"	86' 3"	103' 6"	**51.75**	69.00	72.45	77.63	86.25	103.50
51' 10"	69' 1 3/8"	72' 6 3/4"	77' 9"	86' 4 5/8"	103' 8"	**51.83**	69.11	72.57	77.75	86.39	103.67
51' 11"	69' 2 5/8"	72' 8 1/4"	77' 10 1/2"	86' 6 3/8"	103' 10"	**51.92**	69.22	72.68	77.88	86.53	103.83
52' 0"	69' 4"	72' 9 5/8"	78' 0"	86' 8"	104' 0"	**52.00**	69.33	72.80	78.00	86.67	104.00
52' 1"	69' 5 3/8"	72' 11"	78' 1 1/2"	86' 9 5/8"	104' 2"	**52.08**	69.44	72.92	78.12	86.81	104.17
52' 2"	69' 6 5/8"	73' 3/8"	78' 3"	86' 11 3/8"	104' 4"	**52.17**	69.56	73.03	78.25	86.94	104.33
52' 3"	69' 8"	73' 1 3/4"	78' 4 1/2"	87' 1"	104' 6"	**52.25**	69.67	73.15	78.38	87.08	104.50
52' 4"	69' 9 3/8"	73' 3 1/4"	78' 6"	87' 2 5/8"	104' 8"	**52.33**	69.78	73.27	78.50	87.22	104.67
52' 5"	69' 10 5/8"	73' 4 5/8"	78' 7 1/2"	87' 4 3/8"	104' 10"	**52.42**	69.89	73.38	78.63	87.36	104.83
52' 6"	70' 0"	73' 6"	78' 9"	87' 6"	105' 0"	**52.50**	70.00	73.50	78.75	87.50	105.00
52' 7"	70' 1 3/8"	73' 7 3/8"	78' 10 1/2"	87' 7 5/8"	105' 2"	**52.58**	70.11	73.62	78.87	87.64	105.17
52' 8"	70' 2 5/8"	73' 8 3/4"	79' 0"	87' 9 3/8"	105' 4"	**52.67**	70.22	73.73	79.00	87.78	105.33
52' 9"	70' 4"	73' 10 1/4"	79' 1 1/2"	87' 11"	105' 6"	**52.75**	70.33	73.85	79.13	87.92	105.50
52' 10"	70' 5 3/8"	73' 11 5/8"	79' 3"	88' 5/8"	105' 8"	**52.83**	70.44	73.97	79.25	88.06	105.67
52' 11"	70' 6 5/8"	74' 1"	79' 4 1/2"	88' 2 3/8"	105' 10"	**52.92**	70.56	74.08	79.38	88.19	105.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal. equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
49' 0"	36' 9"	35' 0"	32' 8"	29' 4 3/4"	24' 6"	**49.00**	36.75	35.00	32.67	29.40	24.50
49' 1"	36' 9 3/4"	35' 3/4"	32' 8 5/8"	29' 5 3/8"	24' 6 1/2"	**49.08**	36.81	35.06	32.72	29.45	24.54
49' 2"	36' 10 1/2"	35' 1 3/8"	32' 9 3/8"	29' 6"	24' 7"	**49.17**	36.87	35.12	32.78	29.50	24.58
49' 3"	36' 11 1/4"	35' 2 1/8"	32' 10"	29' 6 5/8"	24' 7 1/2"	**49.25**	36.94	35.18	32.83	29.55	24.63
49' 4"	37' 0"	35' 2 7/8"	32' 10 5/8"	29' 7 1/4"	24' 8"	**49.33**	37.00	35.24	32.89	29.60	24.67
49' 5"	37' 3/4"	35' 3 5/8"	32' 11 3/8"	29' 7 3/4"	24' 8 1/2"	**49.42**	37.06	35.30	32.94	29.65	24.71
49' 6"	37' 1 1/2"	35' 4 1/4"	33' 0"	29' 8 3/8"	24' 9"	**49.50**	37.13	35.36	33.00	29.70	24.75
49' 7"	37' 2 1/4"	35' 5"	33' 5/8"	29' 9"	24' 9 1/2"	**49.58**	37.19	35.42	33.06	29.75	24.79
49' 8"	37' 3"	35' 5 3/4"	33' 1 3/8"	29' 9 5/8"	24' 10"	**49.67**	37.25	35.48	33.11	29.80	24.83
49' 9"	37' 3 3/4"	35' 6 3/8"	33' 2"	29' 10 1/4"	24' 10 1/2"	**49.75**	37.31	35.54	33.17	29.85	24.88
49' 10"	37' 4 1/2"	35' 7 1/8"	33' 2 5/8"	29' 10 3/4"	24' 11"	**49.83**	37.37	35.60	33.22	29.90	24.92
49' 11"	37' 5 1/4"	35' 7 7/8"	33' 3 3/8"	29' 11 3/8"	24' 11 1/2"	**49.92**	37.44	35.65	33.28	29.95	24.96
50' 0"	37' 6"	35' 8 5/8"	33' 4"	30' 0"	25' 0"	**50.00**	37.50	35.71	33.33	30.00	25.00
50' 1"	37' 6 3/4"	35' 9 1/4"	33' 4 5/8"	30' 5/8"	25' 1/2"	**50.08**	37.56	35.77	33.39	30.05	25.04
50' 2"	37' 7 1/2"	35' 10"	33' 5 3/8"	30' 1 1/4"	25' 1"	**50.17**	37.62	35.83	33.44	30.10	25.08
50' 3"	37' 8 1/4"	35' 10 3/4"	33' 6"	30' 1 3/4"	25' 1 1/2"	**50.25**	37.69	35.89	33.50	30.15	25.13
50' 4"	37' 9"	35' 11 3/8"	33' 6 5/8"	30' 2 3/8"	25' 2"	**50.33**	37.75	35.95	33.56	30.20	25.17
50' 5"	37' 9 3/4"	36' 1/8"	33' 7 3/8"	30' 3"	25' 2 1/2"	**50.42**	37.81	36.01	33.61	30.25	25.21
50' 6"	37' 10 1/2"	36' 7/8"	33' 8"	30' 3 5/8"	25' 3"	**50.50**	37.88	36.07	33.67	30.30	25.25
50' 7"	37' 11 1/4"	36' 1 5/8"	33' 8 5/8"	30' 4 1/4"	25' 3 1/2"	**50.58**	37.94	36.13	33.72	30.35	25.29
50' 8"	38' 0"	36' 2 1/4"	33' 9 3/8"	30' 4 3/4"	25' 4"	**50.67**	38.00	36.19	33.78	30.40	25.33
50' 9"	38' 3/4"	36' 3"	33' 10"	30' 5 3/8"	25' 4 1/2"	**50.75**	38.06	36.25	33.83	30.45	25.38
50' 10"	38' 1 1/2"	36' 3 3/4"	33' 10 5/8"	30' 6"	25' 5"	**50.83**	38.12	36.31	33.89	30.50	25.42
50' 11"	38' 2 1/4"	36' 4 3/8"	33' 11 3/8"	30' 6 5/8"	25' 5 1/2"	**50.92**	38.19	36.37	33.94	30.55	25.46
51' 0"	38' 3"	36' 5 1/8"	34' 0"	30' 7 1/4"	25' 6"	**51.00**	38.25	36.43	34.00	30.60	25.50
51' 1"	38' 3 3/4"	36' 5 7/8"	34' 5/8"	30' 7 3/4"	25' 6 1/2"	**51.08**	38.31	36.49	34.06	30.65	25.54
51' 2"	38' 4 1/2"	36' 6 5/8"	34' 1 3/8"	30' 8 3/8"	25' 7"	**51.17**	38.37	36.55	34.11	30.70	25.58
51' 3"	38' 5 1/4"	36' 7 1/4"	34' 2"	30' 9"	25' 7 1/2"	**51.25**	38.44	36.61	34.17	30.75	25.63
51' 4"	38' 6"	36' 8"	34' 2 5/8"	30' 9 5/8"	25' 8"	**51.33**	38.50	36.67	34.22	30.80	25.67
51' 5"	38' 6 3/4"	36' 8 3/4"	34' 3 3/8"	30' 10 1/4"	25' 8 1/2"	**51.42**	38.56	36.73	34.28	30.85	25.71
51' 6"	38' 7 1/2"	36' 9 3/8"	34' 4"	30' 10 3/4"	25' 9"	**51.50**	38.63	36.79	34.33	30.90	25.75
51' 7"	38' 8 1/4"	36' 10 1/8"	34' 4 5/8"	30' 11 3/8"	25' 9 1/2"	**51.58**	38.69	36.85	34.39	30.95	25.79
51' 8"	38' 9"	36' 10 7/8"	34' 5 3/8"	31' 0"	25' 10"	**51.67**	38.75	36.90	34.44	31.00	25.83
51' 9"	38' 9 3/4"	36' 11 5/8"	34' 6"	31' 5/8"	25' 10 1/2"	**51.75**	38.81	36.96	34.50	31.05	25.88
51' 10"	38' 10 1/2"	37' 1/4"	34' 6 5/8"	31' 1 1/4"	25' 11"	**51.83**	38.87	37.02	34.56	31.10	25.92
51' 11"	38' 11 1/4"	37' 1"	34' 7 3/8"	31' 1 3/4"	25' 11 1/2"	**51.92**	38.94	37.08	34.61	31.15	25.96
52' 0"	39' 0"	37' 1 3/4"	34' 8"	31' 2 3/8"	26' 0"	**52.00**	39.00	37.14	34.67	31.20	26.00
52' 1"	39' 3/4"	37' 2 3/8"	34' 8 5/8"	31' 3"	26' 1/2"	**52.08**	39.06	37.20	34.72	31.25	26.04
52' 2"	39' 1 1/2"	37' 3 1/8"	34' 9 3/8"	31' 3 5/8"	26' 1"	**52.17**	39.12	37.26	34.78	31.30	26.08
52' 3"	39' 2 1/4"	37' 3 7/8"	34' 10"	31' 4 1/4"	26' 1 1/2"	**52.25**	39.19	37.32	34.83	31.35	26.13
52' 4"	39' 3"	37' 4 5/8"	34' 10 5/8"	31' 4 3/4"	26' 2"	**52.33**	39.25	37.38	34.89	31.40	26.17
52' 5"	39' 3 3/4"	37' 5 1/4"	34' 11 3/8"	31' 5 3/8"	26' 2 1/2"	**52.42**	39.31	37.44	34.94	31.45	26.21
52' 6"	39' 4 1/2"	37' 6"	35' 0"	31' 6"	26' 3"	**52.50**	39.38	37.50	35.00	31.50	26.25
52' 7"	39' 5 1/4"	37' 6 3/4"	35' 5/8"	31' 6 5/8"	26' 3 1/2"	**52.58**	39.44	37.56	35.06	31.55	26.29
52' 8"	39' 6"	37' 7 3/8"	35' 1 3/8"	31' 7 1/4"	26' 4"	**52.67**	39.50	37.62	35.11	31.60	26.33
52' 9"	39' 6 3/4"	37' 8 1/8"	35' 2"	31' 7 3/4"	26' 4 1/2"	**52.75**	39.56	37.68	35.17	31.65	26.38
52' 10"	39' 7 1/2"	37' 8 7/8"	35' 2 5/8"	31' 8 3/8"	26' 5"	**52.83**	39.62	37.74	35.22	31.70	26.42
52' 11"	39' 8 1/4"	37' 9 5/8"	35' 3 3/8"	31' 9"	26' 5 1/2"	**52.92**	39.69	37.80	35.28	31.75	26.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
53' 0"	70' 8"	74' 2 3/8"	79' 6"	88' 4"	106' 0"	53.00	70.67	74.20	79.50	88.33	106.00
53' 1"	70' 9 3/8"	74' 3 3/4"	79' 7 1/2"	88' 5 5/8"	106' 2"	53.08	70.78	74.32	79.62	88.47	106.17
53' 2"	70' 10 5/8"	74' 5 1/4"	79' 9"	88' 7 3/8"	106' 4"	53.17	70.89	74.43	79.75	88.61	106.33
53' 3"	71' 0"	74' 6 5/8"	79' 10 1/2"	88' 9"	106' 6"	53.25	71.00	74.55	79.88	88.75	106.50
53' 4"	71' 1 3/8"	74' 8"	80' 0"	88' 10 5/8"	106' 8"	53.33	71.11	74.67	80.00	88.89	106.67
53' 5"	71' 2 5/8"	74' 9 3/8"	80' 1 1/2"	89' 3/8"	106' 10"	53.42	71.22	74.78	80.13	89.03	106.83
53' 6"	71' 4"	74' 10 3/4"	80' 3"	89' 2"	107' 0"	53.50	71.33	74.90	80.25	89.17	107.00
53' 7"	71' 5 3/8"	75' 1/4"	80' 4 1/2"	89' 3 5/8"	107' 2"	53.58	71.44	75.02	80.37	89.31	107.17
53' 8"	71' 6 5/8"	75' 1 5/8"	80' 6"	89' 5 3/8"	107' 4"	53.67	71.56	75.13	80.50	89.44	107.33
53' 9"	71' 8"	75' 3"	80' 7 1/2"	89' 7"	107' 6"	53.75	71.67	75.25	80.63	89.58	107.50
53' 10"	71' 9 3/8"	75' 4 3/8"	80' 9"	89' 8 5/8"	107' 8"	53.83	71.78	75.37	80.75	89.72	107.67
53' 11"	71' 10 5/8"	75' 5 3/4"	80' 10 1/2"	89' 10 3/8"	107' 10"	53.92	71.89	75.48	80.88	89.86	107.83
54' 0"	72' 0"	75' 7 1/4"	81' 0"	90' 0"	108' 0"	54.00	72.00	75.60	81.00	90.00	108.00
54' 1"	72' 1 3/8"	75' 8 5/8"	81' 1 1/2"	90' 1 5/8"	108' 2"	54.08	72.11	75.72	81.12	90.14	108.17
54' 2"	72' 2 5/8"	75' 10"	81' 3"	90' 3 3/8"	108' 4"	54.17	72.22	75.83	81.25	90.28	108.33
54' 3"	72' 4"	75' 11 3/8"	81' 4 1/2"	90' 5"	108' 6"	54.25	72.33	75.95	81.38	90.42	108.50
54' 4"	72' 5 3/8"	76' 3/4"	81' 6"	90' 6 5/8"	108' 8"	54.33	72.44	76.07	81.50	90.56	108.67
54' 5"	72' 6 5/8"	76' 2 1/4"	81' 7 1/2"	90' 8 3/8"	108' 10"	54.42	72.56	76.18	81.63	90.69	108.83
54' 6"	72' 8"	76' 3 5/8"	81' 9"	90' 10"	109' 0"	54.50	72.67	76.30	81.75	90.83	109.00
54' 7"	72' 9 3/8"	76' 5"	81' 10 1/2"	90' 11 5/8"	109' 2"	54.58	72.78	76.42	81.87	90.97	109.17
54' 8"	72' 10 5/8"	76' 6 3/8"	82' 0"	91' 1 3/8"	109' 4"	54.67	72.89	76.53	82.00	91.11	109.33
54' 9"	73' 0"	76' 7 3/4"	82' 1 1/2"	91' 3"	109' 6"	54.75	73.00	76.65	82.13	91.25	109.50
54' 10"	73' 1 3/8"	76' 9 1/4"	82' 3"	91' 4 5/8"	109' 8"	54.83	73.11	76.77	82.25	91.39	109.67
54' 11"	73' 2 5/8"	76' 10 5/8"	82' 4 1/2"	91' 6 3/8"	109' 10"	54.92	73.22	76.88	82.38	91.53	109.83
55' 0"	73' 4"	77' 0"	82' 6"	91' 8"	110' 0"	55.00	73.33	77.00	82.50	91.67	110.00
55' 1"	73' 5 3/8"	77' 1 3/8"	82' 7 1/2"	91' 9 5/8"	110' 2"	55.08	73.44	77.12	82.62	91.81	110.17
55' 2"	73' 6 5/8"	77' 2 3/4"	82' 9"	91' 11 3/8"	110' 4"	55.17	73.56	77.23	82.75	91.94	110.33
55' 3"	73' 8"	77' 4 1/4"	82' 10 1/2"	92' 1"	110' 6"	55.25	73.67	77.35	82.88	92.08	110.50
55' 4"	73' 9 3/8"	77' 5 5/8"	83' 0"	92' 2 5/8"	110' 8"	55.33	73.78	77.47	83.00	92.22	110.67
55' 5"	73' 10 5/8"	77' 7"	83' 1 1/2"	92' 4 3/8"	110' 10"	55.42	73.89	77.58	83.13	92.36	110.83
55' 6"	74' 0"	77' 8 3/8"	83' 3"	92' 6"	111' 0"	55.50	74.00	77.70	83.25	92.50	111.00
55' 7"	74' 1 3/8"	77' 9 3/4"	83' 4 1/2"	92' 7 5/8"	111' 2"	55.58	74.11	77.82	83.37	92.64	111.17
55' 8"	74' 2 5/8"	77' 11 1/4"	83' 6"	92' 9 3/8"	111' 4"	55.67	74.22	77.93	83.50	92.78	111.33
55' 9"	74' 4"	78' 5/8"	83' 7 1/2"	92' 11"	111' 6"	55.75	74.33	78.05	83.63	92.92	111.50
55' 10"	74' 5 3/8"	78' 2"	83' 9"	93' 5/8"	111' 8"	55.83	74.44	78.17	83.75	93.06	111.67
55' 11"	74' 6 5/8"	78' 3 3/8"	83' 10 1/2"	93' 2 3/8"	111' 10"	55.92	74.56	78.28	83.88	93.19	111.83
56' 0"	74' 8"	78' 4 3/4"	84' 0"	93' 4"	112' 0"	56.00	74.67	78.40	84.00	93.33	112.00
56' 1"	74' 9 3/8"	78' 6 1/4"	84' 1 1/2"	93' 5 5/8"	112' 2"	56.08	74.78	78.52	84.12	93.47	112.17
56' 2"	74' 10 5/8"	78' 7 5/8"	84' 3"	93' 7 3/8"	112' 4"	56.17	74.89	78.63	84.25	93.61	112.33
56' 3"	75' 0"	78' 9"	84' 4 1/2"	93' 9"	112' 6"	56.25	75.00	78.75	84.38	93.75	112.50
56' 4"	75' 1 3/8"	78' 10 3/8"	84' 6"	93' 10 5/8"	112' 8"	56.33	75.11	78.87	84.50	93.89	112.67
56' 5"	75' 2 5/8"	78' 11 3/4"	84' 7 1/2"	94' 3/8"	112' 10"	56.42	75.22	78.98	84.63	94.03	112.83
56' 6"	75' 4"	79' 1 1/4"	84' 9"	94' 2"	113' 0"	56.50	75.33	79.10	84.75	94.17	113.00
56' 7"	75' 5 3/8"	79' 2 5/8"	84' 10 1/2"	94' 3 5/8"	113' 2"	56.58	75.44	79.22	84.87	94.31	113.17
56' 8"	75' 6 5/8"	79' 4"	85' 0"	94' 5 3/8"	113' 4"	56.67	75.56	79.33	85.00	94.44	113.33
56' 9"	75' 8"	79' 5 3/8"	85' 1 1/2"	94' 7"	113' 6"	56.75	75.67	79.45	85.13	94.58	113.50
56' 10"	75' 9 3/8"	79' 6 3/4"	85' 3"	94' 8 5/8"	113' 8"	56.83	75.78	79.57	85.25	94.72	113.67
56' 11"	75' 10 5/8"	79' 8 1/4"	85' 4 1/2"	94' 10 3/8"	113' 10"	56.92	75.89	79.68	85.38	94.86	113.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
53' 0"	39' 9"	37' 10 1/4"	35' 4"	31' 9 5/8"	26' 6"	**53.00**	39.75	37.86	35.33	31.80	26.50
53' 1"	39' 9 3/4"	37' 11"	35' 4 5/8"	31' 10 1/4"	26' 6 1/2"	**53.08**	39.81	37.92	35.39	31.85	26.54
53' 2"	39' 10 1/2"	37' 11 3/4"	35' 5 3/8"	31' 10 3/4"	26' 7"	**53.17**	39.87	37.98	35.44	31.90	26.58
53' 3"	39' 11 1/4"	38' 3/8"	35' 6"	31' 11 3/8"	26' 7 1/2"	**53.25**	39.94	38.04	35.50	31.95	26.63
53' 4"	40' 0"	38' 1 1/8"	35' 6 5/8"	32' 0"	26' 8"	**53.33**	40.00	38.10	35.56	32.00	26.67
53' 5"	40' 3/4"	38' 1 7/8"	35' 7 3/8"	32' 5/8"	26' 8 1/2"	**53.42**	40.06	38.15	35.61	32.05	26.71
53' 6"	40' 1 1/2"	38' 2 5/8"	35' 8"	32' 1 1/4"	26' 9"	**53.50**	40.13	38.21	35.67	32.10	26.75
53' 7"	40' 2 1/4"	38' 3 1/4"	35' 8 5/8"	32' 1 3/4"	26' 9 1/2"	**53.58**	40.19	38.27	35.72	32.15	26.79
53' 8"	40' 3"	38' 4"	35' 9 3/8"	32' 2 3/8"	26' 10"	**53.67**	40.25	38.33	35.78	32.20	26.83
53' 9"	40' 3 3/4"	38' 4 3/4"	35' 10"	32' 3"	26' 10 1/2"	**53.75**	40.31	38.39	35.83	32.25	26.88
53' 10"	40' 4 1/2"	38' 5 3/8"	35' 10 5/8"	32' 3 5/8"	26' 11"	**53.83**	40.37	38.45	35.89	32.30	26.92
53' 11"	40' 5 1/4"	38' 6 1/8"	35' 11 3/8"	32' 4 1/4"	26' 11 1/2"	**53.92**	40.44	38.51	35.94	32.35	26.96
54' 0"	40' 6"	38' 6 7/8"	36' 0"	32' 4 3/4"	27' 0"	**54.00**	40.50	38.57	36.00	32.40	27.00
54' 1"	40' 6 3/4"	38' 7 5/8"	36' 5/8"	32' 5 3/8"	27' 1/2"	**54.08**	40.56	38.63	36.06	32.45	27.04
54' 2"	40' 7 1/2"	38' 8 1/4"	36' 1 3/8"	32' 6"	27' 1"	**54.17**	40.62	38.69	36.11	32.50	27.08
54' 3"	40' 8 1/4"	38' 9"	36' 2"	32' 6 5/8"	27' 1 1/2"	**54.25**	40.69	38.75	36.17	32.55	27.13
54' 4"	40' 9"	38' 9 3/4"	36' 2 5/8"	32' 7 1/4"	27' 2"	**54.33**	40.75	38.81	36.22	32.60	27.17
54' 5"	40' 9 3/4"	38' 10 3/8"	36' 3 3/8"	32' 7 3/4"	27' 2 1/2"	**54.42**	40.81	38.87	36.28	32.65	27.21
54' 6"	40' 10 1/2"	38' 11 1/8"	36' 4"	32' 8 3/8"	27' 3"	**54.50**	40.88	38.93	36.33	32.70	27.25
54' 7"	40' 11 1/4"	38' 11 7/8"	36' 4 5/8"	32' 9"	27' 3 1/2"	**54.58**	40.94	38.99	36.39	32.75	27.29
54' 8"	41' 0"	39' 5/8"	36' 5 3/8"	32' 9 5/8"	27' 4"	**54.67**	41.00	39.05	36.44	32.80	27.33
54' 9"	41' 3/4"	39' 1 1/4"	36' 6"	32' 10 1/4"	27' 4 1/2"	**54.75**	41.06	39.11	36.50	32.85	27.38
54' 10"	41' 1 1/2"	39' 2"	36' 6 5/8"	32' 10 3/4"	27' 5"	**54.83**	41.12	39.17	36.56	32.90	27.42
54' 11"	41' 2 1/4"	39' 2 3/4"	36' 7 3/8"	32' 11 3/8"	27' 5 1/2"	**54.92**	41.19	39.23	36.61	32.95	27.46
55' 0"	41' 3"	39' 3 3/8"	36' 8"	33' 0"	27' 6"	**55.00**	41.25	39.29	36.67	33.00	27.50
55' 1"	41' 3 3/4"	39' 4 1/8"	36' 8 5/8"	33' 5/8"	27' 6 1/2"	**55.08**	41.31	39.35	36.72	33.05	27.54
55' 2"	41' 4 1/2"	39' 4 7/8"	36' 9 3/8"	33' 1 1/4"	27' 7"	**55.17**	41.37	39.40	36.78	33.10	27.58
55' 3"	41' 5 1/4"	39' 5 5/8"	36' 10"	33' 1 3/4"	27' 7 1/2"	**55.25**	41.44	39.46	36.83	33.15	27.63
55' 4"	41' 6"	39' 6 1/4"	36' 10 5/8"	33' 2 3/8"	27' 8"	**55.33**	41.50	39.52	36.89	33.20	27.67
55' 5"	41' 6 3/4"	39' 7"	36' 11 3/8"	33' 3"	27' 8 1/2"	**55.42**	41.56	39.58	36.94	33.25	27.71
55' 6"	41' 7 1/2"	39' 7 3/4"	37' 0"	33' 3 5/8"	27' 9"	**55.50**	41.63	39.64	37.00	33.30	27.75
55' 7"	41' 8 1/4"	39' 8 3/8"	37' 5/8"	33' 4 1/4"	27' 9 1/2"	**55.58**	41.69	39.70	37.06	33.35	27.79
55' 8"	41' 9"	39' 9 1/8"	37' 1 3/8"	33' 4 3/4"	27' 10"	**55.67**	41.75	39.76	37.11	33.40	27.83
55' 9"	41' 9 3/4"	39' 9 7/8"	37' 2"	33' 5 3/8"	27' 10 1/2"	**55.75**	41.81	39.82	37.17	33.45	27.88
55' 10"	41' 10 1/2"	39' 10 5/8"	37' 2 5/8"	33' 6"	27' 11"	**55.83**	41.87	39.88	37.22	33.50	27.92
55' 11"	41' 11 1/4"	39' 11 1/4"	37' 3 3/8"	33' 6 5/8"	27' 11 1/2"	**55.92**	41.94	39.94	37.28	33.55	27.96
56' 0"	42' 0"	40' 0"	37' 4"	33' 7 1/4"	28' 0"	**56.00**	42.00	40.00	37.33	33.60	28.00
56' 1"	42' 3/4"	40' 3/4"	37' 4 5/8"	33' 7 3/4"	28' 1/2"	**56.08**	42.06	40.06	37.39	33.65	28.04
56' 2"	42' 1 1/2"	40' 1 3/8"	37' 5 3/8"	33' 8 3/8"	28' 1"	**56.17**	42.12	40.12	37.44	33.70	28.08
56' 3"	42' 2 1/4"	40' 2 1/8"	37' 6"	33' 9"	28' 1 1/2"	**56.25**	42.19	40.18	37.50	33.75	28.13
56' 4"	42' 3"	40' 2 7/8"	37' 6 5/8"	33' 9 5/8"	28' 2"	**56.33**	42.25	40.24	37.56	33.80	28.17
56' 5"	42' 3 3/4"	40' 3 5/8"	37' 7 3/8"	33' 10 1/4"	28' 2 1/2"	**56.42**	42.31	40.30	37.61	33.85	28.21
56' 6"	42' 4 1/2"	40' 4 1/4"	37' 8"	33' 10 3/4"	28' 3"	**56.50**	42.38	40.36	37.67	33.90	28.25
56' 7"	42' 5 1/4"	40' 5"	37' 8 5/8"	33' 11 3/8"	28' 3 1/2"	**56.58**	42.44	40.42	37.72	33.95	28.29
56' 8"	42' 6"	40' 5 3/4"	37' 9 3/8"	34' 0"	28' 4"	**56.67**	42.50	40.48	37.78	34.00	28.33
56' 9"	42' 6 3/4"	40' 6 3/8"	37' 10"	34' 5/8"	28' 4 1/2"	**56.75**	42.56	40.54	37.83	34.05	28.38
56' 10"	42' 7 1/2"	40' 7 1/8"	37' 10 5/8"	34' 1 1/4"	28' 5"	**56.83**	42.62	40.60	37.89	34.10	28.42
56' 11"	42' 8 1/4"	40' 7 7/8"	37' 11 3/8"	34' 1 3/4"	28' 5 1/2"	**56.92**	42.69	40.65	37.94	34.15	28.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
57' 0"	76' 0"	79' 9 5/8"	85' 6"	95' 0"	114' 0"	**57.00**	76.00	79.80	85.50	95.00	114.00
57' 1"	76' 1 3/8"	79' 11"	85' 7 1/2"	95' 1 5/8"	114' 2"	**57.08**	76.11	79.92	85.62	95.14	114.17
57' 2"	76' 2 5/8"	80' 3/8"	85' 9"	95' 3 3/8"	114' 4"	**57.17**	76.22	80.03	85.75	95.28	114.33
57' 3"	76' 4"	80' 1 3/4"	85' 10 1/2"	95' 5"	114' 6"	**57.25**	76.33	80.15	85.88	95.42	114.50
57' 4"	76' 5 3/8"	80' 3 1/4"	86' 0"	95' 6 5/8"	114' 8"	**57.33**	76.44	80.27	86.00	95.56	114.67
57' 5"	76' 6 5/8"	80' 4 5/8"	86' 1 1/2"	95' 8 3/8"	114' 10"	**57.42**	76.56	80.38	86.13	95.69	114.83
57' 6"	76' 8"	80' 6"	86' 3"	95' 10"	115' 0"	**57.50**	76.67	80.50	86.25	95.83	115.00
57' 7"	76' 9 3/8"	80' 7 3/8"	86' 4 1/2"	95' 11 5/8"	115' 2"	**57.58**	76.78	80.62	86.37	95.97	115.17
57' 8"	76' 10 5/8"	80' 8 3/4"	86' 6"	96' 1 3/8"	115' 4"	**57.67**	76.89	80.73	86.50	96.11	115.33
57' 9"	77' 0"	80' 10 1/4"	86' 7 1/2"	96' 3"	115' 6"	**57.75**	77.00	80.85	86.63	96.25	115.50
57' 10"	77' 1 3/8"	80' 11 5/8"	86' 9"	96' 4 5/8"	115' 8"	**57.83**	77.11	80.97	86.75	96.39	115.67
57' 11"	77' 2 5/8"	81' 1"	86' 10 1/2"	96' 6 3/8"	115' 10"	**57.92**	77.22	81.08	86.88	96.53	115.83
58' 0"	77' 4"	81' 2 3/8"	87' 0"	96' 8"	116' 0"	**58.00**	77.33	81.20	87.00	96.67	116.00
58' 1"	77' 5 3/8"	81' 3 3/4"	87' 1 1/2"	96' 9 5/8"	116' 2"	**58.08**	77.44	81.32	87.12	96.81	116.17
58' 2"	77' 6 5/8"	81' 5 1/4"	87' 3"	96' 11 3/8"	116' 4"	**58.17**	77.56	81.43	87.25	96.94	116.33
58' 3"	77' 8"	81' 6 5/8"	87' 4 1/2"	97' 1"	116' 6"	**58.25**	77.67	81.55	87.38	97.08	116.50
58' 4"	77' 9 3/8"	81' 8"	87' 6"	97' 2 5/8"	116' 8"	**58.33**	77.78	81.67	87.50	97.22	116.67
58' 5"	77' 10 5/8"	81' 9 3/8"	87' 7 1/2"	97' 4 3/8"	116' 10"	**58.42**	77.89	81.78	87.63	97.36	116.83
58' 6"	78' 0"	81' 10 3/4"	87' 9"	97' 6"	117' 0"	**58.50**	78.00	81.90	87.75	97.50	117.00
58' 7"	78' 1 3/8"	82' 1/4"	87' 10 1/2"	97' 7 5/8"	117' 2"	**58.58**	78.11	82.02	87.87	97.64	117.17
58' 8"	78' 2 5/8"	82' 1 5/8"	88' 0"	97' 9 3/8"	117' 4"	**58.67**	78.22	82.13	88.00	97.78	117.33
58' 9"	78' 4"	82' 3"	88' 1 1/2"	97' 11"	117' 6"	**58.75**	78.33	82.25	88.13	97.92	117.50
58' 10"	78' 5 3/8"	82' 4 3/8"	88' 3"	98' 5/8"	117' 8"	**58.83**	78.44	82.37	88.25	98.06	117.67
58' 11"	78' 6 5/8"	82' 5 3/4"	88' 4 1/2"	98' 2 3/8"	117' 10"	**58.92**	78.56	82.48	88.38	98.19	117.83
59' 0"	78' 8"	82' 7 1/4"	88' 6"	98' 4"	118' 0"	**59.00**	78.67	82.60	88.50	98.33	118.00
59' 1"	78' 9 3/8"	82' 8 5/8"	88' 7 1/2"	98' 5 5/8"	118' 2"	**59.08**	78.78	82.72	88.62	98.47	118.17
59' 2"	78' 10 5/8"	82' 10"	88' 9"	98' 7 3/8"	118' 4"	**59.17**	78.89	82.83	88.75	98.61	118.33
59' 3"	79' 0"	82' 11 3/8"	88' 10 1/2"	98' 9"	118' 6"	**59.25**	79.00	82.95	88.88	98.75	118.50
59' 4"	79' 1 3/8"	83' 3/4"	89' 0"	98' 10 5/8"	118' 8"	**59.33**	79.11	83.07	89.00	98.89	118.67
59' 5"	79' 2 5/8"	83' 2 1/4"	89' 1 1/2"	99' 3/8"	118' 10"	**59.42**	79.22	83.18	89.13	99.03	118.83
59' 6"	79' 4"	83' 3 5/8"	89' 3"	99' 2"	119' 0"	**59.50**	79.33	83.30	89.25	99.17	119.00
59' 7"	79' 5 3/8"	83' 5"	89' 4 1/2"	99' 3 5/8"	119' 2"	**59.58**	79.44	83.42	89.37	99.31	119.17
59' 8"	79' 6 5/8"	83' 6 3/8"	89' 6"	99' 5 3/8"	119' 4"	**59.67**	79.56	83.53	89.50	99.44	119.33
59' 9"	79' 8"	83' 7 3/4"	89' 7 1/2"	99' 7"	119' 6"	**59.75**	79.67	83.65	89.63	99.58	119.50
59' 10"	79' 9 3/8"	83' 9 1/4"	89' 9"	99' 8 5/8"	119' 8"	**59.83**	79.78	83.77	89.75	99.72	119.67
59' 11"	79' 10 5/8"	83' 10 5/8"	89' 10 1/2"	99' 10 3/8"	119' 10"	**59.92**	79.89	83.88	89.88	99.86	119.83
60' 0"	80' 0"	84' 0"	90' 0"	100' 0"	120' 0"	**60.00**	80.00	84.00	90.00	100.00	120.00
60' 1"	80' 1 3/8"	84' 1 3/8"	90' 1 1/2"	100' 1 5/8"	120' 2"	**60.08**	80.11	84.12	90.12	100.14	120.17
60' 2"	80' 2 5/8"	84' 2 3/4"	90' 3"	100' 3 3/8"	120' 4"	**60.17**	80.22	84.23	90.25	100.28	120.33
60' 3"	80' 4"	84' 4 1/4"	90' 4 1/2"	100' 5"	120' 6"	**60.25**	80.33	84.35	90.38	100.42	120.50
60' 4"	80' 5 3/8"	84' 5 5/8"	90' 6"	100' 6 5/8"	120' 8"	**60.33**	80.44	84.47	90.50	100.56	120.67
60' 5"	80' 6 5/8"	84' 7"	90' 7 1/2"	100' 8 3/8"	120' 10"	**60.42**	80.56	84.58	90.63	100.69	120.83
60' 6"	80' 8"	84' 8 3/8"	90' 9"	100' 10"	121' 0"	**60.50**	80.67	84.70	90.75	100.83	121.00
60' 7"	80' 9 3/8"	84' 9 3/4"	90' 10 1/2"	100' 11 5/8"	121' 2"	**60.58**	80.78	84.82	90.87	100.97	121.17
60' 8"	80' 10 5/8"	84' 11 1/4"	91' 0"	101' 1 3/8"	121' 4"	**60.67**	80.89	84.93	91.00	101.11	121.33
60' 9"	81' 0"	85' 5/8"	91' 1 1/2"	101' 3"	121' 6"	**60.75**	81.00	85.05	91.13	101.25	121.50
60' 10"	81' 1 3/8"	85' 2"	91' 3"	101' 4 5/8"	121' 8"	**60.83**	81.11	85.17	91.25	101.39	121.67
60' 11"	81' 2 5/8"	85' 3 3/8"	91' 4 1/2"	101' 6 3/8"	121' 10"	**60.92**	81.22	85.28	91.38	101.53	121.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
57' 0"	42' 9"	40' 8 5/8"	38' 0"	34' 2 3/8"	28' 6"	**57.00**	42.75	40.71	38.00	34.20	28.50
57' 1"	42' 9 3/4"	40' 9 1/4"	38' 5/8"	34' 3"	28' 6 1/2"	**57.08**	42.81	40.77	38.06	34.25	28.54
57' 2"	42' 10 1/2"	40' 10"	38' 1 3/8"	34' 3 5/8"	28' 7"	**57.17**	42.87	40.83	38.11	34.30	28.58
57' 3"	42' 11 1/4"	40' 10 3/4"	38' 2"	34' 4 1/4"	28' 7 1/2"	**57.25**	42.94	40.89	38.17	34.35	28.63
57' 4"	43' 0"	40' 11 3/8"	38' 2 5/8"	34' 4 3/4"	28' 8"	**57.33**	43.00	40.95	38.22	34.40	28.67
57' 5"	43' 3/4"	41' 1/8"	38' 3 3/8"	34' 5 3/8"	28' 8 1/2"	**57.42**	43.06	41.01	38.28	34.45	28.71
57' 6"	43' 1 1/2"	41' 7/8"	38' 4"	34' 6"	28' 9"	**57.50**	43.13	41.07	38.33	34.50	28.75
57' 7"	43' 2 1/4"	41' 1 5/8"	38' 4 5/8"	34' 6 5/8"	28' 9 1/2"	**57.58**	43.19	41.13	38.39	34.55	28.79
57' 8"	43' 3"	41' 2 1/4"	38' 5 3/8"	34' 7 1/4"	28' 10"	**57.67**	43.25	41.19	38.44	34.60	28.83
57' 9"	43' 3 3/4"	41' 3"	38' 6"	34' 7 3/4"	28' 10 1/2"	**57.75**	43.31	41.25	38.50	34.65	28.88
57' 10"	43' 4 1/2"	41' 3 3/4"	38' 6 5/8"	34' 8 3/8"	28' 11"	**57.83**	43.37	41.31	38.56	34.70	28.92
57' 11"	43' 5 1/4"	41' 4 3/8"	38' 7 3/8"	34' 9"	28' 11 1/2"	**57.92**	43.44	41.37	38.61	34.75	28.96
58' 0"	43' 6"	41' 5 1/8"	38' 8"	34' 9 5/8"	29' 0"	**58.00**	43.50	41.43	38.67	34.80	29.00
58' 1"	43' 6 3/4"	41' 5 7/8"	38' 8 5/8"	34' 10 1/4"	29' 1/2"	**58.08**	43.56	41.49	38.72	34.85	29.04
58' 2"	43' 7 1/2"	41' 6 5/8"	38' 9 3/8"	34' 10 3/4"	29' 1"	**58.17**	43.62	41.55	38.78	34.90	29.08
58' 3"	43' 8 1/4"	41' 7 1/4"	38' 10"	34' 11 3/8"	29' 1 1/2"	**58.25**	43.69	41.61	38.83	34.95	29.13
58' 4"	43' 9"	41' 8"	38' 10 5/8"	35' 0"	29' 2"	**58.33**	43.75	41.67	38.89	35.00	29.17
58' 5"	43' 9 3/4"	41' 8 3/4"	38' 11 3/8"	35' 5/8"	29' 2 1/2"	**58.42**	43.81	41.73	38.94	35.05	29.21
58' 6"	43' 10 1/2"	41' 9 3/8"	39' 0"	35' 1 1/4"	29' 3"	**58.50**	43.88	41.79	39.00	35.10	29.25
58' 7"	43' 11 1/4"	41' 10 1/8"	39' 5/8"	35' 1 3/4"	29' 3 1/2"	**58.58**	43.94	41.85	39.06	35.15	29.29
58' 8"	44' 0"	41' 10 7/8"	39' 1 3/8"	35' 2 3/8"	29' 4"	**58.67**	44.00	41.90	39.11	35.20	29.33
58' 9"	44' 3/4"	41' 11 5/8"	39' 2"	35' 3"	29' 4 1/2"	**58.75**	44.06	41.96	39.17	35.25	29.38
58' 10"	44' 1 1/2"	42' 1/4"	39' 2 5/8"	35' 3 5/8"	29' 5"	**58.83**	44.12	42.02	39.22	35.30	29.42
58' 11"	44' 2 1/4"	42' 1"	39' 3 3/8"	35' 4 1/4"	29' 5 1/2"	**58.92**	44.19	42.08	39.28	35.35	29.46
59' 0"	44' 3"	42' 1 3/4"	39' 4"	35' 4 3/4"	29' 6"	**59.00**	44.25	42.14	39.33	35.40	29.50
59' 1"	44' 3 3/4"	42' 2 3/8"	39' 4 5/8"	35' 5 3/8"	29' 6 1/2"	**59.08**	44.31	42.20	39.39	35.45	29.54
59' 2"	44' 4 1/2"	42' 3 1/8"	39' 5 3/8"	35' 6"	29' 7"	**59.17**	44.37	42.26	39.44	35.50	29.58
59' 3"	44' 5 1/4"	42' 3 7/8"	39' 6"	35' 6 5/8"	29' 7 1/2"	**59.25**	44.44	42.32	39.50	35.55	29.63
59' 4"	44' 6"	42' 4 5/8"	39' 6 5/8"	35' 7 1/4"	29' 8"	**59.33**	44.50	42.38	39.56	35.60	29.67
59' 5"	44' 6 3/4"	42' 5 1/4"	39' 7 3/8"	35' 7 3/4"	29' 8 1/2"	**59.42**	44.56	42.44	39.61	35.65	29.71
59' 6"	44' 7 1/2"	42' 6"	39' 8"	35' 8 3/8"	29' 9"	**59.50**	44.63	42.50	39.67	35.70	29.75
59' 7"	44' 8 1/4"	42' 6 3/4"	39' 8 5/8"	35' 9"	29' 9 1/2"	**59.58**	44.69	42.56	39.72	35.75	29.79
59' 8"	44' 9"	42' 7 3/8"	39' 9 3/8"	35' 9 5/8"	29' 10"	**59.67**	44.75	42.62	39.78	35.80	29.83
59' 9"	44' 9 3/4"	42' 8 1/8"	39' 10"	35' 10 1/4"	29' 10 1/2"	**59.75**	44.81	42.68	39.83	35.85	29.88
59' 10"	44' 10 1/2"	42' 8 7/8"	39' 10 5/8"	35' 10 3/4"	29' 11"	**59.83**	44.87	42.74	39.89	35.90	29.92
59' 11"	44' 11 1/4"	42' 9 5/8"	39' 11 3/8"	35' 11 3/8"	29' 11 1/2"	**59.92**	44.94	42.80	39.94	35.95	29.96
60' 0"	45' 0"	42' 10 1/4"	40' 0"	36' 0"	30' 0"	**60.00**	45.00	42.86	40.00	36.00	30.00
60' 1"	45' 3/4"	42' 11"	40' 5/8"	36' 5/8"	30' 1/2"	**60.08**	45.06	42.92	40.06	36.05	30.04
60' 2"	45' 1 1/2"	42' 11 3/4"	40' 1 3/8"	36' 1 1/4"	30' 1"	**60.17**	45.12	42.98	40.11	36.10	30.08
60' 3"	45' 2 1/4"	43' 3/8"	40' 2"	36' 1 3/4"	30' 1 1/2"	**60.25**	45.19	43.04	40.17	36.15	30.13
60' 4"	45' 3"	43' 1 1/8"	40' 2 5/8"	36' 2 3/8"	30' 2"	**60.33**	45.25	43.10	40.22	36.20	30.17
60' 5"	45' 3 3/4"	43' 1 7/8"	40' 3 3/8"	36' 3"	30' 2 1/2"	**60.42**	45.31	43.15	40.28	36.25	30.21
60' 6"	45' 4 1/2"	43' 2 5/8"	40' 4"	36' 3 5/8"	30' 3"	**60.50**	45.38	43.21	40.33	36.30	30.25
60' 7"	45' 5 1/4"	43' 3 1/4"	40' 4 5/8"	36' 4 1/4"	30' 3 1/2"	**60.58**	45.44	43.27	40.39	36.35	30.29
60' 8"	45' 6"	43' 4"	40' 5 3/8"	36' 4 3/4"	30' 4"	**60.67**	45.50	43.33	40.44	36.40	30.33
60' 9"	45' 6 3/4"	43' 4 3/4"	40' 6"	36' 5 3/8"	30' 4 1/2"	**60.75**	45.56	43.39	40.50	36.45	30.38
60' 10"	45' 7 1/2"	43' 5 3/8"	40' 6 5/8"	36' 6"	30' 5"	**60.83**	45.62	43.45	40.56	36.50	30.42
60' 11"	45' 8 1/4"	43' 6 1/8"	40' 7 3/8"	36' 6 5/8"	30' 5 1/2"	**60.92**	45.69	43.51	40.61	36.55	30.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
61' 0"	81' 4"	85' 4 3/4"	91' 6"	101' 8"	122' 0"	61.00	81.33	85.40	91.50	101.67	122.00
61' 1"	81' 5 3/8"	85' 6 1/4"	91' 7 1/2"	101' 9 5/8"	122' 2"	61.08	81.44	85.52	91.62	101.81	122.17
61' 2"	81' 6 5/8"	85' 7 5/8"	91' 9"	101' 11 3/8"	122' 4"	61.17	81.56	85.63	91.75	101.94	122.33
61' 3"	81' 8"	85' 9"	91' 10 1/2"	102' 1"	122' 6"	61.25	81.67	85.75	91.88	102.08	122.50
61' 4"	81' 9 3/8"	85' 10 3/8"	92' 0"	102' 2 5/8"	122' 8"	61.33	81.78	85.87	92.00	102.22	122.67
61' 5"	81' 10 5/8"	85' 11 3/4"	92' 1 1/2"	102' 4 3/8"	122' 10"	61.42	81.89	85.98	92.13	102.36	122.83
61' 6"	82' 0"	86' 1 1/4"	92' 3"	102' 6"	123' 0"	61.50	82.00	86.10	92.25	102.50	123.00
61' 7"	82' 1 3/8"	86' 2 5/8"	92' 4 1/2"	102' 7 5/8"	123' 2"	61.58	82.11	86.22	92.37	102.64	123.17
61' 8"	82' 2 5/8"	86' 4"	92' 6"	102' 9 3/8"	123' 4"	61.67	82.22	86.33	92.50	102.78	123.33
61' 9"	82' 4"	86' 5 3/8"	92' 7 1/2"	102' 11"	123' 6"	61.75	82.33	86.45	92.63	102.92	123.50
61' 10"	82' 5 3/8"	86' 6 3/4"	92' 9"	103' 5/8"	123' 8"	61.83	82.44	86.57	92.75	103.06	123.67
61' 11"	82' 6 5/8"	86' 8 1/4"	92' 10 1/2"	103' 2 3/8"	123' 10"	61.92	82.56	86.68	92.88	103.19	123.83
62' 0"	82' 8"	86' 9 5/8"	93' 0"	103' 4"	124' 0"	62.00	82.67	86.80	93.00	103.33	124.00
62' 1"	82' 9 3/8"	86' 11"	93' 1 1/2"	103' 5 5/8"	124' 2"	62.08	82.78	86.92	93.12	103.47	124.17
62' 2"	82' 10 5/8"	87' 3/8"	93' 3"	103' 7 3/8"	124' 4"	62.17	82.89	87.03	93.25	103.61	124.33
62' 3"	83' 0"	87' 1 3/4"	93' 4 1/2"	103' 9"	124' 6"	62.25	83.00	87.15	93.38	103.75	124.50
62' 4"	83' 1 3/8"	87' 3 1/4"	93' 6"	103' 10 5/8"	124' 8"	62.33	83.11	87.27	93.50	103.89	124.67
62' 5"	83' 2 5/8"	87' 4 5/8"	93' 7 1/2"	104' 3/8"	124' 10"	62.42	83.22	87.38	93.63	104.03	124.83
62' 6"	83' 4"	87' 6"	93' 9"	104' 2"	125' 0"	62.50	83.33	87.50	93.75	104.17	125.00
62' 7"	83' 5 3/8"	87' 7 3/8"	93' 10 1/2"	104' 3 5/8"	125' 2"	62.58	83.44	87.62	93.87	104.31	125.17
62' 8"	83' 6 5/8"	87' 8 3/4"	94' 0"	104' 5 3/8"	125' 4"	62.67	83.56	87.73	94.00	104.44	125.33
62' 9"	83' 8"	87' 10 1/4"	94' 1 1/2"	104' 7"	125' 6"	62.75	83.67	87.85	94.13	104.58	125.50
62' 10"	83' 9 3/8"	87' 11 5/8"	94' 3"	104' 8 5/8"	125' 8"	62.83	83.78	87.97	94.25	104.72	125.67
62' 11"	83' 10 5/8"	88' 1"	94' 4 1/2"	104' 10 3/8"	125' 10"	62.92	83.89	88.08	94.38	104.86	125.83
63' 0"	84' 0"	88' 2 3/8"	94' 6"	105' 0"	126' 0"	63.00	84.00	88.20	94.50	105.00	126.00
63' 1"	84' 1 3/8"	88' 3 3/4"	94' 7 1/2"	105' 1 5/8"	126' 2"	63.08	84.11	88.32	94.62	105.14	126.17
63' 2"	84' 2 5/8"	88' 5 1/4"	94' 9"	105' 3 3/8"	126' 4"	63.17	84.22	88.43	94.75	105.28	126.33
63' 3"	84' 4"	88' 6 5/8"	94' 10 1/2"	105' 5"	126' 6"	63.25	84.33	88.55	94.88	105.42	126.50
63' 4"	84' 5 3/8"	88' 8"	95' 0"	105' 6 5/8"	126' 8"	63.33	84.44	88.67	95.00	105.56	126.67
63' 5"	84' 6 5/8"	88' 9 3/8"	95' 1 1/2"	105' 8 3/8"	126' 10"	63.42	84.56	88.78	95.13	105.69	126.83
63' 6"	84' 8"	88' 10 3/4"	95' 3"	105' 10"	127' 0"	63.50	84.67	88.90	95.25	105.83	127.00
63' 7"	84' 9 3/8"	89' 1/4"	95' 4 1/2"	105' 11 5/8"	127' 2"	63.58	84.78	89.02	95.37	105.97	127.17
63' 8"	84' 10 5/8"	89' 1 5/8"	95' 6"	106' 1 3/8"	127' 4"	63.67	84.89	89.13	95.50	106.11	127.33
63' 9"	85' 0"	89' 3"	95' 7 1/2"	106' 3"	127' 6"	63.75	85.00	89.25	95.63	106.25	127.50
63' 10"	85' 1 3/8"	89' 4 3/8"	95' 9"	106' 4 5/8"	127' 8"	63.83	85.11	89.37	95.75	106.39	127.67
63' 11"	85' 2 5/8"	89' 5 3/4"	95' 10 1/2"	106' 6 3/8"	127' 10"	63.92	85.22	89.48	95.88	106.53	127.83
64' 0"	85' 4"	89' 7 1/4"	96' 0"	106' 8"	128' 0"	64.00	85.33	89.60	96.00	106.67	128.00
64' 1"	85' 5 3/8"	89' 8 5/8"	96' 1 1/2"	106' 9 5/8"	128' 2"	64.08	85.44	89.72	96.12	106.81	128.17
64' 2"	85' 6 5/8"	89' 10"	96' 3"	106' 11 3/8"	128' 4"	64.17	85.56	89.83	96.25	106.94	128.33
64' 3"	85' 8"	89' 11 3/8"	96' 4 1/2"	107' 1"	128' 6"	64.25	85.67	89.95	96.38	107.08	128.50
64' 4"	85' 9 3/8"	90' 3/4"	96' 6"	107' 2 5/8"	128' 8"	64.33	85.78	90.07	96.50	107.22	128.67
64' 5"	85' 10 5/8"	90' 2 1/4"	96' 7 1/2"	107' 4 3/8"	128' 10"	64.42	85.89	90.18	96.63	107.36	128.83
64' 3 5/8"	85' 8 3/4"	90' 1/4"	96' 5 3/8"	107' 2"	128' 7	64.30	85.73	90.02	96.45	107.17	128.60
64' 7"	86' 1 3/8"	90' 5"	96' 10 1/2"	107' 7 5/8"	129' 2"	64.58	86.11	90.42	96.87	107.64	129.17
64' 8"	86' 2 5/8"	90' 6 3/8"	97' 0"	107' 9 3/8"	129' 4"	64.67	86.22	90.53	97.00	107.78	129.33
64' 9"	86' 4"	90' 7 3/4"	97' 1 1/2"	107' 11"	129' 6"	64.75	86.33	90.65	97.13	107.92	129.50
64' 10"	86' 5 3/8"	90' 9 1/4"	97' 3"	108' 5/8"	129' 8"	64.83	86.44	90.77	97.25	108.06	129.67
64' 11"	86' 6 5/8"	90' 10 5/8"	97' 4 1/2"	108' 2 3/8"	129' 10"	64.92	86.56	90.88	97.38	108.19	129.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
61' 0"	45' 9"	43' 6 7/8"	40' 8"	36' 7 1/4"	30' 6"	**61.00**	45.75	43.57	40.67	36.60	30.50
61' 1"	45' 9 3/4"	43' 7 5/8"	40' 8 5/8"	36' 7 3/4"	30' 6 1/2"	**61.08**	45.81	43.63	40.72	36.65	30.54
61' 2"	45' 10 1/2"	43' 8 1/4"	40' 9 3/8"	36' 8 3/8"	30' 7"	**61.17**	45.87	43.69	40.78	36.70	30.58
61' 3"	45' 11 1/4"	43' 9"	40' 10"	36' 9"	30' 7 1/2"	**61.25**	45.94	43.75	40.83	36.75	30.63
61' 4"	46' 0"	43' 9 3/4"	40' 10 5/8"	36' 9 5/8"	30' 8"	**61.33**	46.00	43.81	40.89	36.80	30.67
61' 5"	46' 3/4"	43' 10 3/8"	40' 11 3/8"	36' 10 1/4"	30' 8 1/2"	**61.42**	46.06	43.87	40.94	36.85	30.71
61' 6"	46' 1 1/2"	43' 11 1/8"	41' 0"	36' 10 3/4"	30' 9"	**61.50**	46.13	43.93	41.00	36.90	30.75
61' 7"	46' 2 1/4"	43' 11 7/8"	41' 5/8"	36' 11 3/8"	30' 9 1/2"	**61.58**	46.19	43.99	41.06	36.95	30.79
61' 8"	46' 3"	44' 5/8"	41' 1 3/8"	37' 0"	30' 10"	**61.67**	46.25	44.05	41.11	37.00	30.83
61' 9"	46' 3 3/4"	44' 1 1/4"	41' 2"	37' 5/8"	30' 10 1/2"	**61.75**	46.31	44.11	41.17	37.05	30.88
61' 10"	46' 4 1/2"	44' 2"	41' 2 5/8"	37' 1 1/4"	30' 11"	**61.83**	46.37	44.17	41.22	37.10	30.92
61' 11"	46' 5 1/4"	44' 2 3/4"	41' 3 3/8"	37' 1 3/4"	30' 11 1/2"	**61.92**	46.44	44.23	41.28	37.15	30.96
62' 0"	46' 6"	44' 3 3/8"	41' 4"	37' 2 3/8"	31' 0"	**62.00**	46.50	44.29	41.33	37.20	31.00
62' 1"	46' 6 3/4"	44' 4 1/8"	41' 4 5/8"	37' 3"	31' 1/2"	**62.08**	46.56	44.35	41.39	37.25	31.04
62' 2"	46' 7 1/2"	44' 4 7/8"	41' 5 3/8"	37' 3 5/8"	31' 1"	**62.17**	46.62	44.40	41.44	37.30	31.08
62' 3"	46' 8 1/4"	44' 5 5/8"	41' 6"	37' 4 1/4"	31' 1 1/2"	**62.25**	46.69	44.46	41.50	37.35	31.13
62' 4"	46' 9"	44' 6 1/4"	41' 6 5/8"	37' 4 3/4"	31' 2"	**62.33**	46.75	44.52	41.56	37.40	31.17
62' 5"	46' 9 3/4"	44' 7"	41' 7 3/8"	37' 5 3/8"	31' 2 1/2"	**62.42**	46.81	44.58	41.61	37.45	31.21
62' 6"	46' 10 1/2"	44' 7 3/4"	41' 8"	37' 6"	31' 3"	**62.50**	46.88	44.64	41.67	37.50	31.25
62' 7"	46' 11 1/4"	44' 8 3/8"	41' 8 5/8"	37' 6 5/8"	31' 3 1/2"	**62.58**	46.94	44.70	41.72	37.55	31.29
62' 8"	47' 0"	44' 9 1/8"	41' 9 3/8"	37' 7 1/4"	31' 4"	**62.67**	47.00	44.76	41.78	37.60	31.33
62' 9"	47' 3/4"	44' 9 7/8"	41' 10"	37' 7 3/4"	31' 4 1/2"	**62.75**	47.06	44.82	41.83	37.65	31.38
62' 10"	47' 1 1/2"	44' 10 5/8"	41' 10 5/8"	37' 8 3/8"	31' 5"	**62.83**	47.12	44.88	41.89	37.70	31.42
62' 11"	47' 2 1/4"	44' 11 1/4"	41' 11 3/8"	37' 9"	31' 5 1/2"	**62.92**	47.19	44.94	41.94	37.75	31.46
63' 0"	47' 3"	45' 0"	42' 0"	37' 9 5/8"	31' 6"	63.00	47.25	45.00	42.00	37.80	31.50
63' 1"	47' 3 3/4"	45' 3/4"	42' 5/8"	37' 10 1/4"	31' 6 1/2"	63.08	47.31	45.06	42.06	37.85	31.54
63' 2"	47' 4 1/2"	45' 1 3/8"	42' 1 3/8"	37' 10 3/4"	31' 7"	63.17	47.37	45.12	42.11	37.90	31.58
63' 3"	47' 5 1/4"	45' 2 1/8"	42' 2"	37' 11 3/8"	31' 7 1/2"	**63.25**	47.44	45.18	42.17	37.95	31.63
63' 4"	47' 6"	45' 2 7/8"	42' 2 5/8"	38' 0"	31' 8"	**63.33**	47.50	45.24	42.22	38.00	31.67
63' 5"	47' 6 3/4"	45' 3 5/8"	42' 3 3/8"	38' 5/8"	31' 8 1/2"	**63.42**	47.56	45.30	42.28	38.05	31.71
63' 6"	47' 7 1/2"	45' 4 1/4"	42' 4"	38' 1 1/4"	31' 9"	**63.50**	47.63	45.36	42.33	38.10	31.75
63' 7"	47' 8 1/4"	45' 5"	42' 4 5/8"	38' 1 3/4"	31' 9 1/2"	**63.58**	47.69	45.42	42.39	38.15	31.79
63' 8"	47' 9"	45' 5 3/4"	42' 5 3/8"	38' 2 3/8"	31' 10"	**63.67**	47.75	45.48	42.44	38.20	31.83
63' 9"	47' 9 3/4"	45' 6 3/8"	42' 6"	38' 3"	31' 10 1/2"	**63.75**	47.81	45.54	42.50	38.25	31.88
63' 10"	47' 10 1/2"	45' 7 1/8"	42' 6 5/8"	38' 3 5/8"	31' 11"	**63.83**	47.87	45.60	42.56	38.30	31.92
63' 11"	47' 11 1/4"	45' 7 7/8"	42' 7 3/8"	38' 4 1/4"	31' 11 1/2"	**63.92**	47.94	45.65	42.61	38.35	31.96
64' 0"	48' 0"	45' 8 5/8"	42' 8"	38' 4 3/4"	32' 0"	**64.00**	48.00	45.71	42.67	38.40	32.00
64' 1"	48' 3/4"	45' 9 1/4"	42' 8 5/8"	38' 5 3/8"	32' 1/2"	**64.08**	48.06	45.77	42.72	38.45	32.04
64' 2"	48' 1 1/2"	45' 10"	42' 9 3/8"	38' 6"	32' 1"	**64.17**	48.12	45.83	42.78	38.50	32.08
64' 3"	48' 2 1/4"	45' 10 3/4"	42' 10"	38' 6 5/8"	32' 1 1/2"	**64.25**	48.19	45.89	42.83	38.55	32.13
64' 4"	48' 3"	45' 11 3/8"	42' 10 5/8"	38' 7 1/4"	32' 2"	**64.33**	48.25	45.95	42.89	38.60	32.17
64' 5"	48' 3 3/4"	46' 1/8"	42' 11 3/8"	38' 7 3/4"	32' 2 1/2"	**64.42**	48.31	46.01	42.94	38.65	32.21
64' 3 5/8"	48' 2 3/4"	45' 11 1/8"	42' 10 3/8"	38' 7"	32' 1 3/4"	**64.30**	48.23	45.93	42.87	38.58	32.15
64' 7"	48' 5 1/4"	46' 1 5/8"	43' 5/8"	38' 9"	32' 3 1/2"	**64.58**	48.44	46.13	43.06	38.75	32.29
64' 8"	48' 6"	46' 2 1/4"	43' 1 3/8"	38' 9 5/8"	32' 4"	**64.67**	48.50	46.19	43.11	38.80	32.33
64' 9"	48' 6 3/4"	46' 3"	43' 2"	38' 10 1/4"	32' 4 1/2"	**64.75**	48.56	46.25	43.17	38.85	32.38
64' 10"	48' 7 1/2"	46' 3 3/4"	43' 2 5/8"	38' 10 3/4"	32' 5"	**64.83**	48.62	46.31	43.22	38.90	32.42
64' 11"	48' 8 1/4"	46' 4 3/8"	43' 3 3/8"	38' 11 3/8"	32' 5 1/2"	**64.92**	48.69	46.37	43.28	38.95	32.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
65' 0"	86' 8"	91' 0"	97' 6"	108' 4"	130' 0"	**65.00**	86.67	91.00	97.50	108.33	130.00
65' 1"	86' 9 3/8"	91' 1 3/8"	97' 7 1/2"	108' 5 5/8"	130' 2"	**65.08**	86.78	91.12	97.62	108.47	130.17
65' 2"	86' 10 5/8"	91' 2 3/4"	97' 9"	108' 7 3/8"	130' 4"	**65.17**	86.89	91.23	97.75	108.61	130.33
65' 3"	87' 0"	91' 4 1/4"	97' 10 1/2"	108' 9"	130' 6"	**65.25**	87.00	91.35	97.88	108.75	130.50
65' 4"	87' 1 3/8"	91' 5 5/8"	98' 0"	108' 10 5/8"	130' 8"	**65.33**	87.11	91.47	98.00	108.89	130.67
65' 5"	87' 2 5/8"	91' 7"	98' 1 1/2"	109' 3/8"	130' 10"	**65.42**	87.22	91.58	98.13	109.03	130.83
65' 6"	87' 4"	91' 8 3/8"	98' 3"	109' 2"	131' 0"	**65.50**	87.33	91.70	98.25	109.17	131.00
65' 7"	87' 5 3/8"	91' 9 3/4"	98' 4 1/2"	109' 3 5/8"	131' 2"	**65.58**	87.44	91.82	98.37	109.31	131.17
65' 8"	87' 6 5/8"	91' 11 1/4"	98' 6"	109' 5 3/8"	131' 4"	**65.67**	87.56	91.93	98.50	109.44	131.33
65' 9"	87' 8"	92' 5/8"	98' 7 1/2"	109' 7"	131' 6"	**65.75**	87.67	92.05	98.63	109.58	131.50
65' 10"	87' 9 3/8"	92' 2"	98' 9"	109' 8 5/8"	131' 8"	**65.83**	87.78	92.17	98.75	109.72	131.67
65' 11"	87' 10 5/8"	92' 3 3/8"	98' 10 1/2"	109' 10 3/8"	131' 10"	**65.92**	87.89	92.28	98.88	109.86	131.83
66' 0"	88' 0"	92' 4 3/4"	99' 0"	110' 0"	132' 0"	**66.00**	88.00	92.40	99.00	110.00	132.00
66' 1"	88' 1 3/8"	92' 6 1/4"	99' 1 1/2"	110' 1 5/8"	132' 2"	**66.08**	88.11	92.52	99.12	110.14	132.17
66' 2"	88' 2 5/8"	92' 7 5/8"	99' 3"	110' 3 3/8"	132' 4"	**66.17**	88.22	92.63	99.25	110.28	132.33
66' 3"	88' 4"	92' 9"	99' 4 1/2"	110' 5"	132' 6"	**66.25**	88.33	92.75	99.38	110.42	132.50
66' 4"	88' 5 3/8"	92' 10 3/8"	99' 6"	110' 6 5/8"	132' 8"	**66.33**	88.44	92.87	99.50	110.56	132.67
66' 5"	88' 6 5/8"	92' 11 3/4"	99' 7 1/2"	110' 8 3/8"	132' 10"	**66.42**	88.56	92.98	99.63	110.69	132.83
66' 6"	88' 8"	93' 1 1/4"	99' 9"	110' 10"	133' 0"	**66.50**	88.67	93.10	99.75	110.83	133.00
66' 7"	88' 9 3/8"	93' 2 5/8"	99' 10 1/2"	110' 11 5/8"	133' 2"	**66.58**	88.78	93.22	99.87	110.97	133.17
66' 8"	88' 10 5/8"	93' 4"	100' 0"	111' 1 3/8"	133' 4"	**66.67**	88.89	93.33	100.00	111.11	133.33
66' 9"	89' 0"	93' 5 3/8"	100' 1 1/2"	111' 3"	133' 6"	**66.75**	89.00	93.45	100.13	111.25	133.50
66' 10"	89' 1 3/8"	93' 6 3/4"	100' 3"	111' 4 5/8"	133' 8"	**66.83**	89.11	93.57	100.25	111.39	133.67
66' 11"	89' 2 5/8"	93' 8 1/4"	100' 4 1/2"	111' 6 3/8"	133' 10"	**66.92**	89.22	93.68	100.38	111.53	133.83
67' 0"	89' 4"	93' 9 5/8"	100' 6"	111' 8"	134' 0"	**67.00**	89.33	93.80	100.50	111.67	134.00
67' 1"	89' 5 3/8"	93' 11"	100' 7 1/2"	111' 9 5/8"	134' 2"	**67.08**	89.44	93.92	100.63	111.81	134.17
67' 2"	89' 6 5/8"	94' 3/8"	100' 9"	111' 11 3/8"	134' 4"	**67.17**	89.56	94.03	100.75	111.94	134.33
67' 3"	89' 8"	94' 1 3/4"	100' 10 1/2"	112' 1"	134' 6"	**67.25**	89.67	94.15	100.88	112.08	134.50
67' 4"	89' 9 3/8"	94' 3 1/4"	101' 0"	112' 2 5/8"	134' 8"	**67.33**	89.78	94.27	101.00	112.22	134.67
67' 5"	89' 10 5/8"	94' 4 5/8"	101' 1 1/2"	112' 4 3/8"	134' 10"	**67.42**	89.89	94.38	101.13	112.36	134.83
67' 6"	90' 0"	94' 6"	101' 3"	112' 6"	135' 0"	**67.50**	90.00	94.50	101.25	112.50	135.00
67' 7"	90' 1 3/8"	94' 7 3/8"	101' 4 1/2"	112' 7 5/8"	135' 2"	**67.58**	90.11	94.62	101.37	112.64	135.17
67' 8"	90' 2 5/8"	94' 8 3/4"	101' 6"	112' 9 3/8"	135' 4"	**67.67**	90.22	94.73	101.50	112.78	135.33
67' 9"	90' 4"	94' 10 1/4"	101' 7 1/2"	112' 11"	135' 6"	**67.75**	90.33	94.85	101.63	112.92	135.50
67' 10"	90' 5 3/8"	94' 11 5/8"	101' 9"	113' 5/8"	135' 8"	**67.83**	90.44	94.97	101.75	113.06	135.67
67' 11"	90' 6 5/8"	95' 1"	101' 10 1/2"	113' 2 3/8"	135' 10"	**67.92**	90.56	95.08	101.88	113.19	135.83
68' 0"	90' 8"	95' 2 3/8"	102' 0"	113' 4"	136' 0"	**68.00**	90.67	95.20	102.00	113.33	136.00
68' 1"	90' 9 3/8"	95' 3 3/4"	102' 1 1/2"	113' 5 5/8"	136' 2"	**68.08**	90.78	95.32	102.13	113.47	136.17
68' 2"	90' 10 5/8"	95' 5 1/4"	102' 3"	113' 7 3/8"	136' 4"	**68.17**	90.89	95.43	102.25	113.61	136.33
68' 3"	91' 0"	95' 6 5/8"	102' 4 1/2"	113' 9"	136' 6"	**68.25**	91.00	95.55	102.38	113.75	136.50
68' 4"	91' 1 3/8"	95' 8"	102' 6"	113' 10 5/8"	136' 8"	**68.33**	91.11	95.67	102.50	113.89	136.67
68' 5"	91' 2 5/8"	95' 9 3/8"	102' 7 1/2"	114' 3/8"	136' 10"	**68.42**	91.22	95.78	102.63	114.03	136.83
68' 6"	91' 4"	95' 10 3/4"	102' 9"	114' 2"	137' 0"	**68.50**	91.33	95.90	102.75	114.17	137.00
68' 7"	91' 5 3/8"	96' 1/4"	102' 10 1/2"	114' 3 5/8"	137' 2"	**68.58**	91.44	96.02	102.87	114.31	137.17
68' 8"	91' 6 5/8"	96' 1 5/8"	103' 0"	114' 5 3/8"	137' 4"	**68.67**	91.56	96.13	103.00	114.44	137.33
68' 9"	91' 8"	96' 3"	103' 1 1/2"	114' 7"	137' 6"	**68.75**	91.67	96.25	103.13	114.58	137.50
68' 10"	91' 9 3/8"	96' 4 3/8"	103' 3"	114' 8 5/8"	137' 8"	**68.83**	91.78	96.37	103.25	114.72	137.67
68' 11"	91' 10 5/8"	96' 5 3/4"	103' 4 1/2"	114' 10 3/8"	137' 10"	**68.92**	91.89	96.48	103.38	114.86	137.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
65' 0"	48' 9"	46' 5 1/8"	43' 4"	39' 0"	32' 6"	**65.00**	48.75	46.43	43.33	39.00	32.50
65' 1"	48' 9 3/4"	46' 5 7/8"	43' 4 5/8"	39' 5/8"	32' 6 1/2"	**65.08**	48.81	46.49	43.39	39.05	32.54
65' 2"	48' 10 1/2"	46' 6 5/8"	43' 5 3/8"	39' 1 1/4"	32' 7"	**65.17**	48.87	46.55	43.44	39.10	32.58
65' 3"	48' 11 1/4"	46' 7 1/4"	43' 6"	39' 1 3/4"	32' 7 1/2"	**65.25**	48.94	46.61	43.50	39.15	32.63
65' 4"	49' 0"	46' 8"	43' 6 5/8"	39' 2 3/8"	32' 8"	**65.33**	49.00	46.67	43.56	39.20	32.67
65' 5"	49' 3/4"	46' 8 3/4"	43' 7 3/8"	39' 3"	32' 8 1/2"	**65.42**	49.06	46.73	43.61	39.25	32.71
65' 6"	49' 1 1/2"	46' 9 3/8"	43' 8"	39' 3 5/8"	32' 9"	**65.50**	49.13	46.79	43.67	39.30	32.75
65' 7"	49' 2 1/4"	46' 10 1/8"	43' 8 5/8"	39' 4 1/4"	32' 9 1/2"	**65.58**	49.19	46.85	43.72	39.35	32.79
65' 8"	49' 3"	46' 10 7/8"	43' 9 3/8"	39' 4 3/4"	32' 10"	**65.67**	49.25	46.90	43.78	39.40	32.83
65' 9"	49' 3 3/4"	46' 11 5/8"	43' 10"	39' 5 3/8"	32' 10 1/2"	**65.75**	49.31	46.96	43.83	39.45	32.88
65' 10"	49' 4 1/2"	47' 1/4"	43' 10 5/8"	39' 6"	32' 11"	**65.83**	49.37	47.02	43.89	39.50	32.92
65' 11"	49' 5 1/4"	47' 1"	43' 11 3/8"	39' 6 5/8"	32' 11 1/2"	**65.92**	49.44	47.08	43.94	39.55	32.96
66' 0"	49' 6"	47' 1 3/4"	44' 0"	39' 7 1/4"	33' 0"	66.00	49.50	47.14	44.00	39.60	33.00
66' 1"	49' 6 3/4"	47' 2 3/8"	44' 5/8"	39' 7 3/4"	33' 1/2"	66.08	49.56	47.20	44.06	39.65	33.04
66' 2"	49' 7 1/2"	47' 3 1/8"	44' 1 3/8"	39' 8 3/8"	33' 1"	66.17	49.62	47.26	44.11	39.70	33.08
66' 3"	49' 8 1/4"	47' 3 7/8"	44' 2"	39' 9"	33' 1 1/2"	66.25	49.69	47.32	44.17	39.75	33.13
66' 4"	49' 9"	47' 4 5/8"	44' 2 5/8"	39' 9 5/8"	33' 2"	66.33	49.75	47.38	44.22	39.80	33.17
66' 5"	49' 9 3/4"	47' 5 1/4"	44' 3 3/8"	39' 10 1/4"	33' 2 1/2"	66.42	49.81	47.44	44.28	39.85	33.21
66' 6"	49' 10 1/2"	47' 6"	44' 4"	39' 10 3/4"	33' 3"	66.50	49.88	47.50	44.33	39.90	33.25
66' 7"	49' 11 1/4"	47' 6 3/4"	44' 4 5/8"	39' 11 3/8"	33' 3 1/2"	66.58	49.94	47.56	44.39	39.95	33.29
66' 8"	50' 0"	47' 7 3/8"	44' 5 3/8"	40' 0"	33' 4"	66.67	50.00	47.62	44.44	40.00	33.33
66' 9"	50' 3/4"	47' 8 1/8"	44' 6"	40' 5/8"	33' 4 1/2"	66.75	50.06	47.68	44.50	40.05	33.38
66' 10"	50' 1 1/2"	47' 8 7/8"	44' 6 5/8"	40' 1 1/4"	33' 5"	66.83	50.12	47.74	44.56	40.10	33.42
66' 11"	50' 2 1/4"	47' 9 5/8"	44' 7 3/8"	40' 1 3/4"	33' 5 1/2"	66.92	50.19	47.80	44.61	40.15	33.46
67' 0"	50' 3"	47' 10 1/4"	44' 8"	40' 2 3/8"	33' 6"	67.00	50.25	47.86	44.67	40.20	33.50
67' 1"	50' 3 3/4"	47' 11"	44' 8 5/8"	40' 3"	33' 6 1/2"	67.08	50.31	47.92	44.72	40.25	33.54
67' 2"	50' 4 1/2"	47' 11 3/4"	44' 9 3/8"	40' 3 5/8"	33' 7"	67.17	50.37	47.98	44.78	40.30	33.58
67' 3"	50' 5 1/4"	48' 3/8"	44' 10"	40' 4 1/4"	33' 7 1/2"	67.25	50.44	48.04	44.83	40.35	33.63
67' 4"	50' 6"	48' 1 1/8"	44' 10 5/8"	40' 4 3/4"	33' 8"	67.33	50.50	48.10	44.89	40.40	33.67
67' 5"	50' 6 3/4"	48' 1 7/8"	44' 11 3/8"	40' 5 3/8"	33' 8 1/2"	67.42	50.56	48.15	44.94	40.45	33.71
67' 6"	50' 7 1/2"	48' 2 5/8"	45' 0"	40' 6"	33' 9"	**67.50**	50.63	48.21	45.00	40.50	33.75
67' 7"	50' 8 1/4"	48' 3 1/4"	45' 5/8"	40' 6 5/8"	33' 9 1/2"	**67.58**	50.69	48.27	45.06	40.55	33.79
67' 8"	50' 9"	48' 4"	45' 1 3/8"	40' 7 1/4"	33' 10"	**67.67**	50.75	48.33	45.11	40.60	33.83
67' 9"	50' 9 3/4"	48' 4 3/4"	45' 2"	40' 7 3/4"	33' 10 1/2"	**67.75**	50.81	48.39	45.17	40.65	33.88
67' 10"	50' 10 1/2"	48' 5 3/8"	45' 2 5/8"	40' 8 3/8"	33' 11"	**67.83**	50.87	48.45	45.22	40.70	33.92
67' 11"	50' 11 1/4"	48' 6 1/8"	45' 3 3/8"	40' 9"	33' 11 1/2"	**67.92**	50.94	48.51	45.28	40.75	33.96
68' 0"	51' 0"	48' 6 7/8"	45' 4"	40' 9 5/8"	34' 0"	**68.00**	51.00	48.57	45.33	40.80	34.00
68' 1"	51' 3/4"	48' 7 5/8"	45' 4 5/8"	40' 10 1/4"	34' 1/2"	**68.08**	51.06	48.63	45.39	40.85	34.04
68' 2"	51' 1 1/2"	48' 8 1/4"	45' 5 3/8"	40' 10 3/4"	34' 1"	**68.17**	51.12	48.69	45.44	40.90	34.08
68' 3"	51' 2 1/4"	48' 9"	45' 6"	40' 11 3/8"	34' 1 1/2"	**68.25**	51.19	48.75	45.50	40.95	34.13
68' 4"	51' 3"	48' 9 3/4"	45' 6 5/8"	41' 0"	34' 2"	**68.33**	51.25	48.81	45.56	41.00	34.17
68' 5"	51' 3 3/4"	48' 10 3/8"	45' 7 3/8"	41' 5/8"	34' 2 1/2"	**68.42**	51.31	48.87	45.61	41.05	34.21
68' 6"	51' 4 1/2"	48' 11 1/8"	45' 8"	41' 1 1/4"	34' 3"	**68.50**	51.38	48.93	45.67	41.10	34.25
68' 7"	51' 5 1/4"	48' 11 7/8"	45' 8 5/8"	41' 1 3/4"	34' 3 1/2"	**68.58**	51.44	48.99	45.72	41.15	34.29
68' 8"	51' 6"	49' 5/8"	45' 9 3/8"	41' 2 3/8"	34' 4"	**68.67**	51.50	49.05	45.78	41.20	34.33
68' 9"	51' 6 3/4"	49' 1 1/4"	45' 10"	41' 3"	34' 4 1/2"	**68.75**	51.56	49.11	45.83	41.25	34.38
68' 10"	51' 7 1/2"	49' 2"	45' 10 5/8"	41' 3 5/8"	34' 5"	**68.83**	51.62	49.17	45.89	41.30	34.42
68' 11"	51' 8 1/4"	49' 2 3/4"	45' 11 3/8"	41' 4 1/4"	34' 5 1/2"	**68.92**	51.69	49.23	45.94	41.35	34.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
69' 0"	92' 0"	96' 7 1/4"	103' 6"	115' 0"	138' 0"	**69.00**	92.00	96.60	103.50	115.00	138.00
69' 1"	92' 1 3/8"	96' 8 5/8"	103' 7 1/2"	115' 1 5/8"	138' 2"	**69.08**	92.11	96.72	103.63	115.14	138.17
69' 2"	92' 2 5/8"	96' 10"	103' 9"	115' 3 3/8"	138' 4"	**69.17**	92.22	96.83	103.75	115.28	138.33
69' 3"	92' 4"	96' 11 3/8"	103' 10 1/2"	115' 5"	138' 6"	**69.25**	92.33	96.95	103.88	115.42	138.50
69' 4"	92' 5 3/8"	97' 3/4"	104' 0"	115' 6 5/8"	138' 8"	**69.33**	92.44	97.07	104.00	115.56	138.67
69' 5"	92' 6 5/8"	97' 2 1/4"	104' 1 1/2"	115' 8 3/8"	138' 10"	**69.42**	92.56	97.18	104.13	115.69	138.83
69' 6"	92' 8"	97' 3 5/8"	104' 3"	115' 10"	139' 0"	**69.50**	92.67	97.30	104.25	115.83	139.00
69' 7"	92' 9 3/8"	97' 5"	104' 4 1/2"	115' 11 5/8"	139' 2"	**69.58**	92.78	97.42	104.37	115.97	139.17
69' 8"	92' 10 5/8"	97' 6 3/8"	104' 6"	116' 1 3/8"	139' 4"	**69.67**	92.89	97.53	104.50	116.11	139.33
69' 9"	93' 0"	97' 7 3/4"	104' 7 1/2"	116' 3"	139' 6"	**69.75**	93.00	97.65	104.63	116.25	139.50
69' 10"	93' 1 3/8"	97' 9 1/4"	104' 9"	116' 4 5/8"	139' 8"	**69.83**	93.11	97.77	104.75	116.39	139.67
69' 11"	93' 2 5/8"	97' 10 5/8"	104' 10 1/2"	116' 6 3/8"	139' 10"	**69.92**	93.22	97.88	104.88	116.53	139.83
70' 0"	93' 4"	98' 0"	105' 0"	116' 8"	140' 0"	**70.00**	93.33	98.00	105.00	116.67	140.00
70' 1"	93' 5 3/8"	98' 1 3/8"	105' 1 1/2"	116' 9 5/8"	140' 2"	**70.08**	93.44	98.12	105.13	116.81	140.17
70' 2"	93' 6 5/8"	98' 2 3/4"	105' 3"	116' 11 3/8"	140' 4"	**70.17**	93.56	98.23	105.25	116.94	140.33
70' 3"	93' 8"	98' 4 1/4"	105' 4 1/2"	117' 1"	140' 6"	**70.25**	93.67	98.35	105.38	117.08	140.50
70' 4"	93' 9 3/8"	98' 5 5/8"	105' 6"	117' 2 5/8"	140' 8"	**70.33**	93.78	98.47	105.50	117.22	140.67
70' 5"	93' 10 5/8"	98' 7"	105' 7 1/2"	117' 4 3/8"	140' 10"	**70.42**	93.89	98.58	105.63	117.36	140.83
70' 6"	94' 0"	98' 8 3/8"	105' 9"	117' 6"	141' 0"	**70.50**	94.00	98.70	105.75	117.50	141.00
70' 7"	94' 1 3/8"	98' 9 3/4"	105' 10 1/2"	117' 7 5/8"	141' 2"	**70.58**	94.11	98.82	105.87	117.64	141.17
70' 8"	94' 2 5/8"	98' 11 1/4"	106' 0"	117' 9 3/8"	141' 4"	**70.67**	94.22	98.93	106.00	117.78	141.33
70' 9"	94' 4"	99' 5/8"	106' 1 1/2"	117' 11"	141' 6"	**70.75**	94.33	99.05	106.13	117.92	141.50
70' 10"	94' 5 3/8"	99' 2"	106' 3"	118' 5/8"	141' 8"	**70.83**	94.44	99.17	106.25	118.06	141.67
70' 11"	94' 6 5/8"	99' 3 3/8"	106' 4 1/2"	118' 2 3/8"	141' 10"	**70.92**	94.56	99.28	106.38	118.19	141.83
71' 0"	94' 8"	99' 4 3/4"	106' 6"	118' 4"	142' 0"	**71.00**	94.67	99.40	106.50	118.33	142.00
71' 1"	94' 9 3/8"	99' 6 1/4"	106' 7 1/2"	118' 5 5/8"	142' 2"	**71.08**	94.78	99.52	106.63	118.47	142.17
71' 2"	94' 10 5/8"	99' 7 5/8"	106' 9"	118' 7 3/8"	142' 4"	**71.17**	94.89	99.63	106.75	118.61	142.33
71' 3"	95' 0"	99' 9"	106' 10 1/2"	118' 9"	142' 6"	**71.25**	95.00	99.75	106.88	118.75	142.50
71' 4"	95' 1 3/8"	99' 10 3/8"	107' 0"	118' 10 5/8"	142' 8"	**71.33**	95.11	99.87	107.00	118.89	142.67
71' 5"	95' 2 5/8"	99' 11 3/4"	107' 1 1/2"	119' 3/8"	142' 10"	**71.42**	95.22	99.98	107.13	119.03	142.83
71' 6"	95' 4"	100' 1 1/4"	107' 3"	119' 2"	143' 0"	**71.50**	95.33	100.10	107.25	119.17	143.00
71' 7"	95' 5 3/8"	100' 2 5/8"	107' 4 1/2"	119' 3 5/8"	143' 2"	**71.58**	95.44	100.22	107.37	119.31	143.17
71' 8"	95' 6 5/8"	100' 4"	107' 6"	119' 5 3/8"	143' 4"	**71.67**	95.56	100.33	107.50	119.44	143.33
71' 9"	95' 8"	100' 5 3/8"	107' 7 1/2"	119' 7"	143' 6"	**71.75**	95.67	100.45	107.63	119.58	143.50
71' 10"	95' 9 3/8"	100' 6 3/4"	107' 9"	119' 8 5/8"	143' 8"	**71.83**	95.78	100.57	107.75	119.72	143.67
71' 11"	95' 10 5/8"	100' 8 1/4"	107' 10 1/2"	119' 10 3/8"	143' 10"	**71.92**	95.89	100.68	107.88	119.86	143.83
72' 0"	96' 0"	100' 9 5/8"	108' 0"	120' 0"	144' 0"	**72.00**	96.00	100.80	108.00	120.00	144.00
72' 1"	96' 1 3/8"	100' 11"	108' 1 1/2"	120' 1 5/8"	144' 2"	**72.08**	96.11	100.92	108.13	120.14	144.17
72' 2"	96' 2 5/8"	101' 3/8"	108' 3"	120' 3 3/8"	144' 4"	**72.17**	96.22	101.03	108.25	120.28	144.33
72' 3"	96' 4"	101' 1 3/4"	108' 4 1/2"	120' 5"	144' 6"	**72.25**	96.33	101.15	108.38	120.42	144.50
72' 4"	96' 5 3/8"	101' 3 1/4"	108' 6"	120' 6 5/8"	144' 8"	**72.33**	96.44	101.27	108.50	120.56	144.67
72' 5"	96' 6 5/8"	101' 4 5/8"	108' 7 1/2"	120' 8 3/8"	144' 10"	**72.42**	96.56	101.38	108.63	120.69	144.83
72' 6"	96' 8"	101' 6"	108' 9"	120' 10"	145' 0"	**72.50**	96.67	101.50	108.75	120.83	145.00
72' 7"	96' 9 3/8"	101' 7 3/8"	108' 10 1/2"	120' 11 5/8"	145' 2"	**72.58**	96.78	101.62	108.87	120.97	145.17
72' 8"	96' 10 5/8"	101' 8 3/4"	109' 0"	121' 1 3/8"	145' 4"	**72.67**	96.89	101.73	109.00	121.11	145.33
72' 9"	97' 0"	101' 10 1/4"	109' 1 1/2"	121' 3"	145' 6"	**72.75**	97.00	101.85	109.13	121.25	145.50
72' 10"	97' 1 3/8"	101' 11 5/8"	109' 3"	121' 4 5/8"	145' 8"	**72.83**	97.11	101.97	109.25	121.39	145.67
72' 11"	97' 2 5/8"	102' 1"	109' 4 1/2"	121' 6 3/8"	145' 10"	**72.92**	97.22	102.08	109.38	121.53	145.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
69' 0"	51' 9"	49' 3 3/8"	46' 0"	41' 4 3/4"	34' 6"	**69.00**	51.75	49.29	46.00	41.40	34.50
69' 1"	51' 9 3/4"	49' 4 1/8"	46' 5/8"	41' 5 3/8"	34' 6 1/2"	**69.08**	51.81	49.35	46.06	41.45	34.54
69' 2"	51' 10 1/2"	49' 4 7/8"	46' 1 3/8"	41' 6"	34' 7"	**69.17**	51.87	49.40	46.11	41.50	34.58
69' 3"	51' 11 1/4"	49' 5 5/8"	46' 2"	41' 6 5/8"	34' 7 1/2"	**69.25**	51.94	49.46	46.17	41.55	34.63
69' 4"	52' 0"	49' 6 1/4"	46' 2 5/8"	41' 7 1/4"	34' 8"	**69.33**	52.00	49.52	46.22	41.60	34.67
69' 5"	52' 3/4"	49' 7"	46' 3 3/8"	41' 7 3/4"	34' 8 1/2"	**69.42**	52.06	49.58	46.28	41.65	34.71
69' 6"	52' 1 1/2"	49' 7 3/4"	46' 4"	41' 8 3/8"	34' 9"	**69.50**	52.13	49.64	46.33	41.70	34.75
69' 7"	52' 2 1/4"	49' 8 3/8"	46' 4 5/8"	41' 9"	34' 9 1/2"	**69.58**	52.19	49.70	46.39	41.75	34.79
69' 8"	52' 3"	49' 9 1/8"	46' 5 3/8"	41' 9 5/8"	34' 10"	**69.67**	52.25	49.76	46.44	41.80	34.83
69' 9"	52' 3 3/4"	49' 9 7/8"	46' 6"	41' 10 1/4"	34' 10 1/2"	**69.75**	52.31	49.82	46.50	41.85	34.88
69' 10"	52' 4 1/2"	49' 10 5/8"	46' 6 5/8"	41' 10 3/4"	34' 11"	**69.83**	52.37	49.88	46.56	41.90	34.92
69' 11"	52' 5 1/4"	49' 11 1/4"	46' 7 3/8"	41' 11 3/8"	34' 11 1/2"	**69.92**	52.44	49.94	46.61	41.95	34.96
70' 0"	52' 6"	50' 0"	46' 8"	42' 0"	35' 0"	**70.00**	52.50	50.00	46.67	42.00	35.00
70' 1"	52' 6 3/4"	50' 3/4"	46' 8 5/8"	42' 5/8"	35' 1/2"	**70.08**	52.56	50.06	46.72	42.05	35.04
70' 2"	52' 7 1/2"	50' 1 3/8"	46' 9 3/8"	42' 1 1/4"	35' 1"	**70.17**	52.62	50.12	46.78	42.10	35.08
70' 3"	52' 8 1/4"	50' 2 1/8"	46' 10"	42' 1 3/4"	35' 1 1/2"	**70.25**	52.69	50.18	46.83	42.15	35.13
70' 4"	52' 9"	50' 2 7/8"	46' 10 5/8"	42' 2 3/8"	35' 2"	**70.33**	52.75	50.24	46.89	42.20	35.17
70' 5"	52' 9 3/4"	50' 3 5/8"	46' 11 3/8"	42' 3"	35' 2 1/2"	**70.42**	52.81	50.30	46.94	42.25	35.21
70' 6"	52' 10 1/2"	50' 4 1/4"	47' 0"	42' 3 5/8"	35' 3"	**70.50**	52.88	50.36	47.00	42.30	35.25
70' 7"	52' 11 1/4"	50' 5"	47' 5/8"	42' 4 1/4"	35' 3 1/2"	**70.58**	52.94	50.42	47.06	42.35	35.29
70' 8"	53' 0"	50' 5 3/4"	47' 1 3/8"	42' 4 3/4"	35' 4"	**70.67**	53.00	50.48	47.11	42.40	35.33
70' 9"	53' 3/4"	50' 6 3/8"	47' 2"	42' 5 3/8"	35' 4 1/2"	**70.75**	53.06	50.54	47.17	42.45	35.38
70' 10"	53' 1 1/2"	50' 7 1/8"	47' 2 5/8"	42' 6"	35' 5"	**70.83**	53.12	50.60	47.22	42.50	35.42
70' 11"	53' 2 1/4"	50' 7 7/8"	47' 3 3/8"	42' 6 5/8"	35' 5 1/2"	**70.92**	53.19	50.65	47.28	42.55	35.46
71' 0"	53' 3"	50' 8 5/8"	47' 4"	42' 7 1/4"	35' 6"	**71.00**	53.25	50.71	47.33	42.60	35.50
71' 1"	53' 3 3/4"	50' 9 1/4"	47' 4 5/8"	42' 7 3/4"	35' 6 1/2"	**71.08**	53.31	50.77	47.39	42.65	35.54
71' 2"	53' 4 1/2"	50' 10"	47' 5 3/8"	42' 8 3/8"	35' 7"	**71.17**	53.37	50.83	47.44	42.70	35.58
71' 3"	53' 5 1/4"	50' 10 3/4"	47' 6"	42' 9"	35' 7 1/2"	**71.25**	53.44	50.89	47.50	42.75	35.63
71' 4"	53' 6"	50' 11 3/8"	47' 6 5/8"	42' 9 5/8"	35' 8"	**71.33**	53.50	50.95	47.56	42.80	35.67
71' 5"	53' 6 3/4"	51' 1/8"	47' 7 3/8"	42' 10 1/4"	35' 8 1/2"	**71.42**	53.56	51.01	47.61	42.85	35.71
71' 6"	53' 7 1/2"	51' 7/8"	47' 8"	42' 10 3/4"	35' 9"	**71.50**	53.63	51.07	47.67	42.90	35.75
71' 7"	53' 8 1/4"	51' 1 5/8"	47' 8 5/8"	42' 11 3/8"	35' 9 1/2"	**71.58**	53.69	51.13	47.72	42.95	35.79
71' 8"	53' 9"	51' 2 1/4"	47' 9 3/8"	43' 0"	35' 10"	**71.67**	53.75	51.19	47.78	43.00	35.83
71' 9"	53' 9 3/4"	51' 3"	47' 10"	43' 5/8"	35' 10 1/2"	**71.75**	53.81	51.25	47.83	43.05	35.88
71' 10"	53' 10 1/2"	51' 3 3/4"	47' 10 5/8"	43' 1 1/4"	35' 11"	**71.83**	53.87	51.31	47.89	43.10	35.92
71' 11"	53' 11 1/4"	51' 4 3/8"	47' 11 3/8"	43' 1 3/4"	35' 11 1/2"	**71.92**	53.94	51.37	47.94	43.15	35.96
72' 0"	54' 0"	51' 5 1/8"	48' 0"	43' 2 3/8"	36' 0"	**72.00**	54.00	51.43	48.00	43.20	36.00
72' 1"	54' 3/4"	51' 5 7/8"	48' 5/8"	43' 3"	36' 1/2"	**72.08**	54.06	51.49	48.06	43.25	36.04
72' 2"	54' 1 1/2"	51' 6 5/8"	48' 1 3/8"	43' 3 5/8"	36' 1"	**72.17**	54.12	51.55	48.11	43.30	36.08
72' 3"	54' 2 1/4"	51' 7 1/4"	48' 2"	43' 4 1/4"	36' 1 1/2"	**72.25**	54.19	51.61	48.17	43.35	36.13
72' 4"	54' 3"	51' 8"	48' 2 5/8"	43' 4 3/4"	36' 2"	**72.33**	54.25	51.67	48.22	43.40	36.17
72' 5"	54' 3 3/4"	51' 8 3/4"	48' 3 3/8"	43' 5 3/8"	36' 2 1/2"	**72.42**	54.31	51.73	48.28	43.45	36.21
72' 6"	54' 4 1/2"	51' 9 3/8"	48' 4"	43' 6"	36' 3"	**72.50**	54.38	51.79	48.33	43.50	36.25
72' 7"	54' 5 1/4"	51' 10 1/8"	48' 4 5/8"	43' 6 5/8"	36' 3 1/2"	**72.58**	54.44	51.85	48.39	43.55	36.29
72' 8"	54' 6"	51' 10 7/8"	48' 5 3/8"	43' 7 1/4"	36' 4"	**72.67**	54.50	51.90	48.44	43.60	36.33
72' 9"	54' 6 3/4"	51' 11 5/8"	48' 6"	43' 7 3/4"	36' 4 1/2"	**72.75**	54.56	51.96	48.50	43.65	36.38
72' 10"	54' 7 1/2"	52' 1/4"	48' 6 5/8"	43' 8 3/8"	36' 5"	**72.83**	54.62	52.02	48.56	43.70	36.42
72' 11"	54' 8 1/4"	52' 1"	48' 7 3/8"	43' 9"	36' 5 1/2"	**72.92**	54.69	52.08	48.61	43.75	36.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
73' 0"	97' 4"	102' 2 3/8"	109' 6"	121' 8"	146' 0"	73.00	97.33	102.20	109.50	121.67	146.00
73' 1"	97' 5 3/8"	102' 3 3/4"	109' 7 1/2"	121' 9 5/8"	146' 2"	73.08	97.44	102.32	109.63	121.81	146.17
73' 2"	97' 6 5/8"	102' 5 1/4"	109' 9"	121' 11 3/8"	146' 4"	73.17	97.56	102.43	109.75	121.94	146.33
73' 3"	97' 8"	102' 6 5/8"	109' 10 1/2"	122' 1"	146' 6"	73.25	97.67	102.55	109.88	122.08	146.50
73' 4"	97' 9 3/8"	102' 8"	110' 0"	122' 2 5/8"	146' 8"	73.33	97.78	102.67	110.00	122.22	146.67
73' 5"	97' 10 5/8"	102' 9 3/8"	110' 1 1/2"	122' 4 3/8"	146' 10"	73.42	97.89	102.78	110.13	122.36	146.83
73' 6"	98' 0"	102' 10 3/4"	110' 3"	122' 6"	147' 0"	73.50	98.00	102.90	110.25	122.50	147.00
73' 7"	98' 1 3/8"	103' 1/4"	110' 4 1/2"	122' 7 5/8"	147' 2"	73.58	98.11	103.02	110.37	122.64	147.17
73' 8"	98' 2 5/8"	103' 1 5/8"	110' 6"	122' 9 3/8"	147' 4"	73.67	98.22	103.13	110.50	122.78	147.33
73' 9"	98' 4"	103' 3"	110' 7 1/2"	122' 11"	147' 6"	73.75	98.33	103.25	110.63	122.92	147.50
73' 10"	98' 5 3/8"	103' 4 3/8"	110' 9"	123' 5/8"	147' 8"	73.83	98.44	103.37	110.75	123.06	147.67
73' 11"	98' 6 5/8"	103' 5 3/4"	110' 10 1/2"	123' 2 3/8"	147' 10"	73.92	98.56	103.48	110.88	123.19	147.83
74' 0"	98' 8"	103' 7 1/4"	111' 0"	123' 4"	148' 0"	74.00	98.67	103.60	111.00	123.33	148.00
74' 1"	98' 9 3/8"	103' 8 5/8"	111' 1 1/2"	123' 5 5/8"	148' 2"	74.08	98.78	103.72	111.13	123.47	148.17
74' 2"	98' 10 5/8"	103' 10"	111' 3"	123' 7 3/8"	148' 4"	74.17	98.89	103.83	111.25	123.61	148.33
74' 3"	99' 0"	103' 11 3/8"	111' 4 1/2"	123' 9"	148' 6"	74.25	99.00	103.95	111.38	123.75	148.50
74' 4"	99' 1 3/8"	104' 3/4"	111' 6"	123' 10 5/8"	148' 8"	74.33	99.11	104.07	111.50	123.89	148.67
74' 5"	99' 2 5/8"	104' 2 1/4"	111' 7 1/2"	124' 3/8"	148' 10"	74.42	99.22	104.18	111.63	124.03	148.83
74' 6"	99' 4"	104' 3 5/8"	111' 9"	124' 2"	149' 0"	74.50	99.33	104.30	111.75	124.17	149.00
74' 7"	99' 5 3/8"	104' 5"	111' 10 1/2"	124' 3 5/8"	149' 2"	74.58	99.44	104.42	111.87	124.31	149.17
74' 8"	99' 6 5/8"	104' 6 3/8"	112' 0"	124' 5 3/8"	149' 4"	74.67	99.56	104.53	112.00	124.44	149.33
74' 9"	99' 8"	104' 7 3/4"	112' 1 1/2"	124' 7"	149' 6"	74.75	99.67	104.65	112.13	124.58	149.50
74' 10"	99' 9 3/8"	104' 9 1/4"	112' 3"	124' 8 5/8"	149' 8"	74.83	99.78	104.77	112.25	124.72	149.67
74' 11"	99' 10 5/8"	104' 10 5/8"	112' 4 1/2"	124' 10 3/8"	149' 10"	74.92	99.89	104.88	112.38	124.86	149.83
75' 0"	100' 0"	105' 0"	112' 6"	125' 0"	150' 0"	75.00	100.00	105.00	112.50	125.00	150.00
75' 1"	100' 1 3/8"	105' 1 3/8"	112' 7 1/2"	125' 1 5/8"	150' 2"	75.08	100.11	105.12	112.63	125.14	150.17
75' 2"	100' 2 5/8"	105' 2 3/4"	112' 9"	125' 3 3/8"	150' 4"	75.17	100.22	105.23	112.75	125.28	150.33
75' 3"	100' 4"	105' 4 1/4"	112' 10 1/2"	125' 5"	150' 6"	75.25	100.33	105.35	112.88	125.42	150.50
75' 4"	100' 5 3/8"	105' 5 5/8"	113' 0"	125' 6 5/8"	150' 8"	75.33	100.44	105.47	113.00	125.56	150.67
75' 5"	100' 6 5/8"	105' 7"	113' 1 1/2"	125' 8 3/8"	150' 10"	75.42	100.56	105.58	113.13	125.69	150.83
75' 6"	100' 8"	105' 8 3/8"	113' 3"	125' 10"	151' 0"	75.50	100.67	105.70	113.25	125.83	151.00
75' 7"	100' 9 3/8"	105' 9 3/4"	113' 4 1/2"	125' 11 5/8"	151' 2"	75.58	100.78	105.82	113.37	125.97	151.17
75' 8"	100' 10 5/8"	105' 11 1/4"	113' 6"	126' 1 3/8"	151' 4"	75.67	100.89	105.93	113.50	126.11	151.33
75' 9"	101' 0"	106' 5/8"	113' 7 1/2"	126' 3"	151' 6"	75.75	101.00	106.05	113.63	126.25	151.50
75' 10"	101' 1 3/8"	106' 2"	113' 9"	126' 4 5/8"	151' 8"	75.83	101.11	106.17	113.75	126.39	151.67
75' 11"	101' 2 5/8"	106' 3 3/8"	113' 10 1/2"	126' 6 3/8"	151' 10"	75.92	101.22	106.28	113.88	126.53	151.83
76' 0"	101' 4"	106' 4 3/4"	114' 0"	126' 8"	152' 0"	76.00	101.33	106.40	114.00	126.67	152.00
76' 1"	101' 5 3/8"	106' 6 1/4"	114' 1 1/2"	126' 9 5/8"	152' 2"	76.08	101.44	106.52	114.13	126.81	152.17
76' 2"	101' 6 5/8"	106' 7 5/8"	114' 3"	126' 11 3/8"	152' 4"	76.17	101.56	106.63	114.25	126.94	152.33
76' 3"	101' 8"	106' 9"	114' 4 1/2"	127' 1"	152' 6"	76.25	101.67	106.75	114.38	127.08	152.50
76' 4"	101' 9 3/8"	106' 10 3/8"	114' 6"	127' 2 5/8"	152' 8"	76.33	101.78	106.87	114.50	127.22	152.67
76' 5"	101' 10 5/8"	106' 11 3/4"	114' 7 1/2"	127' 4 3/8"	152' 10"	76.42	101.89	106.98	114.63	127.36	152.83
76' 6"	102' 0"	107' 1 1/4"	114' 9"	127' 6"	153' 0"	76.50	102.00	107.10	114.75	127.50	153.00
76' 7"	102' 1 3/8"	107' 2 5/8"	114' 10 1/2"	127' 7 5/8"	153' 2"	76.58	102.11	107.22	114.87	127.64	153.17
76' 8"	102' 2 5/8"	107' 4"	115' 0"	127' 9 3/8"	153' 4"	76.67	102.22	107.33	115.00	127.78	153.33
76' 9"	102' 4"	107' 5 3/8"	115' 1 1/2"	127' 11"	153' 6"	76.75	102.33	107.45	115.13	127.92	153.50
76' 10"	102' 5 3/8"	107' 6 3/4"	115' 3"	128' 5/8"	153' 8"	76.83	102.44	107.57	115.25	128.06	153.67
76' 11"	102' 6 5/8"	107' 8 1/4"	115' 4 1/2"	128' 2 3/8"	153' 10"	76.92	102.56	107.68	115.38	128.19	153.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
73' 0"	54' 9"	52' 1 3/4"	48' 8"	43' 9 5/8"	36' 6"	73.00	54.75	52.14	48.67	43.80	36.50
73' 1"	54' 9 3/4"	52' 2 3/8"	48' 8 5/8"	43' 10 1/4"	36' 6 1/2"	73.08	54.81	52.20	48.72	43.85	36.54
73' 2"	54' 10 1/2"	52' 3 1/8"	48' 9 3/8"	43' 10 3/4"	36' 7"	73.17	54.87	52.26	48.78	43.90	36.58
73' 3"	54' 11 1/4"	52' 3 7/8"	48' 10"	43' 11 3/8"	36' 7 1/2"	73.25	54.94	52.32	48.83	43.95	36.63
73' 4"	55' 0"	52' 4 5/8"	48' 10 5/8"	44' 0"	36' 8"	73.33	55.00	52.38	48.89	44.00	36.67
73' 5"	55' 3/4"	52' 5 1/4"	48' 11 3/8"	44' 5/8"	36' 8 1/2"	73.42	55.06	52.44	48.94	44.05	36.71
73' 6"	55' 1 1/2"	52' 6"	49' 0"	44' 1 1/4"	36' 9"	73.50	55.13	52.50	49.00	44.10	36.75
73' 7"	55' 2 1/4"	52' 6 3/4"	49' 5/8"	44' 1 3/4"	36' 9 1/2"	73.58	55.19	52.56	49.06	44.15	36.79
73' 8"	55' 3"	52' 7 3/8"	49' 1 3/8"	44' 2 3/8"	36' 10"	73.67	55.25	52.62	49.11	44.20	36.83
73' 9"	55' 3 3/4"	52' 8 1/8"	49' 2"	44' 3"	36' 10 1/2"	73.75	55.31	52.68	49.17	44.25	36.88
73' 10"	55' 4 1/2"	52' 8 7/8"	49' 2 5/8"	44' 3 5/8"	36' 11"	73.83	55.37	52.74	49.22	44.30	36.92
73' 11"	55' 5 1/4"	52' 9 5/8"	49' 3 3/8"	44' 4 1/4"	36' 11 1/2"	73.92	55.44	52.80	49.28	44.35	36.96
74' 0"	55' 6"	52' 10 1/4"	49' 4"	44' 4 3/4"	37' 0"	74.00	55.50	52.86	49.33	44.40	37.00
74' 1"	55' 6 3/4"	52' 11"	49' 4 5/8"	44' 5 3/8"	37' 1/2"	74.08	55.56	52.92	49.39	44.45	37.04
74' 2"	55' 7 1/2"	52' 11 3/4"	49' 5 3/8"	44' 6"	37' 1"	74.17	55.62	52.98	49.44	44.50	37.08
74' 3"	55' 8 1/4"	53' 3/8"	49' 6"	44' 6 5/8"	37' 1 1/2"	74.25	55.69	53.04	49.50	44.55	37.13
74' 4"	55' 9"	53' 1 1/8"	49' 6 5/8"	44' 7 1/4"	37' 2"	74.33	55.75	53.10	49.56	44.60	37.17
74' 5"	55' 9 3/4"	53' 1 7/8"	49' 7 3/8"	44' 7 3/4"	37' 2 1/2"	74.42	55.81	53.15	49.61	44.65	37.21
74' 6"	55' 10 1/2"	53' 2 5/8"	49' 8"	44' 8 3/8"	37' 3"	74.50	55.88	53.21	49.67	44.70	37.25
74' 7"	55' 11 1/4"	53' 3 1/4"	49' 8 5/8"	44' 9"	37' 3 1/2"	74.58	55.94	53.27	49.72	44.75	37.29
74' 8"	56' 0"	53' 4"	49' 9 3/8"	44' 9 5/8"	37' 4"	74.67	56.00	53.33	49.78	44.80	37.33
74' 9"	56' 3/4"	53' 4 3/4"	49' 10"	44' 10 1/4"	37' 4 1/2"	74.75	56.06	53.39	49.83	44.85	37.38
74' 10"	56' 1 1/2"	53' 5 3/8"	49' 10 5/8"	44' 10 3/4"	37' 5"	74.83	56.12	53.45	49.89	44.90	37.42
74' 11"	56' 2 1/4"	53' 6 1/8"	49' 11 3/8"	44' 11 3/8"	37' 5 1/2"	74.92	56.19	53.51	49.94	44.95	37.46
75' 0"	56' 3"	53' 6 7/8"	50' 0"	45' 0"	37' 6"	75.00	56.25	53.57	50.00	45.00	37.50
75' 1"	56' 3 3/4"	53' 7 5/8"	50' 5/8"	45' 5/8"	37' 6 1/2"	75.08	56.31	53.63	50.06	45.05	37.54
75' 2"	56' 4 1/2"	53' 8 1/4"	50' 1 3/8"	45' 1 1/4"	37' 7"	75.17	56.37	53.69	50.11	45.10	37.58
75' 3"	56' 5 1/4"	53' 9"	50' 2"	45' 1 3/4"	37' 7 1/2"	75.25	56.44	53.75	50.17	45.15	37.63
75' 4"	56' 6"	53' 9 3/4"	50' 2 5/8"	45' 2 3/8"	37' 8"	75.33	56.50	53.81	50.22	45.20	37.67
75' 5"	56' 6 3/4"	53' 10 3/8"	50' 3 3/8"	45' 3"	37' 8 1/2"	75.42	56.56	53.87	50.28	45.25	37.71
75' 6"	56' 7 1/2"	53' 11 1/8"	50' 4"	45' 3 5/8"	37' 9"	75.50	56.63	53.93	50.33	45.30	37.75
75' 7"	56' 8 1/4"	53' 11 7/8"	50' 4 5/8"	45' 4 1/4"	37' 9 1/2"	75.58	56.69	53.99	50.39	45.35	37.79
75' 8"	56' 9"	54' 5/8"	50' 5 3/8"	45' 4 3/4"	37' 10"	75.67	56.75	54.05	50.44	45.40	37.83
75' 9"	56' 9 3/4"	54' 1 1/4"	50' 6"	45' 5 3/8"	37' 10 1/2"	75.75	56.81	54.11	50.50	45.45	37.88
75' 10"	56' 10 1/2"	54' 2"	50' 6 5/8"	45' 6"	37' 11"	75.83	56.87	54.17	50.56	45.50	37.92
75' 11"	56' 11 1/4"	54' 2 3/4"	50' 7 3/8"	45' 6 5/8"	37' 11 1/2"	75.92	56.94	54.23	50.61	45.55	37.96
76' 0"	57' 0"	54' 3 3/8"	50' 8"	45' 7 1/4"	38' 0"	76.00	57.00	54.29	50.67	45.60	38.00
76' 1"	57' 3/4"	54' 4 1/8"	50' 8 5/8"	45' 7 3/4"	38' 1/2"	76.08	57.06	54.35	50.72	45.65	38.04
76' 2"	57' 1 1/2"	54' 4 7/8"	50' 9 3/8"	45' 8 3/8"	38' 1"	76.17	57.12	54.40	50.78	45.70	38.08
76' 3"	57' 2 1/4"	54' 5 5/8"	50' 10"	45' 9"	38' 1 1/2"	76.25	57.19	54.46	50.83	45.75	38.13
76' 4"	57' 3"	54' 6 1/4"	50' 10 5/8"	45' 9 5/8"	38' 2"	76.33	57.25	54.52	50.89	45.80	38.17
76' 5"	57' 3 3/4"	54' 7"	50' 11 3/8"	45' 10 1/4"	38' 2 1/2"	76.42	57.31	54.58	50.94	45.85	38.21
76' 6"	57' 4 1/2"	54' 7 3/4"	51' 0"	45' 10 3/4"	38' 3"	76.50	57.38	54.64	51.00	45.90	38.25
76' 7"	57' 5 1/4"	54' 8 3/8"	51' 5/8"	45' 11 3/8"	38' 3 1/2"	76.58	57.44	54.70	51.06	45.95	38.29
76' 8"	57' 6"	54' 9 1/8"	51' 1 3/8"	46' 0"	38' 4"	76.67	57.50	54.76	51.11	46.00	38.33
76' 9"	57' 6 3/4"	54' 9 7/8"	51' 2"	46' 5/8"	38' 4 1/2"	76.75	57.56	54.82	51.17	46.05	38.38
76' 10"	57' 7 1/2"	54' 10 5/8"	51' 2 5/8"	46' 1 1/4"	38' 5"	76.83	57.62	54.88	51.22	46.10	38.42
76' 11"	57' 8 1/4"	54' 11 1/4"	51' 3 3/8"	46' 1 3/4"	38' 5 1/2"	76.92	57.69	54.94	51.28	46.15	38.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
77' 0"	102' 8"	107' 9 5/8"	115' 6"	128' 4"	154' 0"	**77.00**	102.67	107.80	115.50	128.33	154.00
77' 1"	102' 9 3/8"	107' 11"	115' 7 1/2"	128' 5 5/8"	154' 2"	**77.08**	102.78	107.92	115.63	128.47	154.17
77' 2"	102' 10 5/8"	108' 3/8"	115' 9"	128' 7 3/8"	154' 4"	**77.17**	102.89	108.03	115.75	128.61	154.33
77' 3"	103' 0"	108' 1 3/4"	115' 10 1/2"	128' 9"	154' 6"	**77.25**	103.00	108.15	115.88	128.75	154.50
77' 4"	103' 1 3/8"	108' 3 1/4"	116' 0"	128' 10 5/8"	154' 8"	**77.33**	103.11	108.27	116.00	128.89	154.67
77' 5"	103' 2 5/8"	108' 4 5/8"	116' 1 1/2"	129' 3/8"	154' 10"	**77.42**	103.22	108.38	116.13	129.03	154.83
77' 6"	103' 4"	108' 6"	116' 3"	129' 2"	155' 0"	**77.50**	103.33	108.50	116.25	129.17	155.00
77' 7"	103' 5 3/8"	108' 7 3/8"	116' 4 1/2"	129' 3 5/8"	155' 2"	**77.58**	103.44	108.62	116.37	129.31	155.17
77' 8"	103' 6 5/8"	108' 8 3/4"	116' 6"	129' 5 3/8"	155' 4"	**77.67**	103.56	108.73	116.50	129.44	155.33
77' 9"	103' 8"	108' 10 1/4"	116' 7 1/2"	129' 7"	155' 6"	**77.75**	103.67	108.85	116.63	129.58	155.50
77' 10"	103' 9 3/8"	108' 11 5/8"	116' 9"	129' 8 5/8"	155' 8"	**77.83**	103.78	108.97	116.75	129.72	155.67
77' 11"	103' 10 5/8"	109' 1"	116' 10 1/2"	129' 10 3/8"	155' 10"	**77.92**	103.89	109.08	116.88	129.86	155.83
78' 0"	104' 0"	109' 2 3/8"	117' 0"	130' 0"	156' 0"	**78.00**	104.00	109.20	117.00	130.00	156.00
78' 1"	104' 1 3/8"	109' 3 3/4"	117' 1 1/2"	130' 1 5/8"	156' 2"	**78.08**	104.11	109.32	117.13	130.14	156.17
78' 2"	104' 2 5/8"	109' 5 1/4"	117' 3"	130' 3 3/8"	156' 4"	**78.17**	104.22	109.43	117.25	130.28	156.33
78' 3"	104' 4"	109' 6 5/8"	117' 4 1/2"	130' 5"	156' 6"	**78.25**	104.33	109.55	117.38	130.42	156.50
78' 4"	104' 5 3/8"	109' 8"	117' 6"	130' 6 5/8"	156' 8"	**78.33**	104.44	109.67	117.50	130.56	156.67
78' 5"	104' 6 5/8"	109' 9 3/8"	117' 7 1/2"	130' 8 3/8"	156' 10"	**78.42**	104.56	109.78	117.63	130.69	156.83
78' 6"	104' 8"	109' 10 3/4"	117' 9"	130' 10"	157' 0"	**78.50**	104.67	109.90	117.75	130.83	157.00
78' 7"	104' 9 3/8"	110' 1/4"	117' 10 1/2"	130' 11 5/8"	157' 2"	**78.58**	104.78	110.02	117.87	130.97	157.17
78' 8"	104' 10 5/8"	110' 1 5/8"	118' 0"	131' 1 3/8"	157' 4"	**78.67**	104.89	110.13	118.00	131.11	157.33
78' 9"	105' 0"	110' 3"	118' 1 1/2"	131' 3"	157' 6"	**78.75**	105.00	110.25	118.13	131.25	157.50
78' 10"	105' 1 3/8"	110' 4 3/8"	118' 3"	131' 4 5/8"	157' 8"	**78.83**	105.11	110.37	118.25	131.39	157.67
78' 11"	105' 2 5/8"	110' 5 3/4"	118' 4 1/2"	131' 6 3/8"	157' 10"	**78.92**	105.22	110.48	118.38	131.53	157.83
79' 0"	105' 4"	110' 7 1/4"	118' 6"	131' 8"	158' 0"	**79.00**	105.33	110.60	118.50	131.67	158.00
79' 1"	105' 5 3/8"	110' 8 5/8"	118' 7 1/2"	131' 9 5/8"	158' 2"	**79.08**	105.44	110.72	118.63	131.81	158.17
79' 2"	105' 6 5/8"	110' 10"	118' 9"	131' 11 3/8"	158' 4"	**79.17**	105.56	110.83	118.75	131.94	158.33
79' 3"	105' 8"	110' 11 3/8"	118' 10 1/2"	132' 1"	158' 6"	**79.25**	105.67	110.95	118.88	132.08	158.50
79' 4"	105' 9 3/8"	111' 3/4"	119' 0"	132' 2 5/8"	158' 8"	**79.33**	105.78	111.07	119.00	132.22	158.67
79' 5"	105' 10 5/8"	111' 2 1/4"	119' 1 1/2"	132' 4 3/8"	158' 10"	**79.42**	105.89	111.18	119.13	132.36	158.83
79' 6"	106' 0"	111' 3 5/8"	119' 3"	132' 6"	159' 0"	**79.50**	106.00	111.30	119.25	132.50	159.00
79' 7"	106' 1 3/8"	111' 5"	119' 4 1/2"	132' 7 5/8"	159' 2"	**79.58**	106.11	111.42	119.37	132.64	159.17
79' 8"	106' 2 5/8"	111' 6 3/8"	119' 6"	132' 9 3/8"	159' 4"	**79.67**	106.22	111.53	119.50	132.78	159.33
79' 9"	106' 4"	111' 7 3/4"	119' 7 1/2"	132' 11"	159' 6"	**79.75**	106.33	111.65	119.63	132.92	159.50
79' 10"	106' 5 3/8"	111' 9 1/4"	119' 9"	133' 5/8"	159' 8"	**79.83**	106.44	111.77	119.75	133.06	159.67
79' 11"	106' 6 5/8"	111' 10 5/8"	119' 10 1/2"	133' 2 3/8"	159' 10"	**79.92**	106.56	111.88	119.88	133.19	159.83
80' 0"	106' 8"	112' 0"	120' 0"	133' 4"	160' 0"	**80.00**	106.67	112.00	120.00	133.33	160.00
80' 1"	106' 9 3/8"	112' 1 3/8"	120' 1 1/2"	133' 5 5/8"	160' 2"	**80.08**	106.78	112.12	120.13	133.47	160.17
80' 2"	106' 10 5/8"	112' 2 3/4"	120' 3"	133' 7 3/8"	160' 4"	**80.17**	106.89	112.23	120.25	133.61	160.33
80' 3"	107' 0"	112' 4 1/4"	120' 4 1/2"	133' 9"	160' 6"	**80.25**	107.00	112.35	120.38	133.75	160.50
80' 4"	107' 1 3/8"	112' 5 5/8"	120' 6"	133' 10 5/8"	160' 8"	**80.33**	107.11	112.47	120.50	133.89	160.67
80' 5"	107' 2 5/8"	112' 7"	120' 7 1/2"	134' 3/8"	160' 10"	**80.42**	107.22	112.58	120.63	134.03	160.83
80' 6"	107' 4"	112' 8 3/8"	120' 9"	134' 2"	161' 0"	**80.50**	107.33	112.70	120.75	134.17	161.00
80' 7"	107' 5 3/8"	112' 9 3/4"	120' 10 1/2"	134' 3 5/8"	161' 2"	**80.58**	107.44	112.82	120.87	134.31	161.17
80' 8"	107' 6 5/8"	112' 11 1/4"	121' 0"	134' 5 3/8"	161' 4"	**80.67**	107.56	112.93	121.00	134.44	161.33
80' 9"	107' 8"	113' 5/8"	121' 1 1/2"	134' 7"	161' 6"	**80.75**	107.67	113.05	121.13	134.58	161.50
80' 10"	107' 9 3/8"	113' 2"	121' 3"	134' 8 5/8"	161' 8"	**80.83**	107.78	113.17	121.25	134.72	161.67
80' 11"	107' 10 5/8"	113' 3 3/8"	121' 4 1/2"	134' 10 3/8"	161' 10"	**80.92**	107.89	113.28	121.38	134.86	161.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
77' 0"	57' 9"	55' 0"	51' 4"	46' 2 3/8"	38' 6"	**77.00**	57.75	55.00	51.33	46.20	38.50
77' 1"	57' 9 3/4"	55' 3/4"	51' 4 5/8"	46' 3"	38' 6 1/2"	**77.08**	57.81	55.06	51.39	46.25	38.54
77' 2"	57' 10 1/2"	55' 1 3/8"	51' 5 3/8"	46' 3 5/8"	38' 7"	**77.17**	57.87	55.12	51.44	46.30	38.58
77' 3"	57' 11 1/4"	55' 2 1/8"	51' 6"	46' 4 1/4"	38' 7 1/2"	**77.25**	57.94	55.18	51.50	46.35	38.63
77' 4"	58' 0"	55' 2 7/8"	51' 6 5/8"	46' 4 3/4"	38' 8"	**77.33**	58.00	55.24	51.56	46.40	38.67
77' 5"	58' 3/4"	55' 3 5/8"	51' 7 3/8"	46' 5 3/8"	38' 8 1/2"	**77.42**	58.06	55.30	51.61	46.45	38.71
77' 6"	58' 1 1/2"	55' 4 1/4"	51' 8"	46' 6"	38' 9"	**77.50**	58.13	55.36	51.67	46.50	38.75
77' 7"	58' 2 1/4"	55' 5"	51' 8 5/8"	46' 6 5/8"	38' 9 1/2"	**77.58**	58.19	55.42	51.72	46.55	38.79
77' 8"	58' 3"	55' 5 3/4"	51' 9 3/8"	46' 7 1/4"	38' 10"	**77.67**	58.25	55.48	51.78	46.60	38.83
77' 9"	58' 3 3/4"	55' 6 3/8"	51' 10"	46' 7 3/4"	38' 10 1/2"	**77.75**	58.31	55.54	51.83	46.65	38.88
77' 10"	58' 4 1/2"	55' 7 1/8"	51' 10 5/8"	46' 8 3/8"	38' 11"	**77.83**	58.37	55.60	51.89	46.70	38.92
77' 11"	58' 5 1/4"	55' 7 7/8"	51' 11 3/8"	46' 9"	38' 11 1/2"	**77.92**	58.44	55.65	51.94	46.75	38.96
78' 0"	58' 6"	55' 8 5/8"	52' 0"	46' 9 5/8"	39' 0"	**78.00**	58.50	55.71	52.00	46.80	39.00
78' 1"	58' 6 3/4"	55' 9 1/4"	52' 5/8"	46' 10 1/4"	39' 1/2"	**78.08**	58.56	55.77	52.06	46.85	39.04
78' 2"	58' 7 1/2"	55' 10"	52' 1 3/8"	46' 10 3/4"	39' 1"	**78.17**	58.62	55.83	52.11	46.90	39.08
78' 3"	58' 8 1/4"	55' 10 3/4"	52' 2"	46' 11 3/8"	39' 1 1/2"	**78.25**	58.69	55.89	52.17	46.95	39.13
78' 4"	58' 9"	55' 11 3/8"	52' 2 5/8"	47' 0"	39' 2"	**78.33**	58.75	55.95	52.22	47.00	39.17
78' 5"	58' 9 3/4"	56' 1/8"	52' 3 3/8"	47' 5/8"	39' 2 1/2"	**78.42**	58.81	56.01	52.28	47.05	39.21
78' 6"	58' 10 1/2"	56' 7/8"	52' 4"	47' 1 1/4"	39' 3"	**78.50**	58.88	56.07	52.33	47.10	39.25
78' 7"	58' 11 1/4"	56' 1 5/8"	52' 4 5/8"	47' 1 3/4"	39' 3 1/2"	**78.58**	58.94	56.13	52.39	47.15	39.29
78' 8"	59' 0"	56' 2 1/4"	52' 5 3/8"	47' 2 3/8"	39' 4"	**78.67**	59.00	56.19	52.44	47.20	39.33
78' 9"	59' 3/4"	56' 3"	52' 6"	47' 3"	39' 4 1/2"	**78.75**	59.06	56.25	52.50	47.25	39.38
78' 10"	59' 1 1/2"	56' 3 3/4"	52' 6 5/8"	47' 3 5/8"	39' 5"	**78.83**	59.12	56.31	52.56	47.30	39.42
78' 11"	59' 2 1/4"	56' 4 3/8"	52' 7 3/8"	47' 4 1/4"	39' 5 1/2"	**78.92**	59.19	56.37	52.61	47.35	39.46
79' 0"	59' 3"	56' 5 1/8"	52' 8"	47' 4 3/4"	39' 6"	**79.00**	59.25	56.43	52.67	47.40	39.50
79' 1"	59' 3 3/4"	56' 5 7/8"	52' 8 5/8"	47' 5 3/8"	39' 6 1/2"	**79.08**	59.31	56.49	52.72	47.45	39.54
79' 2"	59' 4 1/2"	56' 6 5/8"	52' 9 3/8"	47' 6"	39' 7"	**79.17**	59.37	56.55	52.78	47.50	39.58
79' 3"	59' 5 1/4"	56' 7 1/4"	52' 10"	47' 6 5/8"	39' 7 1/2"	**79.25**	59.44	56.61	52.83	47.55	39.63
79' 4"	59' 6"	56' 8"	52' 10 5/8"	47' 7 1/4"	39' 8"	**79.33**	59.50	56.67	52.89	47.60	39.67
79' 5"	59' 6 3/4"	56' 8 3/4"	52' 11 3/8"	47' 7 3/4"	39' 8 1/2"	**79.42**	59.56	56.73	52.94	47.65	39.71
79' 6"	59' 7 1/2"	56' 9 3/8"	53' 0"	47' 8 3/8"	39' 9"	**79.50**	59.63	56.79	53.00	47.70	39.75
79' 7"	59' 8 1/4"	56' 10 1/8"	53' 5/8"	47' 9"	39' 9 1/2"	**79.58**	59.69	56.85	53.06	47.75	39.79
79' 8"	59' 9"	56' 10 7/8"	53' 1 3/8"	47' 9 5/8"	39' 10"	**79.67**	59.75	56.90	53.11	47.80	39.83
79' 9"	59' 9 3/4"	56' 11 5/8"	53' 2"	47' 10 1/4"	39' 10 1/2"	**79.75**	59.81	56.96	53.17	47.85	39.88
79' 10"	59' 10 1/2"	57' 1/4"	53' 2 5/8"	47' 10 3/4"	39' 11"	**79.83**	59.87	57.02	53.22	47.90	39.92
79' 11"	59' 11 1/4"	57' 1"	53' 3 3/8"	47' 11 3/8"	39' 11 1/2"	**79.92**	59.94	57.08	53.28	47.95	39.96
80' 0"	60' 0"	57' 1 3/4"	53' 4"	48' 0"	40' 0"	**80.00**	60.00	57.14	53.33	48.00	40.00
80' 1"	60' 3/4"	57' 2 3/8"	53' 4 5/8"	48' 5/8"	40' 1/2"	**80.08**	60.06	57.20	53.39	48.05	40.04
80' 2"	60' 1 1/2"	57' 3 1/8"	53' 5 3/8"	48' 1 1/4"	40' 1"	**80.17**	60.12	57.26	53.44	48.10	40.08
80' 3"	60' 2 1/4"	57' 3 7/8"	53' 6"	48' 1 3/4"	40' 1 1/2"	**80.25**	60.19	57.32	53.50	48.15	40.13
80' 4"	60' 3"	57' 4 5/8"	53' 6 5/8"	48' 2 3/8"	40' 2"	**80.33**	60.25	57.38	53.56	48.20	40.17
80' 5"	60' 3 3/4"	57' 5 1/4"	53' 7 3/8"	48' 3"	40' 2 1/2"	**80.42**	60.31	57.44	53.61	48.25	40.21
80' 6"	60' 4 1/2"	57' 6"	53' 8"	48' 3 5/8"	40' 3"	**80.50**	60.38	57.50	53.67	48.30	40.25
80' 7"	60' 5 1/4"	57' 6 3/4"	53' 8 5/8"	48' 4 1/4"	40' 3 1/2"	**80.58**	60.44	57.56	53.72	48.35	40.29
80' 8"	60' 6"	57' 7 3/8"	53' 9 3/8"	48' 4 3/4"	40' 4"	**80.67**	60.50	57.62	53.78	48.40	40.33
80' 9"	60' 6 3/4"	57' 8 1/8"	53' 10"	48' 5 3/8"	40' 4 1/2"	**80.75**	60.56	57.68	53.83	48.45	40.38
80' 10"	60' 7 1/2"	57' 8 7/8"	53' 10 5/8"	48' 6"	40' 5"	**80.83**	60.62	57.74	53.89	48.50	40.42
80' 11"	60' 8 1/4"	57' 9 5/8"	53' 11 3/8"	48' 6 5/8"	40' 5 1/2"	**80.92**	60.69	57.80	53.94	48.55	40.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
81' 0"	108' 0"	113' 4 3/4"	121' 6"	135' 0"	162' 0"	81.00	108.00	113.40	121.50	135.00	162.00
81' 1"	108' 1 3/8"	113' 6 1/4"	121' 7 1/2"	135' 1 5/8"	162' 2"	81.08	108.11	113.52	121.63	135.14	162.17
81' 2"	108' 2 5/8"	113' 7 5/8"	121' 9"	135' 3 3/8"	162' 4"	81.17	108.22	113.63	121.75	135.28	162.33
81' 3"	108' 4"	113' 9"	121' 10 1/2"	135' 5"	162' 6"	81.25	108.33	113.75	121.88	135.42	162.50
81' 4"	108' 5 3/8"	113' 10 3/8"	122' 0"	135' 6 5/8"	162' 8"	81.33	108.44	113.87	122.00	135.56	162.67
81' 5"	108' 6 5/8"	113' 11 3/4"	122' 1 1/2"	135' 8 3/8"	162' 10"	81.42	108.56	113.98	122.13	135.69	162.83
81' 6"	108' 8"	114' 1 1/4"	122' 3"	135' 10"	163' 0"	81.50	108.67	114.10	122.25	135.83	163.00
81' 7"	108' 9 3/8"	114' 2 5/8"	122' 4 1/2"	135' 11 5/8"	163' 2"	81.58	108.78	114.22	122.37	135.97	163.17
81' 8"	108' 10 5/8"	114' 4"	122' 6"	136' 1 3/8"	163' 4"	81.67	108.89	114.33	122.50	136.11	163.33
81' 9"	109' 0"	114' 5 3/8"	122' 7 1/2"	136' 3"	163' 6"	81.75	109.00	114.45	122.63	136.25	163.50
81' 10"	109' 1 3/8"	114' 6 3/4"	122' 9"	136' 4 5/8"	163' 8"	81.83	109.11	114.57	122.75	136.39	163.67
81' 11"	109' 2 5/8"	114' 8 1/4"	122' 10 1/2"	136' 6 3/8"	163' 10"	81.92	109.22	114.68	122.88	136.53	163.83
82' 0"	109' 4"	114' 9 5/8"	123' 0"	136' 8"	164' 0"	82.00	109.33	114.80	123.00	136.67	164.00
82' 1"	109' 5 3/8"	114' 11"	123' 1 1/2"	136' 9 5/8"	164' 2"	82.08	109.44	114.92	123.13	136.81	164.17
82' 2"	109' 6 5/8"	115' 3/8"	123' 3"	136' 11 3/8"	164' 4"	82.17	109.56	115.03	123.25	136.94	164.33
82' 3"	109' 8"	115' 1 3/4"	123' 4 1/2"	137' 1"	164' 6"	82.25	109.67	115.15	123.38	137.08	164.50
82' 4"	109' 9 3/8"	115' 3 1/4"	123' 6"	137' 2 5/8"	164' 8"	82.33	109.78	115.27	123.50	137.22	164.67
82' 5"	109' 10 5/8"	115' 4 5/8"	123' 7 1/2"	137' 4 3/8"	164' 10"	82.42	109.89	115.38	123.63	137.36	164.83
82' 6"	110' 0"	115' 6"	123' 9"	137' 6"	165' 0"	82.50	110.00	115.50	123.75	137.50	165.00
82' 7"	110' 1 3/8"	115' 7 3/8"	123' 10 1/2"	137' 7 5/8"	165' 2"	82.58	110.11	115.62	123.87	137.64	165.17
82' 8"	110' 2 5/8"	115' 8 3/4"	124' 0"	137' 9 3/8"	165' 4"	82.67	110.22	115.73	124.00	137.78	165.33
82' 9"	110' 4"	115' 10 1/4"	124' 1 1/2"	137' 11"	165' 6"	82.75	110.33	115.85	124.13	137.92	165.50
82' 10"	110' 5 3/8"	115' 11 5/8"	124' 3"	138' 5/8"	165' 8"	82.83	110.44	115.97	124.25	138.06	165.67
82' 11"	110' 6 5/8"	116' 1"	124' 4 1/2"	138' 2 3/8"	165' 10"	82.92	110.56	116.08	124.38	138.19	165.83
83' 0"	110' 8"	116' 2 3/8"	124' 6"	138' 4"	166' 0"	83.00	110.67	116.20	124.50	138.33	166.00
83' 1"	110' 9 3/8"	116' 3 3/4"	124' 7 1/2"	138' 5 5/8"	166' 2"	83.08	110.78	116.32	124.63	138.47	166.17
83' 2"	110' 10 5/8"	116' 5 1/4"	124' 9"	138' 7 3/8"	166' 4"	83.17	110.89	116.43	124.75	138.61	166.33
83' 3"	111' 0"	116' 6 5/8"	124' 10 1/2"	138' 9"	166' 6"	83.25	111.00	116.55	124.88	138.75	166.50
83' 4"	111' 1 3/8"	116' 8"	125' 0"	138' 10 5/8"	166' 8"	83.33	111.11	116.67	125.00	138.89	166.67
83' 5"	111' 2 5/8"	116' 9 3/8"	125' 1 1/2"	139' 3/8"	166' 10"	83.42	111.22	116.78	125.13	139.03	166.83
83' 6"	111' 4"	116' 10 3/4"	125' 3"	139' 2"	167' 0"	83.50	111.33	116.90	125.25	139.17	167.00
83' 7"	111' 5 3/8"	117' 1/4"	125' 4 1/2"	139' 3 5/8"	167' 2"	83.58	111.44	117.02	125.37	139.31	167.17
83' 8"	111' 6 5/8"	117' 1 5/8"	125' 6"	139' 5 3/8"	167' 4"	83.67	111.56	117.13	125.50	139.44	167.33
83' 9"	111' 8"	117' 3"	125' 7 1/2"	139' 7"	167' 6"	83.75	111.67	117.25	125.63	139.58	167.50
83' 10"	111' 9 3/8"	117' 4 3/8"	125' 9"	139' 8 5/8"	167' 8"	83.83	111.78	117.37	125.75	139.72	167.67
83' 11"	111' 10 5/8"	117' 5 3/4"	125' 10 1/2"	139' 10 3/8"	167' 10"	83.92	111.89	117.48	125.88	139.86	167.83
84' 0"	112' 0"	117' 7 1/4"	126' 0"	140' 0"	168' 0"	84.00	112.00	117.60	126.00	140.00	168.00
84' 1"	112' 1 3/8"	117' 8 5/8"	126' 1 1/2"	140' 1 5/8"	168' 2"	84.08	112.11	117.72	126.13	140.14	168.17
84' 2"	112' 2 5/8"	117' 10"	126' 3"	140' 3 3/8"	168' 4"	84.17	112.22	117.83	126.25	140.28	168.33
84' 3"	112' 4"	117' 11 3/8"	126' 4 1/2"	140' 5"	168' 6"	84.25	112.33	117.95	126.38	140.42	168.50
84' 4"	112' 5 3/8"	118' 3/4"	126' 6"	140' 6 5/8"	168' 8"	84.33	112.44	118.07	126.50	140.56	168.67
84' 5"	112' 6 5/8"	118' 2 1/4"	126' 7 1/2"	140' 8 3/8"	168' 10"	84.42	112.56	118.18	126.63	140.69	168.83
84' 6"	112' 8"	118' 3 5/8"	126' 9"	140' 10"	169' 0"	84.50	112.67	118.30	126.75	140.83	169.00
84' 7"	112' 9 3/8"	118' 5"	126' 10 1/2"	140' 11 5/8"	169' 2"	84.58	112.78	118.42	126.87	140.97	169.17
84' 8"	112' 10 5/8"	118' 6 3/8"	127' 0"	141' 1 3/8"	169' 4"	84.67	112.89	118.53	127.00	141.11	169.33
84' 9"	113' 0"	118' 7 3/4"	127' 1 1/2"	141' 3"	169' 6"	84.75	113.00	118.65	127.13	141.25	169.50
84' 10"	113' 1 3/8"	118' 9 1/4"	127' 3"	141' 4 5/8"	169' 8"	84.83	113.11	118.77	127.25	141.39	169.67
84' 11"	113' 2 5/8"	118' 10 5/8"	127' 4 1/2"	141' 6 3/8"	169' 10"	84.92	113.22	118.88	127.38	141.53	169.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
81' 0"	60' 9"	57' 10 1/4"	54' 0"	48' 7 1/4"	40' 6"	81.00	60.75	57.86	54.00	48.60	40.50
81' 1"	60' 9 3/4"	57' 11"	54' 5/8"	48' 7 3/4"	40' 6 1/2"	81.08	60.81	57.92	54.06	48.65	40.54
81' 2"	60' 10 1/2"	57' 11 3/4"	54' 1 3/8"	48' 8 3/8"	40' 7"	81.17	60.87	57.98	54.11	48.70	40.58
81' 3"	60' 11 1/4"	58' 3/8"	54' 2"	48' 9"	40' 7 1/2"	81.25	60.94	58.04	54.17	48.75	40.63
81' 4"	61' 0"	58' 1 1/8"	54' 2 5/8"	48' 9 5/8"	40' 8"	81.33	61.00	58.10	54.22	48.80	40.67
81' 5"	61' 3/4"	58' 1 7/8"	54' 3 3/8"	48' 10 1/4"	40' 8 1/2"	81.42	61.06	58.15	54.28	48.85	40.71
81' 6"	61' 1 1/2"	58' 2 5/8"	54' 4"	48' 10 3/4"	40' 9"	81.50	61.13	58.21	54.33	48.90	40.75
81' 7"	61' 2 1/4"	58' 3 1/4"	54' 4 5/8"	48' 11 3/8"	40' 9 1/2"	81.58	61.19	58.27	54.39	48.95	40.79
81' 8"	61' 3"	58' 4"	54' 5 3/8"	49' 0"	40' 10"	81.67	61.25	58.33	54.44	49.00	40.83
81' 9"	61' 3 3/4"	58' 4 3/4"	54' 6"	49' 5/8"	40' 10 1/2"	81.75	61.31	58.39	54.50	49.05	40.88
81' 10"	61' 4 1/2"	58' 5 3/8"	54' 6 5/8"	49' 1 1/4"	40' 11"	81.83	61.37	58.45	54.56	49.10	40.92
81' 11"	61' 5 1/4"	58' 6 1/8"	54' 7 3/8"	49' 1 3/4"	40' 11 1/2"	81.92	61.44	58.51	54.61	49.15	40.96
82' 0"	61' 6"	58' 6 7/8"	54' 8"	49' 2 3/8"	41' 0"	82.00	61.50	58.57	54.67	49.20	41.00
82' 1"	61' 6 3/4"	58' 7 5/8"	54' 8 5/8"	49' 3"	41' 1/2"	82.08	61.56	58.63	54.72	49.25	41.04
82' 2"	61' 7 1/2"	58' 8 1/4"	54' 9 3/8"	49' 3 5/8"	41' 1"	82.17	61.62	58.69	54.78	49.30	41.08
82' 3"	61' 8 1/4"	58' 9"	54' 10"	49' 4 1/4"	41' 1 1/2"	82.25	61.69	58.75	54.83	49.35	41.13
82' 4"	61' 9"	58' 9 3/4"	54' 10 5/8"	49' 4 3/4"	41' 2"	82.33	61.75	58.81	54.89	49.40	41.17
82' 5"	61' 9 3/4"	58' 10 3/8"	54' 11 3/8"	49' 5 3/8"	41' 2 1/2"	82.42	61.81	58.87	54.94	49.45	41.21
82' 6"	61' 10 1/2"	58' 11 1/8"	55' 0"	49' 6"	41' 3"	82.50	61.88	58.93	55.00	49.50	41.25
82' 7"	61' 11 1/4"	58' 11 7/8"	55' 5/8"	49' 6 5/8"	41' 3 1/2"	82.58	61.94	58.99	55.06	49.55	41.29
82' 8"	62' 0"	59' 5/8"	55' 1 3/8"	49' 7 1/4"	41' 4"	82.67	62.00	59.05	55.11	49.60	41.33
82' 9"	62' 3/4"	59' 1 1/4"	55' 2"	49' 7 3/4"	41' 4 1/2"	82.75	62.06	59.11	55.17	49.65	41.38
82' 10"	62' 1 1/2"	59' 2"	55' 2 5/8"	49' 8 3/8"	41' 5"	82.83	62.12	59.17	55.22	49.70	41.42
82' 11"	62' 2 1/4"	59' 2 3/4"	55' 3 3/8"	49' 9"	41' 5 1/2"	82.92	62.19	59.23	55.28	49.75	41.46
83' 0"	62' 3"	59' 3 3/8"	55' 4"	49' 9 5/8"	41' 6"	83.00	62.25	59.29	55.33	49.80	41.50
83' 1"	62' 3 3/4"	59' 4 1/8"	55' 4 5/8"	49' 10 1/4"	41' 6 1/2"	83.08	62.31	59.35	55.39	49.85	41.54
83' 2"	62' 4 1/2"	59' 4 7/8"	55' 5 3/8"	49' 10 3/4"	41' 7"	83.17	62.37	59.40	55.44	49.90	41.58
83' 3"	62' 5 1/4"	59' 5 5/8"	55' 6"	49' 11 3/8"	41' 7 1/2"	83.25	62.44	59.46	55.50	49.95	41.63
83' 4"	62' 6"	59' 6 1/4"	55' 6 5/8"	50' 0"	41' 8"	83.33	62.50	59.52	55.56	50.00	41.67
83' 5"	62' 6 3/4"	59' 7"	55' 7 3/8"	50' 5/8"	41' 8 1/2"	83.42	62.56	59.58	55.61	50.05	41.71
83' 6"	62' 7 1/2"	59' 7 3/4"	55' 8"	50' 1 1/4"	41' 9"	83.50	62.63	59.64	55.67	50.10	41.75
83' 7"	62' 8 1/4"	59' 8 3/8"	55' 8 5/8"	50' 1 3/4"	41' 9 1/2"	83.58	62.69	59.70	55.72	50.15	41.79
83' 8"	62' 9"	59' 9 1/8"	55' 9 3/8"	50' 2 3/8"	41' 10"	83.67	62.75	59.76	55.78	50.20	41.83
83' 9"	62' 9 3/4"	59' 9 7/8"	55' 10"	50' 3"	41' 10 1/2"	83.75	62.81	59.82	55.83	50.25	41.88
83' 10"	62' 10 1/2"	59' 10 5/8"	55' 10 5/8"	50' 3 5/8"	41' 11"	83.83	62.87	59.88	55.89	50.30	41.92
83' 11"	62' 11 1/4"	59' 11 1/4"	55' 11 3/8"	50' 4 1/4"	41' 11 1/2"	83.92	62.94	59.94	55.94	50.35	41.96
84' 0"	63' 0"	60' 0"	56' 0"	50' 4 3/4"	42' 0"	84.00	63.00	60.00	56.00	50.40	42.00
84' 1"	63' 3/4"	60' 3/4"	56' 5/8"	50' 5 3/8"	42' 1/2"	84.08	63.06	60.06	56.06	50.45	42.04
84' 2"	63' 1 1/2"	60' 1 3/8"	56' 1 3/8"	50' 6"	42' 1"	84.17	63.12	60.12	56.11	50.50	42.08
84' 3"	63' 2 1/4"	60' 2 1/8"	56' 2"	50' 6 5/8"	42' 1 1/2"	84.25	63.19	60.18	56.17	50.55	42.13
84' 4"	63' 3"	60' 2 7/8"	56' 2 5/8"	50' 7 1/4"	42' 2"	84.33	63.25	60.24	56.22	50.60	42.17
84' 5"	63' 3 3/4"	60' 3 5/8"	56' 3 3/8"	50' 7 3/4"	42' 2 1/2"	84.42	63.31	60.30	56.28	50.65	42.21
84' 6"	63' 4 1/2"	60' 4 1/4"	56' 4"	50' 8 3/8"	42' 3"	84.50	63.38	60.36	56.33	50.70	42.25
84' 7"	63' 5 1/4"	60' 5"	56' 4 5/8"	50' 9"	42' 3 1/2"	84.58	63.44	60.42	56.39	50.75	42.29
84' 8"	63' 6"	60' 5 3/4"	56' 5 3/8"	50' 9 5/8"	42' 4"	84.67	63.50	60.48	56.44	50.80	42.33
84' 9"	63' 6 3/4"	60' 6 3/8"	56' 6"	50' 10 1/4"	42' 4 1/2"	84.75	63.56	60.54	56.50	50.85	42.38
84' 10"	63' 7 1/2"	60' 7 1/8"	56' 6 5/8"	50' 10 3/4"	42' 5"	84.83	63.62	60.60	56.56	50.90	42.42
84' 11"	63' 8 1/4"	60' 7 7/8"	56' 7 3/8"	50' 11 3/8"	42' 5 1/2"	84.92	63.69	60.65	56.61	50.95	42.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
85' 0"	113' 4"	119' 0"	127' 6"	141' 8"	170' 0"	**85.00**	113.33	119.00	127.50	141.67	170.00
85' 1"	113' 5 3/8"	119' 1 3/8"	127' 7 1/2"	141' 9 5/8"	170' 2"	**85.08**	113.44	119.12	127.63	141.81	170.17
85' 2"	113' 6 5/8"	119' 2 3/4"	127' 9"	141' 11 3/8"	170' 4"	**85.17**	113.56	119.23	127.75	141.94	170.33
85' 3"	113' 8"	119' 4 1/4"	127' 10 1/2"	142' 1"	170' 6"	**85.25**	113.67	119.35	127.88	142.08	170.50
85' 4"	113' 9 3/8"	119' 5 5/8"	128' 0"	142' 2 5/8"	170' 8"	**85.33**	113.78	119.47	128.00	142.22	170.67
85' 5"	113' 10 5/8"	119' 7"	128' 1 1/2"	142' 4 3/8"	170' 10"	**85.42**	113.89	119.58	128.13	142.36	170.83
85' 6"	114' 0"	119' 8 3/8"	128' 3"	142' 6"	171' 0"	**85.50**	114.00	119.70	128.25	142.50	171.00
85' 7"	114' 1 3/8"	119' 9 3/4"	128' 4 1/2"	142' 7 5/8"	171' 2"	**85.58**	114.11	119.82	128.37	142.64	171.17
85' 8"	114' 2 5/8"	119' 11 1/4"	128' 6"	142' 9 3/8"	171' 4"	**85.67**	114.22	119.93	128.50	142.78	171.33
85' 9"	114' 4"	120' 5/8"	128' 7 1/2"	142' 11"	171' 6"	**85.75**	114.33	120.05	128.63	142.92	171.50
85' 10"	114' 5 3/8"	120' 2"	128' 9"	143' 5/8"	171' 8"	**85.83**	114.44	120.17	128.75	143.06	171.67
85' 11"	114' 6 5/8"	120' 3 3/8"	128' 10 1/2"	143' 2 3/8"	171' 10"	**85.92**	114.56	120.28	128.88	143.19	171.83
86' 0"	114' 8"	120' 4 3/4"	129' 0"	143' 4"	172' 0"	**86.00**	114.67	120.40	129.00	143.33	172.00
86' 1"	114' 9 3/8"	120' 6 1/4"	129' 1 1/2"	143' 5 5/8"	172' 2"	**86.08**	114.78	120.52	129.13	143.47	172.17
86' 2"	114' 10 5/8"	120' 7 5/8"	129' 3"	143' 7 3/8"	172' 4"	**86.17**	114.89	120.63	129.25	143.61	172.33
86' 3"	115' 0"	120' 9"	129' 4 1/2"	143' 9"	172' 6"	**86.25**	115.00	120.75	129.38	143.75	172.50
86' 4"	115' 1 3/8"	120' 10 3/8"	129' 6"	143' 10 5/8"	172' 8"	**86.33**	115.11	120.87	129.50	143.89	172.67
86' 5"	115' 2 5/8"	120' 11 3/4"	129' 7 1/2"	144' 3/8"	172' 10"	**86.42**	115.22	120.98	129.63	144.03	172.83
86' 6"	115' 4"	121' 1 1/4"	129' 9"	144' 2"	173' 0"	**86.50**	115.33	121.10	129.75	144.17	173.00
86' 7"	115' 5 3/8"	121' 2 5/8"	129' 10 1/2"	144' 3 5/8"	173' 2"	**86.58**	115.44	121.22	129.87	144.31	173.17
86' 8"	115' 6 5/8"	121' 4"	130' 0"	144' 5 3/8"	173' 4"	**86.67**	115.56	121.33	130.00	144.44	173.33
86' 9"	115' 8"	121' 5 3/8"	130' 1 1/2"	144' 7"	173' 6"	**86.75**	115.67	121.45	130.13	144.58	173.50
86' 10"	115' 9 3/8"	121' 6 3/4"	130' 3"	144' 8 5/8"	173' 8"	**86.83**	115.78	121.57	130.25	144.72	173.67
86' 11"	115' 10 5/8"	121' 8 1/4"	130' 4 1/2"	144' 10 3/8"	173' 10"	**86.92**	115.89	121.68	130.38	144.86	173.83
87' 0"	116' 0"	121' 9 5/8"	130' 6"	145' 0"	174' 0"	**87.00**	116.00	121.80	130.50	145.00	174.00
87' 1"	116' 1 3/8"	121' 11"	130' 7 1/2"	145' 1 5/8"	174' 2"	**87.08**	116.11	121.92	130.63	145.14	174.17
87' 2"	116' 2 5/8"	122' 3/8"	130' 9"	145' 3 3/8"	174' 4"	**87.17**	116.22	122.03	130.75	145.28	174.33
87' 3"	116' 4"	122' 1 3/4"	130' 10 1/2"	145' 5"	174' 6"	**87.25**	116.33	122.15	130.88	145.42	174.50
87' 4"	116' 5 3/8"	122' 3 1/4"	131' 0"	145' 6 5/8"	174' 8"	**87.33**	116.44	122.27	131.00	145.56	174.67
87' 5"	116' 6 5/8"	122' 4 5/8"	131' 1 1/2"	145' 8 3/8"	174' 10"	**87.42**	116.56	122.38	131.13	145.69	174.83
87' 6"	116' 8"	122' 6"	131' 3"	145' 10"	175' 0"	**87.50**	116.67	122.50	131.25	145.83	175.00
87' 7"	116' 9 3/8"	122' 7 3/8"	131' 4 1/2"	145' 11 5/8"	175' 2"	**87.58**	116.78	122.62	131.37	145.97	175.17
87' 8"	116' 10 5/8"	122' 8 3/4"	131' 6"	146' 1 3/8"	175' 4"	**87.67**	116.89	122.73	131.50	146.11	175.33
87' 9"	117' 0"	122' 10 1/4"	131' 7 1/2"	146' 3"	175' 6"	**87.75**	117.00	122.85	131.63	146.25	175.50
87' 10"	117' 1 3/8"	122' 11 5/8"	131' 9"	146' 4 5/8"	175' 8"	**87.83**	117.11	122.97	131.75	146.39	175.67
87' 11"	117' 2 5/8"	123' 1"	131' 10 1/2"	146' 6 3/8"	175' 10"	**87.92**	117.22	123.08	131.88	146.53	175.83
88' 0"	117' 4"	123' 2 3/8"	132' 0"	146' 8"	176' 0"	**88.00**	117.33	123.20	132.00	146.67	176.00
88' 1"	117' 5 3/8"	123' 3 3/4"	132' 1 1/2"	146' 9 5/8"	176' 2"	**88.08**	117.44	123.32	132.13	146.81	176.17
88' 2"	117' 6 5/8"	123' 5 1/4"	132' 3"	146' 11 3/8"	176' 4"	**88.17**	117.56	123.43	132.25	146.94	176.33
88' 3"	117' 8"	123' 6 5/8"	132' 4 1/2"	147' 1"	176' 6"	**88.25**	117.67	123.55	132.38	147.08	176.50
88' 4"	117' 9 3/8"	123' 8"	132' 6"	147' 2 5/8"	176' 8"	**88.33**	117.78	123.67	132.50	147.22	176.67
88' 5"	117' 10 5/8"	123' 9 3/8"	132' 7 1/2"	147' 4 3/8"	176' 10"	**88.42**	117.89	123.78	132.63	147.36	176.83
88' 6"	118' 0"	123' 10 3/4"	132' 9"	147' 6"	177' 0"	**88.50**	118.00	123.90	132.75	147.50	177.00
88' 7"	118' 1 3/8"	124' 1/4"	132' 10 1/2"	147' 7 5/8"	177' 2"	**88.58**	118.11	124.02	132.87	147.64	177.17
88' 8"	118' 2 5/8"	124' 1 5/8"	133' 0"	147' 9 3/8"	177' 4"	**88.67**	118.22	124.13	133.00	147.78	177.33
88' 9"	118' 4"	124' 3"	133' 1 1/2"	147' 11"	177' 6"	**88.75**	118.33	124.25	133.13	147.92	177.50
88' 10"	118' 5 3/8"	124' 4 3/8"	133' 3"	148' 5/8"	177' 8"	**88.83**	118.44	124.37	133.25	148.06	177.67
88' 11"	118' 6 5/8"	124' 5 3/4"	133' 4 1/2"	148' 2 3/8"	177' 10"	**88.92**	118.56	124.48	133.38	148.19	177.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
85' 0"	63' 9"	60' 8 5/8"	56' 8"	51' 0"	42' 6"	**85.00**	63.75	60.71	56.67	51.00	42.50
85' 1"	63' 9 3/4"	60' 9 1/4"	56' 8 5/8"	51' 5/8"	42' 6 1/2"	**85.08**	63.81	60.77	56.72	51.05	42.54
85' 2"	63' 10 1/2"	60' 10"	56' 9 3/8"	51' 1 1/4"	42' 7"	**85.17**	63.87	60.83	56.78	51.10	42.58
85' 3"	63' 11 1/4"	60' 10 3/4"	56' 10"	51' 1 3/4"	42' 7 1/2"	**85.25**	63.94	60.89	56.83	51.15	42.63
85' 4"	64' 0"	60' 11 3/8"	56' 10 5/8"	51' 2 3/8"	42' 8"	**85.33**	64.00	60.95	56.89	51.20	42.67
85' 5"	64' 3/4"	61' 1/8"	56' 11 3/8"	51' 3"	42' 8 1/2"	**85.42**	64.06	61.01	56.94	51.25	42.71
85' 6"	64' 1 1/2"	61' 7/8"	57' 0"	51' 3 5/8"	42' 9"	**85.50**	64.13	61.07	57.00	51.30	42.75
85' 7"	64' 2 1/4"	61' 1 5/8"	57' 5/8"	51' 4 1/4"	42' 9 1/2"	**85.58**	64.19	61.13	57.06	51.35	42.79
85' 8"	64' 3"	61' 2 1/4"	57' 1 3/8"	51' 4 3/4"	42' 10"	**85.67**	64.25	61.19	57.11	51.40	42.83
85' 9"	64' 3 3/4"	61' 3"	57' 2"	51' 5 3/8"	42' 10 1/2"	**85.75**	64.31	61.25	57.17	51.45	42.88
85' 10"	64' 4 1/2"	61' 3 3/4"	57' 2 5/8"	51' 6"	42' 11"	**85.83**	64.37	61.31	57.22	51.50	42.92
85' 11"	64' 5 1/4"	61' 4 3/8"	57' 3 3/8"	51' 6 5/8"	42' 11 1/2"	**85.92**	64.44	61.37	57.28	51.55	42.96
86' 0"	64' 6"	61' 5 1/8"	57' 4"	51' 7 1/4"	43' 0"	**86.00**	64.50	61.43	57.33	51.60	43.00
86' 1"	64' 6 3/4"	61' 5 7/8"	57' 4 5/8"	51' 7 3/4"	43' 1/2"	**86.08**	64.56	61.49	57.39	51.65	43.04
86' 2"	64' 7 1/2"	61' 6 5/8"	57' 5 3/8"	51' 8 3/8"	43' 1"	**86.17**	64.62	61.55	57.44	51.70	43.08
86' 3"	64' 8 1/4"	61' 7 1/4"	57' 6"	51' 9"	43' 1 1/2"	**86.25**	64.69	61.61	57.50	51.75	43.13
86' 4"	64' 9"	61' 8"	57' 6 5/8"	51' 9 5/8"	43' 2"	**86.33**	64.75	61.67	57.56	51.80	43.17
86' 5"	64' 9 3/4"	61' 8 3/4"	57' 7 3/8"	51' 10 1/4"	43' 2 1/2"	**86.42**	64.81	61.73	57.61	51.85	43.21
86' 6"	64' 10 1/2"	61' 9 3/8"	57' 8"	51' 10 3/4"	43' 3"	**86.50**	64.88	61.79	57.67	51.90	43.25
86' 7"	64' 11 1/4"	61' 10 1/8"	57' 8 5/8"	51' 11 3/8"	43' 3 1/2"	**86.58**	64.94	61.85	57.72	51.95	43.29
86' 8"	65' 0"	61' 10 7/8"	57' 9 3/8"	52' 0"	43' 4"	**86.67**	65.00	61.90	57.78	52.00	43.33
86' 9"	65' 3/4"	61' 11 5/8"	57' 10"	52' 5/8"	43' 4 1/2"	**86.75**	65.06	61.96	57.83	52.05	43.38
86' 10"	65' 1 1/2"	62' 1/4"	57' 10 5/8"	52' 1 1/4"	43' 5"	**86.83**	65.12	62.02	57.89	52.10	43.42
86' 11"	65' 2 1/4"	62' 1"	57' 11 3/8"	52' 1 3/4"	43' 5 1/2"	**86.92**	65.19	62.08	57.94	52.15	43.46
87' 0"	65' 3"	62' 1 3/4"	58' 0"	52' 2 3/8"	43' 6"	**87.00**	65.25	62.14	58.00	52.20	43.50
87' 1"	65' 3 3/4"	62' 2 3/8"	58' 5/8"	52' 3"	43' 6 1/2"	**87.08**	65.31	62.20	58.06	52.25	43.54
87' 2"	65' 4 1/2"	62' 3 1/8"	58' 1 3/8"	52' 3 5/8"	43' 7"	**87.17**	65.37	62.26	58.11	52.30	43.58
87' 3"	65' 5 1/4"	62' 3 7/8"	58' 2"	52' 4 1/4"	43' 7 1/2"	**87.25**	65.44	62.32	58.17	52.35	43.63
87' 4"	65' 6"	62' 4 5/8"	58' 2 5/8"	52' 4 3/4"	43' 8"	**87.33**	65.50	62.38	58.22	52.40	43.67
87' 5"	65' 6 3/4"	62' 5 1/4"	58' 3 3/8"	52' 5 3/8"	43' 8 1/2"	**87.42**	65.56	62.44	58.28	52.45	43.71
87' 6"	65' 7 1/2"	62' 6"	58' 4"	52' 6"	43' 9"	**87.50**	65.63	62.50	58.33	52.50	43.75
87' 7"	65' 8 1/4"	62' 6 3/4"	58' 4 5/8"	52' 6 5/8"	43' 9 1/2"	**87.58**	65.69	62.56	58.39	52.55	43.79
87' 8"	65' 9"	62' 7 3/8"	58' 5 3/8"	52' 7 1/4"	43' 10"	**87.67**	65.75	62.62	58.44	52.60	43.83
87' 9"	65' 9 3/4"	62' 8 1/8"	58' 6"	52' 7 3/4"	43' 10 1/2"	**87.75**	65.81	62.68	58.50	52.65	43.88
87' 10"	65' 10 1/2"	62' 8 7/8"	58' 6 5/8"	52' 8 3/8"	43' 11"	**87.83**	65.87	62.74	58.56	52.70	43.92
87' 11"	65' 11 1/4"	62' 9 5/8"	58' 7 3/8"	52' 9"	43' 11 1/2"	**87.92**	65.94	62.80	58.61	52.75	43.96
88' 0"	66' 0"	62' 10 1/4"	58' 8"	52' 9 5/8"	44' 0"	**88.00**	66.00	62.86	58.67	52.80	44.00
88' 1"	66' 3/4"	62' 11"	58' 8 5/8"	52' 10 1/4"	44' 1/2"	**88.08**	66.06	62.92	58.72	52.85	44.04
88' 2"	66' 1 1/2"	62' 11 3/4"	58' 9 3/8"	52' 10 3/4"	44' 1"	**88.17**	66.12	62.98	58.78	52.90	44.08
88' 3"	66' 2 1/4"	63' 3/8"	58' 10"	52' 11 3/8"	44' 1 1/2"	**88.25**	66.19	63.04	58.83	52.95	44.13
88' 4"	66' 3"	63' 1 1/8"	58' 10 5/8"	53' 0"	44' 2"	**88.33**	66.25	63.10	58.89	53.00	44.17
88' 5"	66' 3 3/4"	63' 1 7/8"	58' 11 3/8"	53' 5/8"	44' 2 1/2"	**88.42**	66.31	63.15	58.94	53.05	44.21
88' 6"	66' 4 1/2"	63' 2 5/8"	59' 0"	53' 1 1/4"	44' 3"	**88.50**	66.38	63.21	59.00	53.10	44.25
88' 7"	66' 5 1/4"	63' 3 1/4"	59' 5/8"	53' 1 3/4"	44' 3 1/2"	**88.58**	66.44	63.27	59.06	53.15	44.29
88' 8"	66' 6"	63' 4"	59' 1 3/8"	53' 2 3/8"	44' 4"	**88.67**	66.50	63.33	59.11	53.20	44.33
88' 9"	66' 6 3/4"	63' 4 3/4"	59' 2"	53' 3"	44' 4 1/2"	**88.75**	66.56	63.39	59.17	53.25	44.38
88' 10"	66' 7 1/2"	63' 5 3/8"	59' 2 5/8"	53' 3 5/8"	44' 5"	**88.83**	66.62	63.45	59.22	53.30	44.42
88' 11"	66' 8 1/4"	63' 6 1/8"	59' 3 3/8"	53' 4 1/4"	44' 5 1/2"	**88.92**	66.69	63.51	59.28	53.35	44.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
89' 0"	118' 8"	124' 7 1/4"	133' 6"	148' 4"	178' 0"	**89.00**	118.67	124.60	133.50	148.33	178.00
89' 1"	118' 9 3/8"	124' 8 5/8"	133' 7 1/2"	148' 5 5/8"	178' 2"	**89.08**	118.78	124.72	133.63	148.47	178.17
89' 2"	118' 10 5/8"	124' 10"	133' 9"	148' 7 3/8"	178' 4"	**89.17**	118.89	124.83	133.75	148.61	178.33
89' 3"	119' 0"	124' 11 3/8"	133' 10 1/2"	148' 9"	178' 6"	**89.25**	119.00	124.95	133.88	148.75	178.50
89' 4"	119' 1 3/8"	125' 3/4"	134' 0"	148' 10 5/8"	178' 8"	**89.33**	119.11	125.07	134.00	148.89	178.67
89' 5"	119' 2 5/8"	125' 2 1/4"	134' 1 1/2"	149' 3/8"	178' 10"	**89.42**	119.22	125.18	134.13	149.03	178.83
89' 6"	119' 4"	125' 3 5/8"	134' 3"	149' 2"	179' 0"	**89.50**	119.33	125.30	134.25	149.17	179.00
89' 7"	119' 5 3/8"	125' 5"	134' 4 1/2"	149' 3 5/8"	179' 2"	**89.58**	119.44	125.42	134.37	149.31	179.17
89' 8"	119' 6 5/8"	125' 6 3/8"	134' 6"	149' 5 3/8"	179' 4"	**89.67**	119.56	125.53	134.50	149.44	179.33
89' 9"	119' 8"	125' 7 3/4"	134' 7 1/2"	149' 7"	179' 6"	**89.75**	119.67	125.65	134.63	149.58	179.50
89' 10"	119' 9 3/8"	125' 9 1/4"	134' 9"	149' 8 5/8"	179' 8"	**89.83**	119.78	125.77	134.75	149.72	179.67
89' 11"	119' 10 5/8"	125' 10 5/8"	134' 10 1/2"	149' 10 3/8"	179' 10"	**89.92**	119.89	125.88	134.88	149.86	179.83
90' 0"	120' 0"	126' 0"	135' 0"	150' 0"	180' 0"	**90.00**	120.00	126.00	135.00	150.00	180.00
90' 1"	120' 1 3/8"	126' 1 3/8"	135' 1 1/2"	150' 1 5/8"	180' 2"	**90.08**	120.11	126.12	135.13	150.14	180.17
90' 2"	120' 2 5/8"	126' 2 3/4"	135' 3"	150' 3 3/8"	180' 4"	**90.17**	120.22	126.23	135.25	150.28	180.33
90' 3"	120' 4"	126' 4 1/4"	135' 4 1/2"	150' 5"	180' 6"	**90.25**	120.33	126.35	135.38	150.42	180.50
90' 4"	120' 5 3/8"	126' 5 5/8"	135' 6"	150' 6 5/8"	180' 8"	**90.33**	120.44	126.47	135.50	150.56	180.67
90' 5"	120' 6 5/8"	126' 7"	135' 7 1/2"	150' 8 3/8"	180' 10"	**90.42**	120.56	126.58	135.63	150.69	180.83
90' 6"	120' 8"	126' 8 3/8"	135' 9"	150' 10"	181' 0"	**90.50**	120.67	126.70	135.75	150.83	181.00
80' 7"	107' 5 3/8"	112' 9 3/4"	120' 10 1/2"	134' 3 5/8"	161' 2"	**80.58**	107.44	112.82	120.87	134.31	161.17
90' 8"	120' 10 5/8"	126' 11 1/4"	136' 0"	151' 1 3/8"	181' 4"	**90.67**	120.89	126.93	136.00	151.11	181.33
90' 9"	121' 0"	127' 5/8"	136' 1 1/2"	151' 3"	181' 6"	**90.75**	121.00	127.05	136.13	151.25	181.50
90' 10"	121' 1 3/8"	127' 2"	136' 3"	151' 4 5/8"	181' 8"	**90.83**	121.11	127.17	136.25	151.39	181.67
90' 11"	121' 2 5/8"	127' 3 3/8"	136' 4 1/2"	151' 6 3/8"	181' 10"	**90.92**	121.22	127.28	136.38	151.53	181.83
91' 0"	121' 4"	127' 4 3/4"	136' 6"	151' 8"	182' 0"	**91.00**	121.33	127.40	136.50	151.67	182.00
91' 1"	121' 5 3/8"	127' 6 1/4"	136' 7 1/2"	151' 9 5/8"	182' 2"	**91.08**	121.44	127.52	136.63	151.81	182.17
91' 2"	121' 6 5/8"	127' 7 5/8"	136' 9"	151' 11 3/8"	182' 4"	**91.17**	121.56	127.63	136.75	151.94	182.33
91' 3"	121' 8"	127' 9"	136' 10 1/2"	152' 1"	182' 6"	**91.25**	121.67	127.75	136.88	152.08	182.50
91' 4"	121' 9 3/8"	127' 10 3/8"	137' 0"	152' 2 5/8"	182' 8"	**91.33**	121.78	127.87	137.00	152.22	182.67
91' 5"	121' 10 5/8"	127' 11 3/4"	137' 1 1/2"	152' 4 3/8"	182' 10"	**91.42**	121.89	127.98	137.13	152.36	182.83
91' 6"	122' 0"	128' 1 1/4"	137' 3"	152' 6"	183' 0"	**91.50**	122.00	128.10	137.25	152.50	183.00
91' 7"	122' 1 3/8"	128' 2 5/8"	137' 4 1/2"	152' 7 5/8"	183' 2"	**91.58**	122.11	128.22	137.37	152.64	183.17
91' 8"	122' 2 5/8"	128' 4"	137' 6"	152' 9 3/8"	183' 4"	**91.67**	122.22	128.33	137.50	152.78	183.33
91' 9"	122' 4"	128' 5 3/8"	137' 7 1/2"	152' 11"	183' 6"	**91.75**	122.33	128.45	137.63	152.92	183.50
91' 10"	122' 5 3/8"	128' 6 3/4"	137' 9"	153' 5/8"	183' 8"	**91.83**	122.44	128.57	137.75	153.06	183.67
91' 11"	122' 6 5/8"	128' 8 1/4"	137' 10 1/2"	153' 2 3/8"	183' 10"	**91.92**	122.56	128.68	137.88	153.19	183.83
92' 0"	122' 8"	128' 9 5/8"	138' 0"	153' 4"	184' 0"	**92.00**	122.67	128.80	138.00	153.33	184.00
92' 1"	122' 9 3/8"	128' 11"	138' 1 1/2"	153' 5 5/8"	184' 2"	**92.08**	122.78	128.92	138.13	153.47	184.17
92' 2"	122' 10 5/8"	129' 3/8"	138' 3"	153' 7 3/8"	184' 4"	**92.17**	122.89	129.03	138.25	153.61	184.33
92' 3"	123' 0"	129' 1 3/4"	138' 4 1/2"	153' 9"	184' 6"	**92.25**	123.00	129.15	138.38	153.75	184.50
92' 4"	123' 1 3/8"	129' 3 1/4"	138' 6"	153' 10 5/8"	184' 8"	**92.33**	123.11	129.27	138.50	153.89	184.67
92' 5"	123' 2 5/8"	129' 4 5/8"	138' 7 1/2"	154' 3/8"	184' 10"	**92.42**	123.22	129.38	138.63	154.03	184.83
92' 6"	123' 4"	129' 6"	138' 9"	154' 2"	185' 0"	**92.50**	123.33	129.50	138.75	154.17	185.00
92' 7"	123' 5 3/8"	129' 7 3/8"	138' 10 1/2"	154' 3 5/8"	185' 2"	**92.58**	123.44	129.62	138.87	154.31	185.17
92' 8"	123' 6 5/8"	129' 8 3/4"	139' 0"	154' 5 3/8"	185' 4"	**92.67**	123.56	129.73	139.00	154.44	185.33
92' 9"	123' 8"	129' 10 1/4"	139' 1 1/2"	154' 7"	185' 6"	**92.75**	123.67	129.85	139.13	154.58	185.50
92' 10"	123' 9 3/8"	129' 11 5/8"	139' 3"	154' 8 5/8"	185' 8"	**92.83**	123.78	129.97	139.25	154.72	185.67
92' 11"	123' 10 5/8"	130' 1"	139' 4 1/2"	154' 10 3/8"	185' 10"	**92.92**	123.89	130.08	139.38	154.86	185.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
89' 0"	66' 9"	63' 6 7/8"	59' 4"	53' 4 3/4"	44' 6"	**89.00**	66.75	63.57	59.33	53.40	44.50
89' 1"	66' 9 3/4"	63' 7 5/8"	59' 4 5/8"	53' 5 3/8"	44' 6 1/2"	**89.08**	66.81	63.63	59.39	53.45	44.54
89' 2"	66' 10 1/2"	63' 8 1/4"	59' 5 3/8"	53' 6"	44' 7"	**89.17**	66.87	63.69	59.44	53.50	44.58
89' 3"	66' 11 1/4"	63' 9"	59' 6"	53' 6 5/8"	44' 7 1/2"	**89.25**	66.94	63.75	59.50	53.55	44.63
89' 4"	67' 0"	63' 9 3/4"	59' 6 5/8"	53' 7 1/4"	44' 8"	**89.33**	67.00	63.81	59.56	53.60	44.67
89' 5"	67' 3/4"	63' 10 3/8"	59' 7 3/8"	53' 7 3/4"	44' 8 1/2"	**89.42**	67.06	63.87	59.61	53.65	44.71
89' 6"	67' 1 1/2"	63' 11 1/8"	59' 8"	53' 8 3/8"	44' 9"	**89.50**	67.13	63.93	59.67	53.70	44.75
89' 7"	67' 2 1/4"	63' 11 7/8"	59' 8 5/8"	53' 9"	44' 9 1/2"	**89.58**	67.19	63.99	59.72	53.75	44.79
89' 8"	67' 3"	64' 5/8"	59' 9 3/8"	53' 9 5/8"	44' 10"	**89.67**	67.25	64.05	59.78	53.80	44.83
89' 9"	67' 3 3/4"	64' 1 1/4"	59' 10"	53' 10 1/4"	44' 10 1/2"	**89.75**	67.31	64.11	59.83	53.85	44.88
89' 10"	67' 4 1/2"	64' 2"	59' 10 5/8"	53' 10 3/4"	44' 11"	**89.83**	67.37	64.17	59.89	53.90	44.92
89' 11"	67' 5 1/4"	64' 2 3/4"	59' 11 3/8"	53' 11 3/8"	44' 11 1/2"	**89.92**	67.44	64.23	59.94	53.95	44.96
90' 0"	67' 6"	64' 3 3/8"	60' 0"	54' 0"	45' 0"	**90.00**	67.50	64.29	60.00	54.00	45.00
90' 1"	67' 6 3/4"	64' 4 1/8"	60' 5/8"	54' 5/8"	45' 1/2"	**90.08**	67.56	64.35	60.06	54.05	45.04
90' 2"	67' 7 1/2"	64' 4 7/8"	60' 1 3/8"	54' 1 1/4"	45' 1"	**90.17**	67.62	64.40	60.11	54.10	45.08
90' 3"	67' 8 1/4"	64' 5 5/8"	60' 2"	54' 1 3/4"	45' 1 1/2"	**90.25**	67.69	64.46	60.17	54.15	45.13
90' 4"	67' 9"	64' 6 1/4"	60' 2 5/8"	54' 2 3/8"	45' 2"	**90.33**	67.75	64.52	60.22	54.20	45.17
90' 5"	67' 9 3/4"	64' 7"	60' 3 3/8"	54' 3"	45' 2 1/2"	**90.42**	67.81	64.58	60.28	54.25	45.21
90' 6"	67' 10 1/2"	64' 7 3/4"	60' 4"	54' 3 5/8"	45' 3"	**90.50**	67.88	64.64	60.33	54.30	45.25
80' 7"	60' 5 1/4"	57' 6 3/4"	53' 8 5/8"	48' 4 1/4"	40' 3 1/2"	**80.58**	60.44	57.56	53.72	48.35	40.29
90' 8"	68' 0"	64' 9 1/8"	60' 5 3/8"	54' 4 3/4"	45' 4"	**90.67**	68.00	64.76	60.44	54.40	45.33
90' 9"	68' 3/4"	64' 9 7/8"	60' 6"	54' 5 3/8"	45' 4 1/2"	**90.75**	68.06	64.82	60.50	54.45	45.38
90' 10"	68' 1 1/2"	64' 10 5/8"	60' 6 5/8"	54' 6"	45' 5"	**90.83**	68.12	64.88	60.56	54.50	45.42
90' 11"	68' 2 1/4"	64' 11 1/4"	60' 7 3/8"	54' 6 5/8"	45' 5 1/2"	**90.92**	68.19	64.94	60.61	54.55	45.46
91' 0"	68' 3"	65' 0"	60' 8"	54' 7 1/4"	45' 6"	**91.00**	68.25	65.00	60.67	54.60	45.50
91' 1"	68' 3 3/4"	65' 3/4"	60' 8 5/8"	54' 7 3/4"	45' 6 1/2"	**91.08**	68.31	65.06	60.72	54.65	45.54
91' 2"	68' 4 1/2"	65' 1 3/8"	60' 9 3/8"	54' 8 3/8"	45' 7"	**91.17**	68.37	65.12	60.78	54.70	45.58
91' 3"	68' 5 1/4"	65' 2 1/8"	60' 10"	54' 9"	45' 7 1/2"	**91.25**	68.44	65.18	60.83	54.75	45.63
91' 4"	68' 6"	65' 2 7/8"	60' 10 5/8"	54' 9 5/8"	45' 8"	**91.33**	68.50	65.24	60.89	54.80	45.67
91' 5"	68' 6 3/4"	65' 3 5/8"	60' 11 3/8"	54' 10 1/4"	45' 8 1/2"	**91.42**	68.56	65.30	60.94	54.85	45.71
91' 6"	68' 7 1/2"	65' 4 1/4"	61' 0"	54' 10 3/4"	45' 9"	**91.50**	68.63	65.36	61.00	54.90	45.75
91' 7"	68' 8 1/4"	65' 5"	61' 5/8"	54' 11 3/8"	45' 9 1/2"	**91.58**	68.69	65.42	61.06	54.95	45.79
91' 8"	68' 9"	65' 5 3/4"	61' 1 3/8"	55' 0"	45' 10"	**91.67**	68.75	65.48	61.11	55.00	45.83
91' 9"	68' 9 3/4"	65' 6 3/8"	61' 2"	55' 5/8"	45' 10 1/2"	**91.75**	68.81	65.54	61.17	55.05	45.88
91' 10"	68' 10 1/2"	65' 7 1/8"	61' 2 5/8"	55' 1 1/4"	45' 11"	**91.83**	68.87	65.60	61.22	55.10	45.92
91' 11"	68' 11 1/4"	65' 7 7/8"	61' 3 3/8"	55' 1 3/4"	45' 11 1/2"	**91.92**	68.94	65.65	61.28	55.15	45.96
92' 0"	69' 0"	65' 8 5/8"	61' 4"	55' 2 3/8"	46' 0"	**92.00**	69.00	65.71	61.33	55.20	46.00
92' 1"	69' 3/4"	65' 9 1/4"	61' 4 5/8"	55' 3"	46' 1/2"	**92.08**	69.06	65.77	61.39	55.25	46.04
92' 2"	69' 1 1/2"	65' 10"	61' 5 3/8"	55' 3 5/8"	46' 1"	**92.17**	69.12	65.83	61.44	55.30	46.08
92' 3"	69' 2 1/4"	65' 10 3/4"	61' 6"	55' 4 1/4"	46' 1 1/2"	**92.25**	69.19	65.89	61.50	55.35	46.13
92' 4"	69' 3"	65' 11 3/8"	61' 6 5/8"	55' 4 3/4"	46' 2"	**92.33**	69.25	65.95	61.56	55.40	46.17
92' 5"	69' 3 3/4"	66' 1/8"	61' 7 3/8"	55' 5 3/8"	46' 2 1/2"	**92.42**	69.31	66.01	61.61	55.45	46.21
92' 6"	69' 4 1/2"	66' 7/8"	61' 8"	55' 6"	46' 3"	**92.50**	69.38	66.07	61.67	55.50	46.25
92' 7"	69' 5 1/4"	66' 1 5/8"	61' 8 5/8"	55' 6 5/8"	46' 3 1/2"	**92.58**	69.44	66.13	61.72	55.55	46.29
92' 8"	69' 6"	66' 2 1/4"	61' 9 3/8"	55' 7 1/4"	46' 4"	**92.67**	69.50	66.19	61.78	55.60	46.33
92' 9"	69' 6 3/4"	66' 3"	61' 10"	55' 7 3/4"	46' 4 1/2"	**92.75**	69.56	66.25	61.83	55.65	46.38
92' 10"	69' 7 1/2"	66' 3 3/4"	61' 10 5/8"	55' 8 3/8"	46' 5"	**92.83**	69.62	66.31	61.89	55.70	46.42
92' 11"	69' 8 1/4"	66' 4 3/8"	61' 11 3/8"	55' 9"	46' 5 1/2"	**92.92**	69.69	66.37	61.94	55.75	46.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
93' 0"	124' 0"	130' 2 3/8"	139' 6"	155' 0"	186' 0"	**93.00**	124.00	130.20	139.50	155.00	186.00
93' 1"	124' 1 3/8"	130' 3 3/4"	139' 7 1/2"	155' 1 5/8"	186' 2"	**93.08**	124.11	130.32	139.63	155.14	186.17
93' 2"	124' 2 5/8"	130' 5 1/4"	139' 9"	155' 3 3/8"	186' 4"	**93.17**	124.22	130.43	139.75	155.28	186.33
93' 3"	124' 4"	130' 6 5/8"	139' 10 1/2"	155' 5"	186' 6"	**93.25**	124.33	130.55	139.88	155.42	186.50
93' 4"	124' 5 3/8"	130' 8"	140' 0"	155' 6 5/8"	186' 8"	**93.33**	124.44	130.67	140.00	155.56	186.67
93' 5"	124' 6 5/8"	130' 9 3/8"	140' 1 1/2"	155' 8 3/8"	186' 10"	**93.42**	124.56	130.78	140.13	155.69	186.83
93' 6"	124' 8"	130' 10 3/4"	140' 3"	155' 10"	187' 0"	**93.50**	124.67	130.90	140.25	155.83	187.00
93' 7"	124' 9 3/8"	131' 1/4"	140' 4 1/2"	155' 11 5/8"	187' 2"	**93.58**	124.78	131.02	140.37	155.97	187.17
93' 8"	124' 10 5/8"	131' 1 5/8"	140' 6"	156' 1 3/8"	187' 4"	**93.67**	124.89	131.13	140.50	156.11	187.33
93' 9"	125' 0"	131' 3"	140' 7 1/2"	156' 3"	187' 6"	**93.75**	125.00	131.25	140.63	156.25	187.50
93' 10"	125' 1 3/8"	131' 4 3/8"	140' 9"	156' 4 5/8"	187' 8"	**93.83**	125.11	131.37	140.75	156.39	187.67
93' 11"	125' 2 5/8"	131' 5 3/4"	140' 10 1/2"	156' 6 3/8"	187' 10"	**93.92**	125.22	131.48	140.88	156.53	187.83
94' 0"	125' 4"	131' 7 1/4"	141' 0"	156' 8"	188' 0"	**94.00**	125.33	131.60	141.00	156.67	188.00
94' 1"	125' 5 3/8"	131' 8 5/8"	141' 1 1/2"	156' 9 5/8"	188' 2"	**94.08**	125.44	131.72	141.13	156.81	188.17
94' 2"	125' 6 5/8"	131' 10"	141' 3"	156' 11 3/8"	188' 4"	**94.17**	125.56	131.83	141.25	156.94	188.33
94' 3"	125' 8"	131' 11 3/8"	141' 4 1/2"	157' 1"	188' 6"	**94.25**	125.67	131.95	141.38	157.08	188.50
94' 4"	125' 9 3/8"	132' 3/4"	141' 6"	157' 2 5/8"	188' 8"	**94.33**	125.78	132.07	141.50	157.22	188.67
94' 5"	125' 10 5/8"	132' 2 1/4"	141' 7 1/2"	157' 4 3/8"	188' 10"	**94.42**	125.89	132.18	141.63	157.36	188.83
94' 6"	126' 0"	132' 3 5/8"	141' 9"	157' 6"	189' 0"	**94.50**	126.00	132.30	141.75	157.50	189.00
94' 7"	126' 1 3/8"	132' 5"	141' 10 1/2"	157' 7 5/8"	189' 2"	**94.58**	126.11	132.42	141.87	157.64	189.17
94' 8"	126' 2 5/8"	132' 6 3/8"	142' 0"	157' 9 3/8"	189' 4"	**94.67**	126.22	132.53	142.00	157.78	189.33
94' 9"	126' 4"	132' 7 3/4"	142' 1 1/2"	157' 11"	189' 6"	**94.75**	126.33	132.65	142.13	157.92	189.50
94' 10"	126' 5 3/8"	132' 9 1/4"	142' 3"	158' 5/8"	189' 8"	**94.83**	126.44	132.77	142.25	158.06	189.67
94' 11"	126' 6 5/8"	132' 10 5/8"	142' 4 1/2"	158' 2 3/8"	189' 10"	**94.92**	126.56	132.88	142.38	158.19	189.83
95' 0"	126' 8"	133' 0"	142' 6"	158' 4"	190' 0"	**95.00**	126.67	133.00	142.50	158.33	190.00
95' 1"	126' 9 3/8"	133' 1 3/8"	142' 7 1/2"	158' 5 5/8"	190' 2"	**95.08**	126.78	133.12	142.63	158.47	190.17
95' 2"	126' 10 5/8"	133' 2 3/4"	142' 9"	158' 7 3/8"	190' 4"	**95.17**	126.89	133.23	142.75	158.61	190.33
95' 3"	127' 0"	133' 4 1/4"	142' 10 1/2"	158' 9"	190' 6"	**95.25**	127.00	133.35	142.88	158.75	190.50
95' 4"	127' 1 3/8"	133' 5 5/8"	143' 0"	158' 10 5/8"	190' 8"	**95.33**	127.11	133.47	143.00	158.89	190.67
95' 5"	127' 2 5/8"	133' 7"	143' 1 1/2"	159' 3/8"	190' 10"	**95.42**	127.22	133.58	143.13	159.03	190.83
95' 6"	127' 4"	133' 8 3/8"	143' 3"	159' 2"	191' 0"	**95.50**	127.33	133.70	143.25	159.17	191.00
95' 7"	127' 5 3/8"	133' 9 3/4"	143' 4 1/2"	159' 3 5/8"	191' 2"	**95.58**	127.44	133.82	143.37	159.31	191.17
95' 8"	127' 6 5/8"	133' 11 1/4"	143' 6"	159' 5 3/8"	191' 4"	**95.67**	127.56	133.93	143.50	159.44	191.33
95' 9"	127' 8"	134' 5/8"	143' 7 1/2"	159' 7"	191' 6"	**95.75**	127.67	134.05	143.63	159.58	191.50
95' 10"	127' 9 3/8"	134' 2"	143' 9"	159' 8 5/8"	191' 8"	**95.83**	127.78	134.17	143.75	159.72	191.67
95' 11"	127' 10 5/8"	134' 3 3/8"	143' 10 1/2"	159' 10 3/8"	191' 10"	**95.92**	127.89	134.28	143.88	159.86	191.83
96' 0"	128' 0"	134' 4 3/4"	144' 0"	160' 0"	192' 0"	**96.00**	128.00	134.40	144.00	160.00	192.00
96' 1"	128' 1 3/8"	134' 6 1/4"	144' 1 1/2"	160' 1 5/8"	192' 2"	**96.08**	128.11	134.52	144.13	160.14	192.17
96' 2"	128' 2 5/8"	134' 7 5/8"	144' 3"	160' 3 3/8"	192' 4"	**96.17**	128.22	134.63	144.25	160.28	192.33
96' 3"	128' 4"	134' 9"	144' 4 1/2"	160' 5"	192' 6"	**96.25**	128.33	134.75	144.38	160.42	192.50
96' 4"	128' 5 3/8"	134' 10 3/8"	144' 6"	160' 6 5/8"	192' 8"	**96.33**	128.44	134.87	144.50	160.56	192.67
96' 5"	128' 6 5/8"	134' 11 3/4"	144' 7 1/2"	160' 8 3/8"	192' 10"	**96.42**	128.56	134.98	144.63	160.69	192.83
96' 6"	128' 8"	135' 1 1/4"	144' 9"	160' 10"	193' 0"	**96.50**	128.67	135.10	144.75	160.83	193.00
96' 7"	128' 9 3/8"	135' 2 5/8"	144' 10 1/2"	160' 11 5/8"	193' 2"	**96.58**	128.78	135.22	144.87	160.97	193.17
96' 8"	128' 10 5/8"	135' 4"	145' 0"	161' 1 3/8"	193' 4"	**96.67**	128.89	135.33	145.00	161.11	193.33
96' 9"	129' 0"	135' 5 3/8"	145' 1 1/2"	161' 3"	193' 6"	**96.75**	129.00	135.45	145.13	161.25	193.50
96' 10"	129' 1 3/8"	135' 6 3/4"	145' 3"	161' 4 5/8"	193' 8"	**96.83**	129.11	135.57	145.25	161.39	193.67
96' 11"	129' 2 5/8"	135' 8 1/4"	145' 4 1/2"	161' 6 3/8"	193' 10"	**96.92**	129.22	135.68	145.38	161.53	193.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
93' 0"	69' 9"	66' 5 1/8"	62' 0"	55' 9 5/8"	46' 6"	**93.00**	69.75	66.43	62.00	55.80	46.50
93' 1"	69' 9 3/4"	66' 5 7/8"	62' 5/8"	55' 10 1/4"	46' 6 1/2"	**93.08**	69.81	66.49	62.06	55.85	46.54
93' 2"	69' 10 1/2"	66' 6 5/8"	62' 1 3/8"	55' 10 3/4"	46' 7"	**93.17**	69.87	66.55	62.11	55.90	46.58
93' 3"	69' 11 1/4"	66' 7 1/4"	62' 2"	55' 11 3/8"	46' 7 1/2"	**93.25**	69.94	66.61	62.17	55.95	46.63
93' 4"	70' 0"	66' 8"	62' 2 5/8"	56' 0"	46' 8"	**93.33**	70.00	66.67	62.22	56.00	46.67
93' 5"	70' 3/4"	66' 8 3/4"	62' 3 3/8"	56' 5/8"	46' 8 1/2"	**93.42**	70.06	66.73	62.28	56.05	46.71
93' 6"	70' 1 1/2"	66' 9 3/8"	62' 4"	56' 1 1/4"	46' 9"	**93.50**	70.13	66.79	62.33	56.10	46.75
93' 7"	70' 2 1/4"	66' 10 1/8"	62' 4 5/8"	56' 1 3/4"	46' 9 1/2"	**93.58**	70.19	66.85	62.39	56.15	46.79
93' 8"	70' 3"	66' 10 7/8"	62' 5 3/8"	56' 2 3/8"	46' 10"	**93.67**	70.25	66.90	62.44	56.20	46.83
93' 9"	70' 3 3/4"	66' 11 5/8"	62' 6"	56' 3"	46' 10 1/2"	**93.75**	70.31	66.96	62.50	56.25	46.88
93' 10"	70' 4 1/2"	67' 1/4"	62' 6 5/8"	56' 3 5/8"	46' 11"	**93.83**	70.37	67.02	62.56	56.30	46.92
93' 11"	70' 5 1/4"	67' 1"	62' 7 3/8"	56' 4 1/4"	46' 11 1/2"	**93.92**	70.44	67.08	62.61	56.35	46.96
94' 0"	70' 6"	67' 1 3/4"	62' 8"	56' 4 3/4"	47' 0"	**94.00**	70.50	67.14	62.67	56.40	47.00
94' 1"	70' 6 3/4"	67' 2 3/8"	62' 8 5/8"	56' 5 3/8"	47' 1/2"	**94.08**	70.56	67.20	62.72	56.45	47.04
94' 2"	70' 7 1/2"	67' 3 1/8"	62' 9 3/8"	56' 6"	47' 1"	**94.17**	70.62	67.26	62.78	56.50	47.08
94' 3"	70' 8 1/4"	67' 3 7/8"	62' 10"	56' 6 5/8"	47' 1 1/2"	**94.25**	70.69	67.32	62.83	56.55	47.13
94' 4"	70' 9"	67' 4 5/8"	62' 10 5/8"	56' 7 1/4"	47' 2"	**94.33**	70.75	67.38	62.89	56.60	47.17
94' 5"	70' 9 3/4"	67' 5 1/4"	62' 11 3/8"	56' 7 3/4"	47' 2 1/2"	**94.42**	70.81	67.44	62.94	56.65	47.21
94' 6"	70' 10 1/2"	67' 6"	63' 0"	56' 8 3/8"	47' 3"	**94.50**	70.88	67.50	63.00	56.70	47.25
94' 7"	70' 11 1/4"	67' 6 3/4"	63' 5/8"	56' 9"	47' 3 1/2"	**94.58**	70.94	67.56	63.06	56.75	47.29
94' 8"	71' 0"	67' 7 3/8"	63' 1 3/8"	56' 9 5/8"	47' 4"	**94.67**	71.00	67.62	63.11	56.80	47.33
94' 9"	71' 3/4"	67' 8 1/8"	63' 2"	56' 10 1/4"	47' 4 1/2"	**94.75**	71.06	67.68	63.17	56.85	47.38
94' 10"	71' 1 1/2"	67' 8 7/8"	63' 2 5/8"	56' 10 3/4"	47' 5"	**94.83**	71.12	67.74	63.22	56.90	47.42
94' 11"	71' 2 1/4"	67' 9 5/8"	63' 3 3/8"	56' 11 3/8"	47' 5 1/2"	**94.92**	71.19	67.80	63.28	56.95	47.46
95' 0"	71' 3"	67' 10 1/4"	63' 4"	57' 0"	47' 6"	**95.00**	71.25	67.86	63.33	57.00	47.50
95' 1"	71' 3 3/4"	67' 11"	63' 4 5/8"	57' 5/8"	47' 6 1/2"	**95.08**	71.31	67.92	63.39	57.05	47.54
95' 2"	71' 4 1/2"	67' 11 3/4"	63' 5 3/8"	57' 1 1/4"	47' 7"	**95.17**	71.37	67.98	63.44	57.10	47.58
95' 3"	71' 5 1/4"	68' 3/8"	63' 6"	57' 1 3/4"	47' 7 1/2"	**95.25**	71.44	68.04	63.50	57.15	47.63
95' 4"	71' 6"	68' 1 1/8"	63' 6 5/8"	57' 2 3/8"	47' 8"	**95.33**	71.50	68.10	63.56	57.20	47.67
95' 5"	71' 6 3/4"	68' 1 7/8"	63' 7 3/8"	57' 3"	47' 8 1/2"	**95.42**	71.56	68.15	63.61	57.25	47.71
95' 6"	71' 7 1/2"	68' 2 5/8"	63' 8"	57' 3 5/8"	47' 9"	**95.50**	71.63	68.21	63.67	57.30	47.75
95' 7"	71' 8 1/4"	68' 3 1/4"	63' 8 5/8"	57' 4 1/4"	47' 9 1/2"	**95.58**	71.69	68.27	63.72	57.35	47.79
95' 8"	71' 9"	68' 4"	63' 9 3/8"	57' 4 3/4"	47' 10"	**95.67**	71.75	68.33	63.78	57.40	47.83
95' 9"	71' 9 3/4"	68' 4 3/4"	63' 10"	57' 5 3/8"	47' 10 1/2"	**95.75**	71.81	68.39	63.83	57.45	47.88
95' 10"	71' 10 1/2"	68' 5 3/8"	63' 10 5/8"	57' 6"	47' 11"	**95.83**	71.87	68.45	63.89	57.50	47.92
95' 11"	71' 11 1/4"	68' 6 1/8"	63' 11 3/8"	57' 6 5/8"	47' 11 1/2"	**95.92**	71.94	68.51	63.94	57.55	47.96
96' 0"	72' 0"	68' 6 7/8"	64' 0"	57' 7 1/4"	48' 0"	96.00	72.00	68.57	64.00	57.60	48.00
96' 1"	72' 3/4"	68' 7 5/8"	64' 5/8"	57' 7 3/4"	48' 1/2"	96.08	72.06	68.63	64.06	57.65	48.04
96' 2"	72' 1 1/2"	68' 8 1/4"	64' 1 3/8"	57' 8 3/8"	48' 1"	96.17	72.12	68.69	64.11	57.70	48.08
96' 3"	72' 2 1/4"	68' 9"	64' 2"	57' 9"	48' 1 1/2"	96.25	72.19	68.75	64.17	57.75	48.13
96' 4"	72' 3"	68' 9 3/4"	64' 2 5/8"	57' 9 5/8"	48' 2"	96.33	72.25	68.81	64.22	57.80	48.17
96' 5"	72' 3 3/4"	68' 10 3/8"	64' 3 3/8"	57' 10 1/4"	48' 2 1/2"	96.42	72.31	68.87	64.28	57.85	48.21
96' 6"	72' 4 1/2"	68' 11 1/8"	64' 4"	57' 10 3/4"	48' 3"	96.50	72.38	68.93	64.33	57.90	48.25
96' 7"	72' 5 1/4"	68' 11 7/8"	64' 4 5/8"	57' 11 3/8"	48' 3 1/2"	96.58	72.44	68.99	64.39	57.95	48.29
96' 8"	72' 6"	69' 5/8"	64' 5 3/8"	58' 0"	48' 4"	96.67	72.50	69.05	64.44	58.00	48.33
96' 9"	72' 6 3/4"	69' 1 1/4"	64' 6"	58' 5/8"	48' 4 1/2"	**96.75**	72.56	69.11	64.50	58.05	48.38
96' 10"	72' 7 1/2"	69' 2"	64' 6 5/8"	58' 1 1/4"	48' 5"	**96.83**	72.62	69.17	64.56	58.10	48.42
96' 11"	72' 8 1/4"	69' 2 3/4"	64' 7 3/8"	58' 1 3/4"	48' 5 1/2"	**96.92**	72.69	69.23	64.61	58.15	48.46

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	3:4	5:7	2:3	3:5	1:2		3:4	5:7	2:3	3:5	1:2
97' 0"	129' 4"	135' 9 5/8"	145' 6"	161' 8"	194' 0"	**97.00**	129.33	135.80	145.50	161.67	194.00
97' 1"	129' 5 3/8"	135' 11"	145' 7 1/2"	161' 9 5/8"	194' 2"	**97.08**	129.44	135.92	145.63	161.81	194.17
97' 2"	129' 6 5/8"	136' 3/8"	145' 9"	161' 11 3/8"	194' 4"	**97.17**	129.56	136.03	145.75	161.94	194.33
97' 3"	129' 8"	136' 1 3/4"	145' 10 1/2"	162' 1"	194' 6"	**97.25**	129.67	136.15	145.88	162.08	194.50
97' 4"	129' 9 3/8"	136' 3 1/4"	146' 0"	162' 2 5/8"	194' 8"	**97.33**	129.78	136.27	146.00	162.22	194.67
97' 5"	129' 10 5/8"	136' 4 5/8"	146' 1 1/2"	162' 4 3/8"	194' 10"	**97.42**	129.89	136.38	146.13	162.36	194.83
97' 6"	130' 0"	136' 6"	146' 3"	162' 6"	195' 0"	**97.50**	130.00	136.50	146.25	162.50	195.00
97' 7"	130' 1 3/8"	136' 7 3/8"	146' 4 1/2"	162' 7 5/8"	195' 2"	**97.58**	130.11	136.62	146.37	162.64	195.17
97' 8"	130' 2 5/8"	136' 8 3/4"	146' 6"	162' 9 3/8"	195' 4"	**97.67**	130.22	136.73	146.50	162.78	195.33
97' 9"	130' 4"	136' 10 1/4"	146' 7 1/2"	162' 11"	195' 6"	**97.75**	130.33	136.85	146.63	162.92	195.50
97' 10"	130' 5 3/8"	136' 11 5/8"	146' 9"	163' 5/8"	195' 8"	**97.83**	130.44	136.97	146.75	163.06	195.67
97' 11"	130' 6 5/8"	137' 1"	146' 10 1/2"	163' 2 3/8"	195' 10"	**97.92**	130.56	137.08	146.88	163.19	195.83
98' 0"	130' 8"	137' 2 3/8"	147' 0"	163' 4"	196' 0"	**98.00**	130.67	137.20	147.00	163.33	196.00
98' 1"	130' 9 3/8"	137' 3 3/4"	147' 1 1/2"	163' 5 5/8"	196' 2"	**98.08**	130.78	137.32	147.13	163.47	196.17
98' 2"	130' 10 5/8"	137' 5 1/4"	147' 3"	163' 7 3/8"	196' 4"	**98.17**	130.89	137.43	147.25	163.61	196.33
98' 3"	131' 0"	137' 6 5/8"	147' 4 1/2"	163' 9"	196' 6"	**98.25**	131.00	137.55	147.38	163.75	196.50
98' 4"	131' 1 3/8"	137' 8"	147' 6"	163' 10 5/8"	196' 8"	**98.33**	131.11	137.67	147.50	163.89	196.67
98' 5"	131' 2 5/8"	137' 9 3/8"	147' 7 1/2"	164' 3/8"	196' 10"	**98.42**	131.22	137.78	147.63	164.03	196.83
98' 6"	131' 4"	137' 10 3/4"	147' 9"	164' 2"	197' 0"	**98.50**	131.33	137.90	147.75	164.17	197.00
98' 7"	131' 5 3/8"	138' 1/4"	147' 10 1/2"	164' 3 5/8"	197' 2"	**98.58**	131.44	138.02	147.87	164.31	197.17
98' 8"	131' 6 5/8"	138' 1 5/8"	148' 0"	164' 5 3/8"	197' 4"	**98.67**	131.56	138.13	148.00	164.44	197.33
98' 9"	131' 8"	138' 3"	148' 1 1/2"	164' 7"	197' 6"	**98.75**	131.67	138.25	148.13	164.58	197.50
98' 10"	131' 9 3/8"	138' 4 3/8"	148' 3"	164' 8 5/8"	197' 8"	**98.83**	131.78	138.37	148.25	164.72	197.67
98' 11"	131' 10 5/8"	138' 5 3/4"	148' 4 1/2"	164' 10 3/8"	197' 10"	**98.92**	131.89	138.48	148.38	164.86	197.83
99' 0"	132' 0"	138' 7 1/4"	148' 6"	165' 0"	198' 0"	**99.00**	132.00	138.60	148.50	165.00	198.00
99' 1"	132' 1 3/8"	138' 8 5/8"	148' 7 1/2"	165' 1 5/8"	198' 2"	**99.08**	132.11	138.72	148.63	165.14	198.17
99' 2"	132' 2 5/8"	138' 10"	148' 9"	165' 3 3/8"	198' 4"	**99.17**	132.22	138.83	148.75	165.28	198.33
99' 3"	132' 4"	138' 11 3/8"	148' 10 1/2"	165' 5"	198' 6"	**99.25**	132.33	138.95	148.88	165.42	198.50
99' 4"	132' 5 3/8"	139' 3/4"	149' 0"	165' 6 5/8"	198' 8"	**99.33**	132.44	139.07	149.00	165.56	198.67
99' 5"	132' 6 5/8"	139' 2 1/4"	149' 1 1/2"	165' 8 3/8"	198' 10"	**99.42**	132.56	139.18	149.13	165.69	198.83
99' 6"	132' 8"	139' 3 5/8"	149' 3"	165' 10"	199' 0"	**99.50**	132.67	139.30	149.25	165.83	199.00
99' 7"	132' 9 3/8"	139' 5"	149' 4 1/2"	165' 11 5/8"	199' 2"	**99.58**	132.78	139.42	149.37	165.97	199.17
99' 8"	132' 10 5/8"	139' 6 3/8"	149' 6"	166' 1 3/8"	199' 4"	**99.67**	132.89	139.53	149.50	166.11	199.33
99' 9"	133' 0"	139' 7 3/4"	149' 7 1/2"	166' 3"	199' 6"	**99.75**	133.00	139.65	149.63	166.25	199.50
99' 10"	133' 1 3/8"	139' 9 1/4"	149' 9"	166' 4 5/8"	199' 8"	**99.83**	133.11	139.77	149.75	166.39	199.67
99' 11"	133' 2 5/8"	139' 10 5/8"	149' 10 1/2"	166' 6 3/8"	199' 10"	**99.92**	133.22	139.88	149.88	166.53	199.83
100' 0"	133' 4"	140' 0"	150' 0"	166' 8"	200' 0"	**100.00**	133.33	140.00	150.00	166.67	200.00
100' 1"	133' 5 3/8"	140' 1 3/8"	150' 1 1/2"	166' 9 5/8"	200' 2"	**100.08**	133.44	140.12	150.12	166.81	200.17
100' 2"	133' 6 5/8"	140' 2 3/4"	150' 3"	166' 11 3/8"	200' 4"	**100.17**	133.56	140.23	150.25	166.94	200.33
100' 3"	133' 8"	140' 4 1/4"	150' 4 1/2"	167' 1"	200' 6"	**100.25**	133.67	140.35	150.38	167.08	200.50
100' 4"	133' 9 3/8"	140' 5 5/8"	150' 6"	167' 2 5/8"	200' 8"	**100.33**	133.78	140.47	150.50	167.22	200.67
100' 5"	133' 10 5/8"	140' 7"	150' 7 1/2"	167' 4 3/8"	200' 10"	**100.42**	133.89	140.58	150.63	167.36	200.83
100' 6"	134' 0"	140' 8 3/8"	150' 9"	167' 6"	201' 0"	**100.50**	134.00	140.70	150.75	167.50	201.00
100' 7"	134' 1 3/8"	140' 9 3/4"	150' 10 1/2"	167' 7 5/8"	201' 2"	**100.58**	134.11	140.82	150.87	167.64	201.17
100' 8"	134' 2 5/8"	140' 11 1/4"	151' 0"	167' 9 3/8"	201' 4"	**100.67**	134.22	140.93	151.00	167.78	201.33
100' 9"	134' 4"	141' 5/8"	151' 1 1/2"	167' 11"	201' 6"	**100.75**	134.33	141.05	151.13	167.92	201.50
100' 10"	134' 5 3/8"	141' 2"	151' 3"	168' 5/8"	201' 8"	**100.83**	134.44	141.17	151.25	168.06	201.67
100' 11"	134' 6 5/8"	141' 3 3/8"	151' 4 1/2"	168' 2 3/8"	201' 10"	**100.92**	134.56	141.28	151.38	168.19	201.83

Room length	Room ratios & calculated dimentions in Feet & Inch					Room length	Room ratios & dimentions in decimal equivalent				
	4:3	7:5	3:2	5:3	2:1		4:3	7:5	3:2	5:3	2:1
97' 0"	72' 9"	69' 3 3/8"	64' 8"	58' 2 3/8"	48' 6"	**97.00**	72.75	69.29	64.67	58.20	48.50
97' 1"	72' 9 3/4"	69' 4 1/8"	64' 8 5/8"	58' 3"	48' 6 1/2"	**97.08**	72.81	69.35	64.72	58.25	48.54
97' 2"	72' 10 1/2"	69' 4 7/8"	64' 9 3/8"	58' 3 5/8"	48' 7"	**97.17**	72.87	69.40	64.78	58.30	48.58
97' 3"	72' 11 1/4"	69' 5 5/8"	64' 10"	58' 4 1/4"	48' 7 1/2"	**97.25**	72.94	69.46	64.83	58.35	48.63
97' 4"	73' 0"	69' 6 1/4"	64' 10 5/8"	58' 4 3/4"	48' 8"	**97.33**	73.00	69.52	64.89	58.40	48.67
97' 5"	73' 3/4"	69' 7"	64' 11 3/8"	58' 5 3/8"	48' 8 1/2"	**97.42**	73.06	69.58	64.94	58.45	48.71
97' 6"	73' 1 1/2"	69' 7 3/4"	65' 0"	58' 6"	48' 9"	**97.50**	73.13	69.64	65.00	58.50	48.75
97' 7"	73' 2 1/4"	69' 8 3/8"	65' 5/8"	58' 6 5/8"	48' 9 1/2"	**97.58**	73.19	69.70	65.06	58.55	48.79
97' 8"	73' 3"	69' 9 1/8"	65' 1 3/8"	58' 7 1/4"	48' 10"	**97.67**	73.25	69.76	65.11	58.60	48.83
97' 9"	73' 3 3/4"	69' 9 7/8"	65' 2"	58' 7 3/4"	48' 10 1/2"	**97.75**	73.31	69.82	65.17	58.65	48.88
97' 10"	73' 4 1/2"	69' 10 5/8"	65' 2 5/8"	58' 8 3/8"	48' 11"	**97.83**	73.37	69.88	65.22	58.70	48.92
97' 11"	73' 5 1/4"	69' 11 1/4"	65' 3 3/8"	58' 9"	48' 11 1/2"	**97.92**	73.44	69.94	65.28	58.75	48.96
98' 0"	73' 6"	70' 0"	65' 4"	58' 9 5/8"	49' 0"	**98.00**	73.50	70.00	65.33	58.80	49.00
98' 1"	73' 6 3/4"	70' 3/4"	65' 4 5/8"	58' 10 1/4"	49' 1/2"	**98.08**	73.56	70.06	65.39	58.85	49.04
98' 2"	73' 7 1/2"	70' 1 3/8"	65' 5 3/8"	58' 10 3/4"	49' 1"	**98.17**	73.62	70.12	65.44	58.90	49.08
98' 3"	73' 8 1/4"	70' 2 1/8"	65' 6"	58' 11 3/8"	49' 1 1/2"	**98.25**	73.69	70.18	65.50	58.95	49.13
98' 4"	73' 9"	70' 2 7/8"	65' 6 5/8"	59' 0"	49' 2"	**98.33**	73.75	70.24	65.56	59.00	49.17
98' 5"	73' 9 3/4"	70' 3 5/8"	65' 7 3/8"	59' 5/8"	49' 2 1/2"	**98.42**	73.81	70.30	65.61	59.05	49.21
98' 6"	73' 10 1/2"	70' 4 1/4"	65' 8"	59' 1 1/4"	49' 3"	**98.50**	73.88	70.36	65.67	59.10	49.25
98' 7"	73' 11 1/4"	70' 5"	65' 8 5/8"	59' 1 3/4"	49' 3 1/2"	**98.58**	73.94	70.42	65.72	59.15	49.29
98' 8"	74' 0"	70' 5 3/4"	65' 9 3/8"	59' 2 3/8"	49' 4"	**98.67**	74.00	70.48	65.78	59.20	49.33
98' 9"	74' 3/4"	70' 6 3/8"	65' 10"	59' 3"	49' 4 1/2"	**98.75**	74.06	70.54	65.83	59.25	49.38
98' 10"	74' 1 1/2"	70' 7 1/8"	65' 10 5/8"	59' 3 5/8"	49' 5"	**98.83**	74.12	70.60	65.89	59.30	49.42
98' 11"	74' 2 1/4"	70' 7 7/8"	65' 11 3/8"	59' 4 1/4"	49' 5 1/2"	**98.92**	74.19	70.65	65.94	59.35	49.46
99' 0"	74' 3"	70' 8 5/8"	66' 0"	59' 4 3/4"	49' 6"	**99.00**	74.25	70.71	66.00	59.40	49.50
99' 1"	74' 3 3/4"	70' 9 1/4"	66' 5/8"	59' 5 3/8"	49' 6 1/2"	**99.08**	74.31	70.77	66.06	59.45	49.54
99' 2"	74' 4 1/2"	70' 10"	66' 1 3/8"	59' 6"	49' 7"	**99.17**	74.37	70.83	66.11	59.50	49.58
99' 3"	74' 5 1/4"	70' 10 3/4"	66' 2"	59' 6 5/8"	49' 7 1/2"	**99.25**	74.44	70.89	66.17	59.55	49.63
99' 4"	74' 6"	70' 11 3/8"	66' 2 5/8"	59' 7 1/4"	49' 8"	**99.33**	74.50	70.95	66.22	59.60	49.67
99' 5"	74' 6 3/4"	71' 1/8"	66' 3 3/8"	59' 7 3/4"	49' 8 1/2"	**99.42**	74.56	71.01	66.28	59.65	49.71
99' 6"	74' 7 1/2"	71' 7/8"	66' 4"	59' 8 3/8"	49' 9"	**99.50**	74.63	71.07	66.33	59.70	49.75
99' 7"	74' 8 1/4"	71' 1 5/8"	66' 4 5/8"	59' 9"	49' 9 1/2"	**99.58**	74.69	71.13	66.39	59.75	49.79
99' 8"	74' 9"	71' 2 1/4"	66' 5 3/8"	59' 9 5/8"	49' 10"	**99.67**	74.75	71.19	66.44	59.80	49.83
99' 9"	74' 9 3/4"	71' 3"	66' 6"	59' 10 1/4"	49' 10 1/2"	**99.75**	74.81	71.25	66.50	59.85	49.88
99' 10"	74' 10 1/2"	71' 3 3/4"	66' 6 5/8"	59' 10 3/4"	49' 11"	**99.83**	74.87	71.31	66.56	59.90	49.92
99' 11"	74' 11 1/4"	71' 4 3/8"	66' 7 3/8"	59' 11 3/8"	49' 11 1/2"	**99.92**	74.94	71.37	66.61	59.95	49.96
100' 0"	75' 0"	71' 5 1/8"	66' 8"	60' 0"	50' 0"	**100.00**	75.00	71.43	66.67	60.00	50.00
100' 1"	75' 3/4"	71' 5 7/8"	66' 8 5/8"	60' 5/8"	50' 1/2"	**100.08**	75.06	71.49	66.72	60.05	50.04
100' 2"	75' 1 1/2"	71' 6 5/8"	66' 9 3/8"	60' 1 1/4"	50' 1"	**100.17**	75.12	71.55	66.78	60.10	50.08
100' 3"	75' 2 1/4"	71' 7 1/4"	66' 10"	60' 1 3/4"	50' 1 1/2"	**100.25**	75.19	71.61	66.83	60.15	50.13
100' 4"	75' 3"	71' 8"	66' 10 5/8"	60' 2 3/8"	50' 2"	**100.33**	75.25	71.67	66.89	60.20	50.17
100' 5"	75' 3 3/4"	71' 8 3/4"	66' 11 3/8"	60' 3"	50' 2 1/2"	**100.42**	75.31	71.73	66.94	60.25	50.21
100' 6"	75' 4 1/2"	71' 9 3/8"	67' 0"	60' 3 5/8"	50' 3"	**100.50**	75.38	71.79	67.00	60.30	50.25
100' 7"	75' 5 1/4"	71' 10 1/8"	67' 5/8"	60' 4 1/4"	50' 3 1/2"	**100.58**	75.44	71.85	67.06	60.35	50.29
100' 8"	75' 6"	71' 10 7/8"	67' 1 3/8"	60' 4 3/4"	50' 4"	**100.67**	75.50	71.90	67.11	60.40	50.33
100' 9"	75' 6 3/4"	71' 11 5/8"	67' 2"	60' 5 3/8"	50' 4 1/2"	**100.75**	75.56	71.96	67.17	60.45	50.38
100' 10"	75' 7 1/2"	72' 1/4"	67' 2 5/8"	60' 6"	50' 5"	**100.83**	75.62	72.02	67.22	60.50	50.42
100' 11"	75' 8 1/4"	72' 1"	67' 3 3/8"	60' 6 5/8"	50' 5 1/2"	**100.92**	75.69	72.08	67.28	60.55	50.46

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
1' 0"		1' 4"	1' 4 3/4"	1' 6"	1' 8"	2' 0"
	AM	1' 2"	1' 2 3/8"	1' 3"	1' 4"	1' 6"
	GM	1' 1 7/8"	1' 2 1/4"	1' 2 3/4"	1' 3 1/2"	1' 5"
	HM	1' 1 3/4"	1' 2"	1' 2 3/8"	1' 3"	1' 4"
1' 6"		2' 0"	2' 1 1/4"	2' 3"	2' 6"	3' 0"
	AM	1' 9"	1' 9 5/8"	1' 10 1/2"	2' 0"	2' 3"
	GM	1' 8 3/4"	1' 9 1/4"	1' 10"	1' 11 1/4"	2' 1 1/2"
	HM	1' 8 5/8"	1' 9"	1' 9 5/8"	1' 10 1/2"	2' 0"
2' 0"		2' 8"	2' 9 5/8"	3' 0"	3' 4"	4' 0"
	AM	2' 4"	2' 4 3/4"	2' 6"	2' 8"	3' 0"
	GM	2' 3 3/4"	2' 4 3/8"	2' 5 3/8"	2' 7"	2' 10"
	HM	2' 3 3/8"	2' 4"	2' 4 3/4"	2' 6"	2' 8"
2' 6"		3' 4"	3' 6"	3' 9"	4' 2"	5' 0"
	AM	2' 11"	3' 0"	3' 1 1/2"	3' 4"	3' 9"
	GM	2' 10 5/8"	2' 11 1/2"	3' 3/4"	3' 2 3/4"	3' 6 3/8"
	HM	2' 10 1/4"	2' 11"	3' 0"	3' 1 1/2"	3' 4"
3' 0"		4' 0"	4' 2 3/8"	4' 6"	5' 0"	6' 0"
	AM	3' 6"	3' 7 1/4"	3' 9"	4' 0"	4' 6"
	GM	3' 5 5/8"	3' 6 5/8"	3' 8 1/8"	3' 10 1/2"	4' 2 7/8"
	HM	3' 5 1/8"	3' 6"	3' 7 1/4"	3' 9"	4' 0"
3' 6"		4' 8"	4' 10 3/4"	5' 3"	5' 10"	7' 0"
	AM	4' 1"	4' 2 3/8"	4' 4 1/2"	4' 8"	5' 3"
	GM	4' 1/2"	4' 1 3/4"	4' 3 1/2"	4' 6 1/4"	4' 11 3/8"
	HM	4' 0"	4' 1"	4' 2 3/8"	4' 4 1/2"	4' 8"
4' 0"		5' 4"	5' 7 1/4"	6' 0"	6' 8"	8' 0"
	AM	4' 8"	4' 9 5/8"	5' 0"	5' 4"	6' 0"
	GM	4' 7 3/8"	4' 8 3/4"	4' 10 3/4"	5' 2"	5' 7 7/8"
	HM	4' 6 7/8"	4' 8"	4' 9 5/8"	5' 0"	5' 4"
4' 6"		6' 0"	6' 3 5/8"	6' 9"	7' 6"	9' 0"
	AM	5' 3"	5' 4 3/4"	5' 7 1/2"	6' 0"	6' 9"
	GM	5' 2 3/8"	5' 3 7/8"	5' 6 1/8"	5' 9 3/4"	6' 4 3/8"
	HM	5' 1 3/4"	5' 3"	5' 4 3/4"	5' 7 1/2"	6' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
1		1.33	1.40	1.50	1.67	2.00
	AM	1.17	1.20	1.25	1.33	1.50
	GM	1.15	1.18	1.22	1.29	1.41
	HM	1.14	1.17	1.20	1.25	1.33
1.5		2.00	2.10	2.25	2.50	3.00
	AM	1.75	1.80	1.88	2.00	2.25
	GM	1.73	1.77	1.84	1.94	2.12
	HM	1.71	1.75	1.80	1.88	2.00
2		2.67	2.80	3.00	3.33	4.00
	AM	2.33	2.40	2.50	2.67	3.00
	GM	2.31	2.37	2.45	2.58	2.83
	HM	2.29	2.33	2.40	2.50	2.67
2.5		3.33	3.50	3.75	4.17	5.00
	AM	2.92	3.00	3.13	3.33	3.75
	GM	2.89	2.96	3.06	3.23	3.54
	HM	2.86	2.92	3.00	3.13	3.33
3		4.00	4.20	4.50	5.00	6.00
	AM	3.50	3.60	3.75	4.00	4.50
	GM	3.46	3.55	3.67	3.87	4.24
	HM	3.43	3.50	3.60	3.75	4.00
3.5		4.67	4.90	5.25	5.83	7.00
	AM	4.08	4.20	4.38	4.67	5.25
	GM	4.04	4.14	4.29	4.52	4.95
	HM	4.00	4.08	4.20	4.37	4.67
4		5.33	5.60	6.00	6.67	8.00
	AM	4.67	4.80	5.00	5.33	6.00
	GM	4.62	4.73	4.90	5.16	5.66
	HM	4.57	4.67	4.80	5.00	5.33
4.5		6.00	6.30	6.75	7.50	9.00
	AM	5.25	5.40	5.63	6.00	6.75
	GM	5.20	5.32	5.51	5.81	6.36
	HM	5.14	5.25	5.40	5.62	6.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
1' 0"		0' 9"	0' 8 5/8"	0' 8"	0' 7 1/4"	0' 6"
	AM	0' 10 1/2"	0' 10 1/4"	0' 10"	0' 9 5/8"	0' 9"
	GM	0' 10 3/8"	0' 10 1/8"	0' 9 3/4"	0' 9 1/4"	0' 8 1/2"
	HM	0' 10 1/4"	0' 10"	0' 9 5/8"	0' 9"	0' 8"
1' 6"		1' 1 1/2"	1' 7/8"	1' 0"	0' 10 3/4"	0' 9"
	AM	1' 3 3/4"	1' 3 3/8"	1' 3"	1' 2 3/8"	1' 1 1/2"
	GM	1' 3 5/8"	1' 3 1/4"	1' 2 3/4"	1' 2"	1' 3/4"
	HM	1' 3 3/8"	1' 3"	1' 2 3/8"	1' 1 1/2"	1' 0"
2' 0"		1' 6"	1' 5 1/8"	1' 4"	1' 2 3/8"	1' 0"
	AM	1' 9"	1' 8 5/8"	1' 8"	1' 7 1/4"	1' 6"
	GM	1' 8 3/4"	1' 8 1/4"	1' 7 5/8"	1' 6 5/8"	1' 5"
	HM	1' 8 5/8"	1' 8"	1' 7 1/4"	1' 6"	1' 4"
2' 6"		1' 10 1/2"	1' 9 3/8"	1' 8"	1' 6"	1' 3"
	AM	2' 2 1/4"	2' 1 3/4"	2' 1"	2' 0"	1' 10 1/2"
	GM	2' 2"	2' 1 3/8"	2' 1/2"	1' 11 1/4"	1' 9 1/4"
	HM	2' 1 3/4"	2' 1"	2' 0"	1' 10 1/2"	1' 8"
3' 0"		2' 3"	2' 1 3/4"	2' 0"	1' 9 5/8"	1' 6"
	AM	2' 7 1/2"	2' 6 7/8"	2' 6"	2' 4 3/4"	2' 3"
	GM	2' 7 1/8"	2' 6 3/8"	2' 5 3/8"	2' 3 7/8"	2' 1 1/2"
	HM	2' 6 7/8"	2' 6"	2' 4 3/4"	2' 3"	2' 0"
3' 6"		2' 7 1/2"	2' 6"	2' 4"	2' 1 1/4"	1' 9"
	AM	3' 3/4"	3' 0"	2' 11"	2' 9 5/8"	2' 7 1/2"
	GM	3' 3/8"	2' 11 1/2"	2' 10 1/4"	2' 8 1/2"	2' 5 3/4"
	HM	3' 0"	2' 11"	2' 9 5/8"	2' 7 1/2"	2' 4"
4' 0"		3' 0"	2' 10 1/4"	2' 8"	2' 4 3/4"	2' 0"
	AM	3' 6"	3' 5 1/8"	3' 4"	3' 2 3/8"	3' 0"
	GM	3' 5 5/8"	3' 4 5/8"	3' 3 1/4"	3' 1 1/8"	2' 10"
	HM	3' 5 1/8"	3' 4"	3' 2 3/8"	3' 0"	2' 8"
4' 6"		3' 4 1/2"	3' 2 5/8"	3' 0"	2' 8 3/8"	2' 3"
	AM	3' 11 1/4"	3' 10 1/4"	3' 9"	3' 7 1/4"	3' 4 1/2"
	GM	3' 10 3/4"	3' 9 5/8"	3' 8 1/8"	3' 5 7/8"	3' 2 1/8"
	HM	3' 10 1/4"	3' 9"	3' 7 1/4"	3' 4 1/2"	3' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
1		0.75	0.71	0.67	0.60	0.50
	AM	0.88	0.86	0.83	0.80	0.75
	GM	0.87	0.85	0.82	0.77	0.71
	HM	0.86	0.83	0.80	0.75	0.67
1.5		1.13	1.07	1.00	0.90	0.75
	AM	1.31	1.29	1.25	1.20	1.13
	GM	1.30	1.27	1.22	1.16	1.06
	HM	1.29	1.25	1.20	1.13	1.00
2		1.50	1.43	1.33	1.20	1.00
	AM	1.75	1.71	1.67	1.60	1.50
	GM	1.73	1.69	1.63	1.55	1.41
	HM	1.71	1.67	1.60	1.50	1.33
2.5		1.88	1.79	1.67	1.50	1.25
	AM	2.19	2.14	2.08	2.00	1.88
	GM	2.17	2.11	2.04	1.94	1.77
	HM	2.14	2.08	2.00	1.88	1.67
3		2.25	2.14	2.00	1.80	1.50
	AM	2.63	2.57	2.50	2.40	2.25
	GM	2.60	2.54	2.45	2.32	2.12
	HM	2.57	2.50	2.40	2.25	2.00
3.5		2.63	2.50	2.33	2.10	1.75
	AM	3.06	3.00	2.92	2.80	2.63
	GM	3.03	2.96	2.86	2.71	2.47
	HM	3.00	2.92	2.80	2.63	2.33
4		3.00	2.86	2.67	2.40	2.00
	AM	3.50	3.43	3.33	3.20	3.00
	GM	3.46	3.38	3.27	3.10	2.83
	HM	3.43	3.33	3.20	3.00	2.67
4.5		3.38	3.21	3.00	2.70	2.25
	AM	3.94	3.86	3.75	3.60	3.38
	GM	3.90	3.80	3.67	3.49	3.18
	HM	3.86	3.75	3.60	3.38	3.00

primary room length.		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
5' 0"		**6' 8"**	**7' 0"**	**7' 6"**	**8' 4"**	**10' 0"**
	AM	5' 10"	6' 0"	6' 3"	6' 8"	7' 6"
	GM	5' 9 1/4"	5' 11"	6' 1 1/2"	6' 5 1/2"	7' 7/8"
	HM	5' 8 5/8"	5' 10"	6' 0"	6' 3"	6' 8"
5' 6"		**7' 4"**	**7' 8 3/8"**	**8' 3"**	**9' 2"**	**11' 0"**
	AM	6' 5"	6' 7 1/4"	6' 10 1/2"	7' 4"	8' 3"
	GM	6' 4 1/4"	6' 6 1/8"	6' 8 7/8"	7' 1 1/4"	7' 9 3/8"
	HM	6' 3 3/8"	6' 5"	6' 7 1/4"	6' 10 1/2"	7' 4"
6' 0"		**8' 0"**	**8' 4 3/4"**	**9' 0"**	**10' 0"**	**12' 0"**
	AM	7' 0"	7' 2 3/8"	7' 6"	8' 0"	9' 0"
	GM	6' 11 1/8"	7' 1 1/4"	7' 4 1/8"	7' 9"	8' 5 7/8"
	HM	6' 10 1/4"	7' 0"	7' 2 3/8"	7' 6"	8' 0"
6' 6"		**8' 8"**	**9' 1 1/4"**	**9' 9"**	**10' 10"**	**13' 0"**
	AM	7' 7"	7' 9 5/8"	8' 1 1/2"	8' 8"	9' 9"
	GM	7' 6 1/8"	7' 8 1/4"	7' 11 1/2"	8' 4 3/4"	9' 2 1/4"
	HM	7' 5 1/8"	7' 7"	7' 9 5/8"	8' 1 1/2"	8' 8"
7' 0"		**9' 4"**	**9' 9 5/8"**	**10' 6"**	**11' 8"**	**14' 0"**
	AM	8' 2"	8' 4 3/4"	8' 9"	9' 4"	10' 6"
	GM	8' 1"	8' 3 3/8"	8' 6 7/8"	9' 1/2"	9' 10 3/4"
	HM	8' 0"	8' 2"	8' 4 3/4"	8' 9"	9' 4"
7' 6"		**10' 0"**	**10' 6"**	**11' 3"**	**12' 6"**	**15' 0"**
	AM	8' 9"	9' 0"	9' 4 1/2"	10' 0"	11' 3"
	GM	8' 7 7/8"	8' 10 1/2"	9' 2 1/4"	9' 8 1/4"	10' 7 1/4"
	HM	8' 6 7/8"	8' 9"	9' 0"	9' 4 1/2"	10' 0"
8' 0"		**10' 8"**	**11' 2 3/8"**	**12' 0"**	**13' 4"**	**16' 0"**
	AM	9' 4"	9' 7 1/4"	10' 0"	10' 8"	12' 0"
	GM	9' 2 7/8"	9' 5 5/8"	9' 9 5/8"	10' 3 7/8"	11' 3 3/4"
	HM	9' 1 3/4"	9' 4"	9' 7 1/4"	10' 0"	10' 8"
8' 6"		**11' 4"**	**11' 10 3/4"**	**12' 9"**	**14' 2"**	**17' 0"**
	AM	9' 11"	10' 2 3/8"	10' 7 1/2"	11' 4"	12' 9"
	GM	9' 9 3/4"	10' 3/4"	10' 4 7/8"	10' 11 5/8"	12' 1/4"
	HM	9' 8 5/8"	9' 11"	10' 2 3/8"	10' 7 1/2"	11' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
5		**6.67**	**7.00**	**7.50**	**8.33**	**10.00**
	AM	5.83	6.00	6.25	6.67	7.50
	GM	5.77	5.92	6.12	6.45	7.07
	HM	5.71	5.83	6.00	6.25	6.67
5.5		**7.33**	**7.70**	**8.25**	**9.17**	**11.00**
	AM	6.42	6.60	6.88	7.33	8.25
	GM	6.35	6.51	6.74	7.10	7.78
	HM	6.29	6.42	6.60	6.87	7.33
6		**8.00**	**8.40**	**9.00**	**10.00**	**12.00**
	AM	7.00	7.20	7.50	8.00	9.00
	GM	6.93	7.10	7.35	7.75	8.49
	HM	6.86	7.00	7.20	7.50	8.00
6.5		**8.67**	**9.10**	**9.75**	**10.83**	**13.00**
	AM	7.58	7.80	8.13	8.67	9.75
	GM	7.51	7.69	7.96	8.39	9.19
	HM	7.43	7.58	7.80	8.12	8.67
7		**9.33**	**9.80**	**10.50**	**11.67**	**14.00**
	AM	8.17	8.40	8.75	9.33	10.50
	GM	8.08	8.28	8.57	9.04	9.90
	HM	8.00	8.17	8.40	8.75	9.33
7.5		**10.00**	**10.50**	**11.25**	**12.50**	**15.00**
	AM	8.75	9.00	9.38	10.00	11.25
	GM	8.66	8.87	9.19	9.68	10.61
	HM	8.57	8.75	9.00	9.37	10.00
8		**10.67**	**11.20**	**12.00**	**13.33**	**16.00**
	AM	9.33	9.60	10.00	10.67	12.00
	GM	9.24	9.47	9.80	10.33	11.31
	HM	9.14	9.33	9.60	10.00	10.67
8.5		**11.33**	**11.90**	**12.75**	**14.17**	**17.00**
	AM	9.92	10.20	10.63	11.33	12.75
	GM	9.81	10.06	10.41	10.97	12.02
	HM	9.71	9.92	10.20	10.63	11.33

primary room length	secondary room length & different room heights					
		4:3	7:5	3:2	5:3	2:1
5' 0"		3' 9"	3' 6 7/8"	3' 4"	3' 0"	2' 6"
	AM	4' 4 1/2"	4' 3 3/8"	4' 2"	4' 0"	3' 9"
	GM	4' 4"	4' 2 3/4"	4' 1"	3' 10 1/2"	3' 6 3/8"
	HM	4' 3 3/8"	4' 2"	4' 0"	3' 9"	3' 4"
5' 6"		4' 1 1/2"	3' 11 1/8"	3' 8"	3' 3 5/8"	2' 9"
	AM	4' 9 3/4"	4' 8 5/8"	4' 7"	4' 4 3/4"	4' 1 1/2"
	GM	4' 9 1/8"	4' 7 3/4"	4' 5 7/8"	4' 3 1/8"	3' 10 5/8"
	HM	4' 8 5/8"	4' 7"	4' 4 3/4"	4' 1 1/2"	3' 8"
6' 0"		4' 6"	4' 3 3/8"	4' 0"	3' 7 1/4"	3' 0"
	AM	5' 3"	5' 1 3/4"	5' 0"	4' 9 5/8"	4' 6"
	GM	5' 2 3/8"	5' 7/8"	4' 10 3/4"	4' 7 3/4"	4' 2 7/8"
	HM	5' 1 3/4"	5' 0"	4' 9 5/8"	4' 6"	4' 0"
6' 6"		4' 10 1/2"	4' 7 3/4"	4' 4"	3' 10 3/4"	3' 3"
	AM	5' 8 1/4"	5' 6 7/8"	5' 5"	5' 2 3/8"	4' 10 1/2"
	GM	5' 7 1/2"	5' 5 7/8"	5' 3 5/8"	5' 3/8"	4' 7 1/8"
	HM	5' 6 7/8"	5' 5"	5' 2 3/8"	4' 10 1/2"	4' 4"
7' 0"		5' 3"	5' 0"	4' 8"	4' 2 3/8"	3' 6"
	AM	6' 1 1/2"	6' 0"	5' 10"	5' 7 1/4"	5' 3"
	GM	6' 3/4"	5' 11"	5' 8 5/8"	5' 5 1/8"	4' 11 3/8"
	HM	6' 0"	5' 10"	5' 7 1/4"	5' 3"	4' 8"
7' 6"		5' 7 1/2"	5' 4 1/4"	5' 0"	4' 6"	3' 9"
	AM	6' 6 3/4"	6' 5 1/8"	6' 3"	6' 0"	5' 7 1/2"
	GM	6' 6"	6' 4 1/8"	6' 1 1/2"	5' 9 3/4"	5' 3 5/8"
	HM	6' 5 1/8"	6' 3"	6' 0"	5' 7 1/2"	5' 0"
8' 0"		6' 0"	5' 8 5/8"	5' 4"	4' 9 5/8"	4' 0"
	AM	7' 0"	6' 10 1/4"	6' 8"	6' 4 3/4"	6' 0"
	GM	6' 11 1/8"	6' 9 1/8"	6' 6 3/8"	6' 2 3/8"	5' 7 7/8"
	HM	6' 10 1/4"	6' 8"	6' 4 3/4"	6' 0"	5' 4"
8' 6"		6' 4 1/2"	6' 7/8"	5' 8"	5' 1 1/4"	4' 3"
	AM	7' 5 1/4"	7' 3 3/8"	7' 1"	6' 9 5/8"	6' 4 1/2"
	GM	7' 4 3/8"	7' 2 1/4"	6' 11 1/4"	6' 7"	6' 1/8"
	HM	7' 3 3/8"	7' 1"	6' 9 5/8"	6' 4 1/2"	5' 8"

primary room length	decimal equivalent values					
		4:3	7:5	3:2	5:3	2:1
5		3.75	3.57	3.33	3.00	2.50
	AM	4.38	4.29	4.17	4.00	3.75
	GM	4.33	4.23	4.08	3.87	3.54
	HM	4.29	4.17	4.00	3.75	3.33
5.5		4.13	3.93	3.67	3.30	2.75
	AM	4.81	4.71	4.58	4.40	4.13
	GM	4.76	4.65	4.49	4.26	3.89
	HM	4.71	4.58	4.40	4.13	3.67
6		4.50	4.29	4.00	3.60	3.00
	AM	5.25	5.14	5.00	4.80	4.50
	GM	5.20	5.07	4.90	4.65	4.24
	HM	5.14	5.00	4.80	4.50	4.00
6.5		4.88	4.64	4.33	3.90	3.25
	AM	5.69	5.57	5.42	5.20	4.88
	GM	5.63	5.49	5.31	5.03	4.60
	HM	5.57	5.42	5.20	4.88	4.33
7		5.25	5.00	4.67	4.20	3.50
	AM	6.13	6.00	5.83	5.60	5.25
	GM	6.06	5.92	5.72	5.42	4.95
	HM	6.00	5.83	5.60	5.25	4.67
7.5		5.63	5.36	5.00	4.50	3.75
	AM	6.56	6.43	6.25	6.00	5.63
	GM	6.50	6.34	6.12	5.81	5.30
	HM	6.43	6.25	6.00	5.63	5.00
8		6.00	5.71	5.33	4.80	4.00
	AM	7.00	6.86	6.67	6.40	6.00
	GM	6.93	6.76	6.53	6.20	5.66
	HM	6.86	6.67	6.40	6.00	5.33
8.5		6.38	6.07	5.67	5.10	4.25
	AM	7.44	7.29	7.08	6.80	6.38
	GM	7.36	7.18	6.94	6.58	6.01
	HM	7.29	7.08	6.80	6.38	5.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
9' 0"		12' 0"	12' 7 1/4"	13' 6"	15' 0"	18' 0"
	AM	10' 6"	10' 9 5/8"	11' 3"	12' 0"	13' 6"
	GM	10' 4 3/4"	10' 7 3/4"	11' 1/4"	11' 7 3/8"	12' 8 3/4"
	HM	10' 3 3/8"	10' 6"	10' 9 5/8"	11' 3"	12' 0"
9' 6"		12' 8"	13' 3 5/8"	14' 3"	15' 10"	19' 0"
	AM	11' 1"	11' 4 3/4"	11' 10 1/2"	12' 8"	14' 3"
	GM	10' 11 5/8"	11' 2 7/8"	11' 7 5/8"	12' 3 1/8"	13' 5 1/4"
	HM	10' 10 1/4"	11' 1"	11' 4 3/4"	11' 10 1/2"	12' 8"
10' 0"		13' 4"	14' 0"	15' 0"	16' 8"	20' 0"
	AM	11' 8"	12' 0"	12' 6"	13' 4"	15' 0"
	GM	11' 6 5/8"	11' 10"	12' 3"	12' 10 7/8"	14' 1 3/4"
	HM	11' 5 1/8"	11' 8"	12' 0"	12' 6"	13' 4"
10' 6"		14' 0"	14' 8 3/8"	15' 9"	17' 6"	21' 0"
	AM	12' 3"	12' 7 1/4"	13' 1 1/2"	14' 0"	15' 9"
	GM	12' 1 1/2"	12' 5 1/8"	12' 10 3/8"	13' 6 5/8"	14' 10 1/4"
	HM	12' 0"	12' 3"	12' 7 1/4"	13' 1 1/2"	14' 0"
11' 0"		14' 8"	15' 4 3/4"	16' 6"	18' 4"	22' 0"
	AM	12' 10"	13' 2 3/8"	13' 9"	14' 8"	16' 6"
	GM	12' 8 3/8"	13' 1/8"	13' 5 5/8"	14' 2 3/8"	15' 6 5/8"
	HM	12' 6 7/8"	12' 10"	13' 2 3/8"	13' 9"	14' 8"
11' 6"		15' 4"	16' 1 1/4"	17' 3"	19' 2"	23' 0"
	AM	13' 5"	13' 9 5/8"	14' 4 1/2"	15' 4"	17' 3"
	GM	13' 3 3/8"	13' 7 1/4"	14' 1"	14' 10 1/8"	16' 3 1/8"
	HM	13' 1 3/4"	13' 5"	13' 9 5/8"	14' 4 1/2"	15' 4"
12' 0"		16' 0"	16' 9 5/8"	18' 0"	20' 0"	24' 0"
	AM	14' 0"	14' 4 3/4"	15' 0"	16' 0"	18' 0"
	GM	13' 10 1/4"	14' 2 3/8"	14' 8 3/8"	15' 5 7/8"	16' 11 5/8"
	HM	13' 8 5/8"	14' 0"	14' 4 3/4"	15' 0"	16' 0"
12' 6"		16' 8"	17' 6"	18' 9"	20' 10"	25' 0"
	AM	14' 7"	15' 0"	15' 7 1/2"	16' 8"	18' 9"
	GM	14' 5 1/4"	14' 9 1/2"	15' 3 3/4"	16' 1 5/8"	17' 8 1/8"
	HM	14' 3 3/8"	14' 7"	15' 0"	15' 7 1/2"	16' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
9		12.00	12.60	13.50	15.00	18.00
	AM	10.50	10.80	11.25	12.00	13.50
	GM	10.39	10.65	11.02	11.62	12.73
	HM	10.29	10.50	10.80	11.25	12.00
9.5		12.67	13.30	14.25	15.83	19.00
	AM	11.08	11.40	11.88	12.67	14.25
	GM	10.97	11.24	11.64	12.26	13.44
	HM	10.86	11.08	11.40	11.88	12.67
10		13.33	14.00	15.00	16.67	20.00
	AM	11.67	12.00	12.50	13.33	15.00
	GM	11.55	11.83	12.25	12.91	14.14
	HM	11.43	11.67	12.00	12.50	13.33
10.5		14.00	14.70	15.75	17.50	21.00
	AM	12.25	12.60	13.13	14.00	15.75
	GM	12.12	12.42	12.86	13.56	14.85
	HM	12.00	12.25	12.60	13.13	14.00
11		14.67	15.40	16.50	18.33	22.00
	AM	12.83	13.20	13.75	14.67	16.50
	GM	12.70	13.02	13.47	14.20	15.56
	HM	12.57	12.83	13.20	13.75	14.67
11.5		15.33	16.10	17.25	19.17	23.00
	AM	13.42	13.80	14.38	15.33	17.25
	GM	13.28	13.61	14.08	14.85	16.26
	HM	13.14	13.42	13.80	14.38	15.33
12		16.00	16.80	18.00	20.00	24.00
	AM	14.00	14.40	15.00	16.00	18.00
	GM	13.86	14.20	14.70	15.49	16.97
	HM	13.71	14.00	14.40	15.00	16.00
12.5		16.67	17.50	18.75	20.83	25.00
	AM	14.58	15.00	15.63	16.67	18.75
	GM	14.43	14.79	15.31	16.14	17.68
	HM	14.29	14.58	15.00	15.63	16.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
9' 0"		6' 9"	6' 5 1/8"	6' 0"	5' 4 3/4"	4' 6"
	AM	7' 10 1/2"	7' 8 5/8"	7' 6"	7' 2 3/8"	6' 9"
	GM	7' 9 1/2"	7' 7 1/4"	7' 4 1/8"	6' 11 5/8"	6' 4 3/8"
	HM	7' 8 5/8"	7' 6"	7' 2 3/8"	6' 9"	6' 0"
9' 6"		7' 1 1/2"	6' 9 3/8"	6' 4"	5' 8 3/8"	4' 9"
	AM	8' 3 3/4"	8' 1 3/4"	7' 11"	7' 7 1/4"	7' 1 1/2"
	GM	8' 2 3/4"	8' 3/8"	7' 9 1/8"	7' 4 1/4"	6' 8 5/8"
	HM	8' 1 3/4"	7' 11"	7' 7 1/4"	7' 1 1/2"	6' 4"
10' 0"		7' 6"	7' 1 3/4"	6' 8"	6' 0"	5' 0"
	AM	8' 9"	8' 6 7/8"	8' 4"	8' 0"	7' 6"
	GM	8' 7 7/8"	8' 5 3/8"	8' 2"	7' 9"	7' 7/8"
	HM	8' 6 7/8"	8' 4"	8' 0"	7' 6"	6' 8"
10' 6"		7' 10 1/2"	7' 6"	7' 0"	6' 3 5/8"	5' 3"
	AM	9' 2 1/4"	9' 0"	8' 9"	8' 4 3/4"	7' 10 1/2"
	GM	9' 1 1/8"	8' 10 1/2"	8' 6 7/8"	8' 1 5/8"	7' 5 1/8"
	HM	9' 0"	8' 9"	8' 4 3/4"	7' 10 1/2"	7' 0"
11' 0"		8' 3"	7' 10 1/4"	7' 4"	6' 7 1/4"	5' 6"
	AM	9' 7 1/2"	9' 5 1/8"	9' 2"	8' 9 5/8"	8' 3"
	GM	9' 6 3/8"	9' 3 1/2"	8' 11 3/4"	8' 6 1/4"	7' 9 3/8"
	HM	9' 5 1/8"	9' 2"	8' 9 5/8"	8' 3"	7' 4"
11' 6"		8' 7 1/2"	8' 2 5/8"	7' 8"	6' 10 3/4"	5' 9"
	AM	10' 3/4"	9' 10 1/4"	9' 7"	9' 2 3/8"	8' 7 1/2"
	GM	9' 11 1/2"	9' 8 5/8"	9' 4 5/8"	8' 10 7/8"	8' 1 5/8"
	HM	9' 10 1/4"	9' 7"	9' 2 3/8"	8' 7 1/2"	7' 8"
12' 0"		9' 0"	8' 6 7/8"	8' 0"	7' 2 3/8"	6' 0"
	AM	10' 6"	10' 3 3/8"	10' 0"	9' 7 1/4"	9' 0"
	GM	10' 4 3/4"	10' 1 3/4"	9' 9 5/8"	9' 3 1/2"	8' 5 7/8"
	HM	10' 3 3/8"	10' 0"	9' 7 1/4"	9' 0"	8' 0"
12' 6"		9' 4 1/2"	8' 11 1/8"	8' 4"	7' 6"	6' 3"
	AM	10' 11 1/4"	10' 8 5/8"	10' 5"	10' 0"	9' 4 1/2"
	GM	10' 9 7/8"	10' 6 3/4"	10' 2 1/2"	9' 8 1/4"	8' 10 1/8"
	HM	10' 8 5/8"	10' 5"	10' 0"	9' 4 1/2"	8' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
9		6.75	6.43	6.00	5.40	4.50
	AM	7.88	7.71	7.50	7.20	6.75
	GM	7.79	7.61	7.35	6.97	6.36
	HM	7.71	7.50	7.20	6.75	6.00
9.5		7.13	6.79	6.33	5.70	4.75
	AM	8.31	8.14	7.92	7.60	7.13
	GM	8.23	8.03	7.76	7.36	6.72
	HM	8.14	7.92	7.60	7.13	6.33
10		7.50	7.14	6.67	6.00	5.00
	AM	8.75	8.57	8.33	8.00	7.50
	GM	8.66	8.45	8.16	7.75	7.07
	HM	8.57	8.33	8.00	7.50	6.67
10.5		7.88	7.50	7.00	6.30	5.25
	AM	9.19	9.00	8.75	8.40	7.88
	GM	9.09	8.87	8.57	8.13	7.42
	HM	9.00	8.75	8.40	7.88	7.00
11		8.25	7.86	7.33	6.60	5.50
	AM	9.63	9.43	9.17	8.80	8.25
	GM	9.53	9.30	8.98	8.52	7.78
	HM	9.43	9.17	8.80	8.25	7.33
11.5		8.63	8.21	7.67	6.90	5.75
	AM	10.06	9.86	9.58	9.20	8.63
	GM	9.96	9.72	9.39	8.91	8.13
	HM	9.86	9.58	9.20	8.63	7.67
12		9.00	8.57	8.00	7.20	6.00
	AM	10.50	10.29	10.00	9.60	9.00
	GM	10.39	10.14	9.80	9.30	8.49
	HM	10.29	10.00	9.60	9.00	8.00
12.5		9.38	8.93	8.33	7.50	6.25
	AM	10.94	10.71	10.42	10.00	9.38
	GM	10.83	10.56	10.21	9.68	8.84
	HM	10.71	10.42	10.00	9.38	8.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
13' 0"		**17' 4"**	**18' 2 3/8"**	**19' 6"**	**21' 8"**	**26' 0"**
	AM	15' 2"	15' 7 1/4"	16' 3"	17' 4"	19' 6"
	GM	15' 1/8"	15' 4 5/8"	15' 11"	16' 9 3/8"	18' 4 5/8"
	HM	14' 10 1/4"	15' 2"	15' 7 1/4"	16' 3"	17' 4"
13' 6"		**18' 0"**	**18' 10 3/4"**	**20' 3"**	**22' 6"**	**27' 0"**
	AM	15' 9"	16' 2 3/8"	16' 10 1/2"	18' 0"	20' 3"
	GM	15' 7"	15' 11 5/8"	16' 6 3/8"	17' 5 1/8"	19' 1 1/8"
	HM	15' 5 1/8"	15' 9"	16' 2 3/8"	16' 10 1/2"	18' 0"
14' 0"		**18' 8"**	**19' 7 1/4"**	**21' 0"**	**23' 4"**	**28' 0"**
	AM	16' 4"	16' 9 5/8"	17' 6"	18' 8"	21' 0"
	GM	16' 2"	16' 6 3/4"	17' 1 3/4"	18' 7/8"	19' 9 5/8"
	HM	16' 0"	16' 4"	16' 9 5/8"	17' 6"	18' 8"
14' 6"		**19' 4"**	**20' 3 5/8"**	**21' 9"**	**24' 2"**	**29' 0"**
	AM	16' 11"	17' 4 3/4"	18' 1 1/2"	19' 4"	21' 9"
	GM	16' 8 7/8"	17' 1 7/8"	17' 9 1/8"	18' 8 5/8"	20' 6 1/8"
	HM	16' 6 7/8"	16' 11"	17' 4 3/4"	18' 1 1/2"	19' 4"
15' 0"		**20' 0"**	**21' 0"**	**22' 6"**	**25' 0"**	**30' 0"**
	AM	17' 6"	18' 0"	18' 9"	20' 0"	22' 6"
	GM	17' 3 7/8"	17' 9"	18' 4 1/2"	19' 4 3/8"	21' 2 1/2"
	HM	17' 1 3/4"	17' 6"	18' 0"	18' 9"	20' 0"
15' 6"		**20' 8"**	**21' 8 3/8"**	**23' 3"**	**25' 10"**	**31' 0"**
	AM	18' 1"	18' 7 1/4"	19' 4 1/2"	20' 8"	23' 3"
	GM	17' 10 3/4"	18' 4 1/8"	18' 11 3/4"	20' 1/8"	21' 11"
	HM	17' 8 5/8"	18' 1"	18' 7 1/4"	19' 4 1/2"	20' 8"
16' 0"		**21' 4"**	**22' 4 3/4"**	**24' 0"**	**26' 8"**	**32' 0"**
	AM	18' 8"	19' 2 3/8"	20' 0"	21' 4"	24' 0"
	GM	18' 5 3/4"	18' 11 1/8"	19' 7 1/8"	20' 7 7/8"	22' 7 1/2"
	HM	18' 3 3/8"	18' 8"	19' 2 3/8"	20' 0"	21' 4"
16' 6"		**22' 0"**	**23' 1 1/4"**	**24' 9"**	**27' 6"**	**33' 0"**
	AM	19' 3"	19' 9 5/8"	20' 7 1/2"	22' 0"	24' 9"
	GM	19' 5/8"	19' 6 1/4"	20' 2 1/2"	21' 3 5/8"	23' 4"
	HM	18' 10 1/4"	19' 3"	19' 9 5/8"	20' 7 1/2"	22' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
13		**17.33**	**18.20**	**19.50**	**21.67**	**26.00**
	AM	15.17	15.60	16.25	17.33	19.50
	GM	15.01	15.38	15.92	16.78	18.38
	HM	14.86	15.17	15.60	16.25	17.33
13.5		**18.00**	**18.90**	**20.25**	**22.50**	**27.00**
	AM	15.75	16.20	16.88	18.00	20.25
	GM	15.59	15.97	16.53	17.43	19.09
	HM	15.43	15.75	16.20	16.88	18.00
14		**18.67**	**19.60**	**21.00**	**23.33**	**28.00**
	AM	16.33	16.80	17.50	18.67	21.00
	GM	16.17	16.57	17.15	18.07	19.80
	HM	16.00	16.33	16.80	17.50	18.67
14.5		**19.33**	**20.30**	**21.75**	**24.17**	**29.00**
	AM	16.92	17.40	18.13	19.33	21.75
	GM	16.74	17.16	17.76	18.72	20.51
	HM	16.57	16.92	17.40	18.13	19.33
15		**20.00**	**21.00**	**22.50**	**25.00**	**30.00**
	AM	17.50	18.00	18.75	20.00	22.50
	GM	17.32	17.75	18.37	19.36	21.21
	HM	17.14	17.50	18.00	18.75	20.00
15.5		**20.67**	**21.70**	**23.25**	**25.83**	**31.00**
	AM	18.08	18.60	19.38	20.67	23.25
	GM	17.90	18.34	18.98	20.01	21.92
	HM	17.71	18.08	18.60	19.38	20.67
16		**21.33**	**22.40**	**24.00**	**26.67**	**32.00**
	AM	18.67	19.20	20.00	21.33	24.00
	GM	18.48	18.93	19.60	20.66	22.63
	HM	18.29	18.67	19.20	20.00	21.33
16.5		**22.00**	**23.10**	**24.75**	**27.50**	**33.00**
	AM	19.25	19.80	20.63	22.00	24.75
	GM	19.05	19.52	20.21	21.30	23.33
	HM	18.86	19.25	19.80	20.63	22.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
13' 0"		**9' 9"**	**9' 3 3/8"**	8' 8"	**7' 9 5/8"**	**6' 6"**
	AM	11' 4 1/2"	11' 1 3/4"	10' 10"	10' 4 3/4"	9' 9"
	GM	11' 3 1/8"	10' 11 7/8"	10' 7 3/8"	10' 7/8"	9' 2 1/4"
	HM	11' 1 3/4"	10' 10"	10' 4 3/4"	9' 9"	8' 8"
13' 6"		**10' 1 1/2"**	**9' 7 3/4"**	**9' 0"**	**8' 1 1/4"**	**6' 9"**
	AM	11' 9 3/4"	11' 6 7/8"	11' 3"	10' 9 5/8"	10' 1 1/2"
	GM	11' 8 1/4"	11' 4 7/8"	11' 1/4"	10' 5 1/2"	9' 6 1/2"
	HM	11' 6 7/8"	11' 3"	10' 9 5/8"	10' 1 1/2"	9' 0"
14' 0"		**10' 6"**	**10' 0"**	**9' 4"**	**8' 4 3/4"**	**7' 0"**
	AM	12' 3"	12' 0"	11' 8"	11' 2 3/8"	10' 6"
	GM	12' 1 1/2"	11' 10"	11' 5 1/8"	10' 10 1/8"	9' 10 3/4"
	HM	12' 0"	11' 8"	11' 2 3/8"	10' 6"	9' 4"
14' 6"		**10' 10 1/2"**	**10' 4 1/4"**	9' 8"	**8' 8 3/8"**	7' 3"
	AM	12' 8 1/4"	12' 5 1/8"	12' 1"	11' 7 1/4"	10' 10 1/2"
	GM	12' 6 3/4"	12' 3"	11' 10 1/8"	11' 2 3/4"	10' 3"
	HM	12' 5 1/8"	12' 1"	11' 7 1/4"	10' 10 1/2"	9' 8"
15' 0"		**11' 3"**	**10' 8 5/8"**	**10' 0"**	**9' 0"**	**7' 6"**
	AM	13' 1 1/2"	12' 10 1/4"	12' 6"	12' 0"	11' 3"
	GM	12' 11 7/8"	12' 8 1/8"	12' 3"	11' 7 3/8"	10' 7 1/4"
	HM	12' 10 1/4"	12' 6"	12' 0"	11' 3"	10' 0"
15' 6"		**11' 7 1/2"**	**11' 7/8"**	**10' 4"**	**9' 3 5/8"**	**7' 9"**
	AM	13' 6 3/4"	13' 3 3/8"	12' 11"	12' 4 3/4"	11' 7 1/2"
	GM	13' 5 1/8"	13' 1 1/4"	12' 7 7/8"	12' 1/8"	10' 11 1/2"
	HM	13' 3 3/8"	12' 11"	12' 4 3/4"	11' 7 1/2"	10' 4"
16' 0"		**12' 0"**	**11' 5 1/8"**	10' 8"	**9' 7 1/4"**	**8' 0"**
	AM	14' 0"	13' 8 5/8"	13' 4"	12' 9 5/8"	12' 0"
	GM	13' 10 1/4"	13' 6 1/4"	13' 3/4"	12' 4 3/4"	11' 3 3/4"
	HM	13' 8 5/8"	13' 4"	12' 9 5/8"	12' 0"	10' 8"
16' 6"		**12' 4 1/2"**	**11' 9 3/8"**	11' 0"	9' 10 3/4"	**8' 3"**
	AM	14' 5 1/4"	14' 1 3/4"	13' 9"	13' 2 3/8"	12' 4 1/2"
	GM	14' 3 1/2"	13' 11 3/8"	13' 5 5/8"	12' 9 3/8"	11' 8"
	HM	14' 1 3/4"	13' 9"	13' 2 3/8"	12' 4 1/2"	11' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
13		**9.75**	**9.29**	**8.67**	7.80	**6.50**
	AM	11.38	11.14	10.83	10.40	9.75
	GM	11.26	10.99	10.61	10.07	9.19
	HM	11.14	10.83	10.40	9.75	8.67
13.5		**10.13**	**9.64**	**9.00**	**8.10**	**6.75**
	AM	11.81	11.57	11.25	10.80	10.13
	GM	11.69	11.41	11.02	10.46	9.55
	HM	11.57	11.25	10.80	10.13	9.00
14		**10.50**	**10.00**	**9.33**	**8.40**	**7.00**
	AM	12.25	12.00	11.67	11.20	10.50
	GM	12.12	11.83	11.43	10.84	9.90
	HM	12.00	11.67	11.20	10.50	9.33
14.5		**10.88**	**10.36**	9.67	**8.70**	**7.25**
	AM	12.69	12.43	12.08	11.60	10.88
	GM	12.56	12.25	11.84	11.23	10.25
	HM	12.43	12.08	11.60	10.88	9.67
15		**11.25**	**10.71**	**10.00**	9.00	**7.50**
	AM	13.13	12.86	12.50	12.00	11.25
	GM	12.99	12.68	12.25	11.62	10.61
	HM	12.86	12.50	12.00	11.25	10.00
15.5		**11.63**	**11.07**	**10.33**	**9.30**	**7.75**
	AM	13.56	13.29	12.92	12.40	11.63
	GM	13.42	13.10	12.66	12.01	10.96
	HM	13.29	12.92	12.40	11.63	10.33
16		**12.00**	**11.43**	**10.67**	9.60	**8.00**
	AM	14.00	13.71	13.33	12.80	12.00
	GM	13.86	13.52	13.06	12.39	11.31
	HM	13.71	13.33	12.80	12.00	10.67
16.5		**12.38**	**11.79**	**11.00**	**9.90**	8.25
	AM	14.44	14.14	13.75	13.20	12.38
	GM	14.29	13.95	13.47	12.78	11.67
	HM	14.14	13.75	13.20	12.38	11.00

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
17' 0"		**22' 8"**	**23' 9 5/8"**	**25' 6"**	**28' 4"**	**34' 0"**
	AM	19' 10"	20' 4 3/4"	21' 3"	22' 8"	25' 6"
	GM	19' 7 1/2"	20' 1 3/8"	20' 9 7/8"	21' 11 3/8"	24' 1/2"
	HM	19' 5 1/8"	19' 10"	20' 4 3/4"	21' 3"	22' 8"
17' 6"		**23' 4"**	**24' 6"**	**26' 3"**	**29' 2"**	**35' 0"**
	AM	20' 5"	21' 0"	21' 10 1/2"	23' 4"	26' 3"
	GM	20' 2 1/2"	20' 8 1/2"	21' 5 1/4"	22' 7 1/8"	24' 9"
	HM	20' 0"	20' 5"	21' 0"	21' 10 1/2"	23' 4"
18' 0"		**24' 0"**	**25' 2 3/8"**	**27' 0"**	**30' 0"**	**36' 0"**
	AM	21' 0"	21' 7 1/4"	22' 6"	24' 0"	27' 0"
	GM	20' 9 3/8"	21' 3 5/8"	22' 1/2"	23' 2 7/8"	25' 5 1/2"
	HM	20' 6 7/8"	21' 0"	21' 7 1/4"	22' 6"	24' 0"
18' 6"		**24' 8"**	**25' 10 3/4"**	**27' 9"**	**30' 10"**	**37' 0"**
	AM	21' 7"	22' 2 3/8"	23' 1 1/2"	24' 8"	27' 9"
	GM	21' 4 3/8"	21' 10 5/8"	22' 7 7/8"	23' 10 5/8"	26' 2"
	HM	21' 1 3/4"	21' 7"	22' 2 3/8"	23' 1 1/2"	24' 8"
19' 0"		**25' 4"**	**26' 7 1/4"**	**28' 6"**	**31' 8"**	**38' 0"**
	AM	22' 2"	22' 9 5/8"	23' 9"	25' 4"	28' 6"
	GM	21' 11 1/4"	22' 5 3/4"	23' 3 1/4"	24' 6 3/8"	26' 10 1/2"
	HM	21' 8 5/8"	22' 2"	22' 9 5/8"	23' 9"	25' 4"
19' 6"		**26' 0"**	**27' 3 5/8"**	**29' 3"**	**32' 6"**	**39' 0"**
	AM	22' 9"	23' 4 3/4"	24' 4 1/2"	26' 0"	29' 3"
	GM	22' 6 1/4"	23' 7/8"	23' 10 5/8"	25' 2 1/8"	27' 6 7/8"
	HM	22' 3 3/8"	22' 9"	23' 4 3/4"	24' 4 1/2"	26' 0"
20' 0"		**26' 8"**	**28' 0"**	**30' 0"**	**33' 4"**	**40' 0"**
	AM	23' 4"	24' 0"	25' 0"	26' 8"	30' 0"
	GM	23' 1 1/8"	23' 8"	24' 6"	25' 9 7/8"	28' 3 3/8"
	HM	22' 10 1/4"	23' 4"	24' 0"	25' 0"	26' 8"
20' 6"		**27' 4"**	**28' 8 3/8"**	**30' 9"**	**34' 2"**	**41' 0"**
	AM	23' 11"	24' 7 1/4"	25' 7 1/2"	27' 4"	30' 9"
	GM	23' 8"	24' 3 1/8"	25' 1 1/4"	26' 5 5/8"	28' 11 7/8"
	HM	23' 5 1/8"	23' 11"	24' 7 1/4"	25' 7 1/2"	27' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
17		**22.67**	**23.80**	**25.50**	**28.33**	**34.00**
	AM	19.83	20.40	21.25	22.67	25.50
	GM	19.63	20.11	20.82	21.95	24.04
	HM	19.43	19.83	20.40	21.25	22.67
17.5		**23.33**	**24.50**	**26.25**	**29.17**	**35.00**
	AM	20.42	21.00	21.88	23.33	26.25
	GM	20.21	20.71	21.43	22.59	24.75
	HM	20.00	20.42	21.00	21.88	23.33
18		**24.00**	**25.20**	**27.00**	**30.00**	**36.00**
	AM	21.00	21.60	22.50	24.00	27.00
	GM	20.78	21.30	22.05	23.24	25.46
	HM	20.57	21.00	21.60	22.50	24.00
18.5		**24.67**	**25.90**	**27.75**	**30.83**	**37.00**
	AM	21.58	22.20	23.13	24.67	27.75
	GM	21.36	21.89	22.66	23.88	26.16
	HM	21.14	21.58	22.20	23.13	24.67
19		**25.33**	**26.60**	**28.50**	**31.67**	**38.00**
	AM	22.17	22.80	23.75	25.33	28.50
	GM	21.94	22.48	23.27	24.53	26.87
	HM	21.71	22.17	22.80	23.75	25.33
19.5		**26.00**	**27.30**	**29.25**	**32.50**	**39.00**
	AM	22.75	23.40	24.38	26.00	29.25
	GM	22.52	23.07	23.88	25.17	27.58
	HM	22.29	22.75	23.40	24.38	26.00
20		**26.67**	**28.00**	**30.00**	**33.33**	**40.00**
	AM	23.33	24.00	25.00	26.67	30.00
	GM	23.09	23.66	24.49	25.82	28.28
	HM	22.86	23.33	24.00	25.00	26.67
20.5		**27.33**	**28.70**	**30.75**	**34.17**	**41.00**
	AM	23.92	24.60	25.63	27.33	30.75
	GM	23.67	24.26	25.11	26.47	28.99
	HM	23.43	23.92	24.60	25.63	27.33

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
17' 0"		12' 9"	12' 1 3/4"	11' 4"	10' 2 3/8"	8' 6"
	AM	14' 10 1/2"	14' 6 7/8"	14' 2"	13' 7 1/4"	12' 9"
	GM	14' 8 5/8"	14' 4 3/8"	13' 10 5/8"	13' 2"	12' 1/4"
	HM	14' 6 7/8"	14' 2"	13' 7 1/4"	12' 9"	11' 4"
17' 6"		13' 1 1/2"	12' 6"	11' 8"	10' 6"	8' 9"
	AM	15' 3 3/4"	15' 0"	14' 7"	14' 0"	13' 1 1/2"
	GM	15' 1 7/8"	14' 9 1/2"	14' 3 1/2"	13' 6 5/8"	12' 4 1/2"
	HM	15' 0"	14' 7"	14' 0"	13' 1 1/2"	11' 8"
18' 0"		13' 6"	12' 10 1/4"	12' 0"	10' 9 5/8"	9' 0"
	AM	15' 9"	15' 5 1/8"	15' 0"	14' 4 3/4"	13' 6"
	GM	15' 7"	15' 2 1/2"	14' 8 3/8"	13' 11 3/8"	12' 8 3/4"
	HM	15' 5 1/8"	15' 0"	14' 4 3/4"	13' 6"	12' 0"
18' 6"		13' 10 1/2"	13' 2 5/8"	12' 4"	11' 1 1/4"	9' 3"
	AM	16' 2 1/4"	15' 10 1/4"	15' 5"	14' 9 5/8"	13' 10 1/2"
	GM	16' 1/4"	15' 7 5/8"	15' 1 1/4"	14' 4"	13' 1"
	HM	15' 10 1/4"	15' 5"	14' 9 5/8"	13' 10 1/2"	12' 4"
19' 0"		14' 3"	13' 6 7/8"	12' 8"	11' 4 3/4"	9' 6"
	AM	16' 7 1/2"	16' 3 3/8"	15' 10"	15' 2 3/8"	14' 3"
	GM	16' 5 1/2"	16' 3/4"	15' 6 1/8"	14' 8 5/8"	13' 5 1/4"
	HM	16' 3 3/8"	15' 10"	15' 2 3/8"	14' 3"	12' 8"
19' 6"		14' 7 1/2"	13' 11 1/8"	13' 0"	11' 8 3/8"	9' 9"
	AM	17' 3/4"	16' 8 5/8"	16' 3"	15' 7 1/4"	14' 7 1/2"
	GM	16' 10 5/8"	16' 5 3/4"	15' 11"	15' 1 1/4"	13' 9 1/2"
	HM	16' 8 5/8"	16' 3"	15' 7 1/4"	14' 7 1/2"	13' 0"
20' 0"		15' 0"	14' 3 3/8"	13' 4"	12' 0"	10' 0"
	AM	17' 6"	17' 1 3/4"	16' 8"	16' 0"	15' 0"
	GM	17' 3 7/8"	16' 10 7/8"	16' 4"	15' 5 7/8"	14' 1 3/4"
	HM	17' 1 3/4"	16' 8"	16' 0"	15' 0"	13' 4"
20' 6"		15' 4 1/2"	14' 7 3/4"	13' 8"	12' 3 5/8"	10' 3"
	AM	17' 11 1/4"	17' 6 7/8"	17' 1"	16' 4 3/4"	15' 4 1/2"
	GM	17' 9"	17' 3 7/8"	16' 8 7/8"	15' 10 1/2"	14' 6"
	HM	17' 6 7/8"	17' 1"	16' 4 3/4"	15' 4 1/2"	13' 8"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
17		12.75	12.14	11.33	10.20	8.50
	AM	14.88	14.57	14.17	13.60	12.75
	GM	14.72	14.37	13.88	13.17	12.02
	HM	14.57	14.17	13.60	12.75	11.33
17.5		13.13	12.50	11.67	10.50	8.75
	AM	15.31	15.00	14.58	14.00	13.13
	GM	15.16	14.79	14.29	13.56	12.37
	HM	15.00	14.58	14.00	13.13	11.67
18		13.50	12.86	12.00	10.80	9.00
	AM	15.75	15.43	15.00	14.40	13.50
	GM	15.59	15.21	14.70	13.94	12.73
	HM	15.43	15.00	14.40	13.50	12.00
18.5		13.88	13.21	12.33	11.10	9.25
	AM	16.19	15.86	15.42	14.80	13.88
	GM	16.02	15.64	15.11	14.33	13.08
	HM	15.86	15.42	14.80	13.88	12.33
19		14.25	13.57	12.67	11.40	9.50
	AM	16.63	16.29	15.83	15.20	14.25
	GM	16.45	16.06	15.51	14.72	13.44
	HM	16.29	15.83	15.20	14.25	12.67
19.5		14.63	13.93	13.00	11.70	9.75
	AM	17.06	16.71	16.25	15.60	14.63
	GM	16.89	16.48	15.92	15.10	13.79
	HM	16.71	16.25	15.60	14.63	13.00
20		15.00	14.29	13.33	12.00	10.00
	AM	17.50	17.14	16.67	16.00	15.00
	GM	17.32	16.90	16.33	15.49	14.14
	HM	17.14	16.67	16.00	15.00	13.33
20.5		15.38	14.64	13.67	12.30	10.25
	AM	17.94	17.57	17.08	16.40	15.38
	GM	17.75	17.33	16.74	15.88	14.50
	HM	17.57	17.08	16.40	15.38	13.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
21' 0"		28' 0"	29' 4 3/4"	31' 6"	35' 0"	42' 0"
	AM	24' 6"	25' 2 3/8"	26' 3"	28' 0"	31' 6"
	GM	24' 3"	24' 10 1/8"	25' 8 5/8"	27' 1 3/8"	29' 8 3/8"
	HM	24' 0"	24' 6"	25' 2 3/8"	26' 3"	28' 0"
21' 6"		28' 8"	30' 1 1/4"	32' 3"	35' 10"	43' 0"
	AM	25' 1"	25' 9 5/8"	26' 10 1/2"	28' 8"	32' 3"
	GM	24' 9 7/8"	25' 5 1/4"	26' 4"	27' 9 1/8"	30' 4 7/8"
	HM	24' 6 7/8"	25' 1"	25' 9 5/8"	26' 10 1/2"	28' 8"
22' 0"		29' 4"	30' 9 5/8"	33' 0"	36' 8"	44' 0"
	AM	25' 8"	26' 4 3/4"	27' 6"	29' 4"	33' 0"
	GM	25' 4 7/8"	26' 3/8"	26' 11 3/8"	28' 4 7/8"	31' 1 3/8"
	HM	25' 1 3/4"	25' 8"	26' 4 3/4"	27' 6"	29' 4"
22' 6"		30' 0"	31' 6"	33' 9"	37' 6"	45' 0"
	AM	26' 3"	27' 0"	28' 1 1/2"	30' 0"	33' 9"
	GM	25' 11 3/4"	26' 7 1/2"	27' 6 5/8"	29' 5/8"	31' 9 7/8"
	HM	25' 8 5/8"	26' 3"	27' 0"	28' 1 1/2"	30' 0"
23' 0"		30' 8"	32' 2 3/8"	34' 6"	38' 4"	46' 0"
	AM	26' 10"	27' 7 1/4"	28' 9"	30' 8"	34' 6"
	GM	26' 6 3/4"	27' 2 5/8"	28' 2"	29' 8 3/8"	32' 6 3/8"
	HM	26' 3 3/8"	26' 10"	27' 7 1/4"	28' 9"	30' 8"
23' 6"		31' 4"	32' 10 3/4"	35' 3"	39' 2"	47' 0"
	AM	27' 5"	28' 2 3/8"	29' 4 1/2"	31' 4"	35' 3"
	GM	27' 1 5/8"	27' 9 5/8"	28' 9 3/8"	30' 4"	33' 2 3/4"
	HM	26' 10 1/4"	27' 5"	28' 2 3/8"	29' 4 1/2"	31' 4"
24' 0"		32' 0"	33' 7 1/4"	36' 0"	40' 0"	48' 0"
	AM	28' 0"	28' 9 5/8"	30' 0"	32' 0"	36' 0"
	GM	27' 8 1/2"	28' 4 3/4"	29' 4 3/4"	30' 11 3/4"	33' 11 1/4"
	HM	27' 5 1/8"	28' 0"	28' 9 5/8"	30' 0"	32' 0"
24' 6"		32' 8"	34' 3 5/8"	36' 9"	40' 10"	49' 0"
	AM	28' 7"	29' 4 3/4"	30' 7 1/2"	32' 8"	36' 9"
	GM	28' 3 1/2"	28' 11 7/8"	30' 1/8"	31' 7 1/2"	34' 7 3/4"
	HM	28' 0"	28' 7"	29' 4 3/4"	30' 7 1/2"	32' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
21		28.00	29.40	31.50	35.00	42.00
	AM	24.50	25.20	26.25	28.00	31.50
	GM	24.25	24.85	25.72	27.11	29.70
	HM	24.00	24.50	25.20	26.25	28.00
21.5		28.67	30.10	32.25	35.83	43.00
	AM	25.08	25.80	26.88	28.67	32.25
	GM	24.83	25.44	26.33	27.76	30.41
	HM	24.57	25.08	25.80	26.88	28.67
22		29.33	30.80	33.00	36.67	44.00
	AM	25.67	26.40	27.50	29.33	33.00
	GM	25.40	26.03	26.94	28.40	31.11
	HM	25.14	25.67	26.40	27.50	29.33
22.5		30.00	31.50	33.75	37.50	45.00
	AM	26.25	27.00	28.13	30.00	33.75
	GM	25.98	26.62	27.56	29.05	31.82
	HM	25.71	26.25	27.00	28.13	30.00
23		30.67	32.20	34.50	38.33	46.00
	AM	26.83	27.60	28.75	30.67	34.50
	GM	26.56	27.21	28.17	29.69	32.53
	HM	26.29	26.83	27.60	28.75	30.67
23.5		31.33	32.90	35.25	39.17	47.00
	AM	27.42	28.20	29.38	31.33	35.25
	GM	27.14	27.81	28.78	30.34	33.23
	HM	26.86	27.42	28.20	29.38	31.33
24		32.00	33.60	36.00	40.00	48.00
	AM	28.00	28.80	30.00	32.00	36.00
	GM	27.71	28.40	29.39	30.98	33.94
	HM	27.43	28.00	28.80	30.00	32.00
24.5		32.67	34.30	36.75	40.83	49.00
	AM	28.58	29.40	30.63	32.67	36.75
	GM	28.29	28.99	30.01	31.63	34.65
	HM	28.00	28.58	29.40	30.63	32.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
21' 0"		15' 9"	15' 0"	14' 0"	12' 7 1/4"	10' 6"
	AM	18' 4 1/2"	18' 0"	17' 6"	16' 9 5/8"	15' 9"
	GM	18' 2 1/4"	17' 9"	17' 1 3/4"	16' 3 1/4"	14' 10 1/4"
	HM	18' 0"	17' 6"	16' 9 5/8"	15' 9"	14' 0"
21' 6"		16' 1 1/2"	15' 4 1/4"	14' 4"	12' 10 3/4"	10' 9"
	AM	18' 9 3/4"	18' 5 1/8"	17' 11"	17' 2 3/8"	16' 1 1/2"
	GM	18' 7 3/8"	18' 2"	17' 6 5/8"	16' 7 7/8"	15' 2 3/8"
	HM	18' 5 1/8"	17' 11"	17' 2 3/8"	16' 1 1/2"	14' 4"
22' 0"		16' 6"	15' 8 5/8"	14' 8"	13' 2 3/8"	11' 0"
	AM	19' 3"	18' 10 1/4"	18' 4"	17' 7 1/4"	16' 6"
	GM	19' 5/8"	18' 7 1/8"	17' 11 1/2"	17' 1/2"	15' 6 5/8"
	HM	18' 10 1/4"	18' 4"	17' 7 1/4"	16' 6"	14' 8"
22' 6"		16' 10 1/2"	16' 7/8"	15' 0"	13' 6"	11' 3"
	AM	19' 8 1/4"	19' 3 3/8"	18' 9"	18' 0"	16' 10 1/2"
	GM	19' 5 7/8"	19' 1/4"	18' 4 1/2"	17' 5 1/8"	15' 10 7/8"
	HM	19' 3 3/8"	18' 9"	18' 0"	16' 10 1/2"	15' 0"
23' 0"		17' 3"	16' 5 1/8"	15' 4"	13' 9 5/8"	11' 6"
	AM	20' 1 1/2"	19' 8 5/8"	19' 2"	18' 4 3/4"	17' 3"
	GM	19' 11"	19' 5 1/4"	18' 9 3/8"	17' 9 3/4"	16' 3 1/8"
	HM	19' 8 5/8"	19' 2"	18' 4 3/4"	17' 3"	15' 4"
23' 6"		17' 7 1/2"	16' 9 3/8"	15' 8"	14' 1 1/4"	11' 9"
	AM	20' 6 3/4"	20' 1 3/4"	19' 7"	18' 9 5/8"	17' 7 1/2"
	GM	20' 4 1/4"	19' 10 3/8"	19' 2 1/4"	18' 2 3/8"	16' 7 3/8"
	HM	20' 1 3/4"	19' 7"	18' 9 5/8"	17' 7 1/2"	15' 8"
24' 0"		18' 0"	17' 1 3/4"	16' 0"	14' 4 3/4"	12' 0"
	AM	21' 0"	20' 6 7/8"	20' 0"	19' 2 3/8"	18' 0"
	GM	20' 9 3/8"	20' 3 3/8"	19' 7 1/8"	18' 7 1/8"	16' 11 5/8"
	HM	20' 6 7/8"	20' 0"	19' 2 3/8"	18' 0"	16' 0"
24' 6"		18' 4 1/2"	17' 6"	16' 4"	14' 8 3/8"	12' 3"
	AM	21' 5 1/4"	21' 0"	20' 5"	19' 7 1/4"	18' 4 1/2"
	GM	21' 2 5/8"	20' 8 1/2"	20' 0"	18' 11 3/4"	17' 3 7/8"
	HM	21' 0"	20' 5"	19' 7 1/4"	18' 4 1/2"	16' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
21		15.75	15.00	14.00	12.60	10.50
	AM	18.38	18.00	17.50	16.80	15.75
	GM	18.19	17.75	17.15	16.27	14.85
	HM	18.00	17.50	16.80	15.75	14.00
21.5		16.13	15.36	14.33	12.90	10.75
	AM	18.81	18.43	17.92	17.20	16.13
	GM	18.62	18.17	17.55	16.65	15.20
	HM	18.43	17.92	17.20	16.13	14.33
22		16.50	15.71	14.67	13.20	11.00
	AM	19.25	18.86	18.33	17.60	16.50
	GM	19.05	18.59	17.96	17.04	15.56
	HM	18.86	18.33	17.60	16.50	14.67
22.5		16.88	16.07	15.00	13.50	11.25
	AM	19.69	19.29	18.75	18.00	16.88
	GM	19.49	19.02	18.37	17.43	15.91
	HM	19.29	18.75	18.00	16.88	15.00
23		17.25	16.43	15.33	13.80	11.50
	AM	20.13	19.71	19.17	18.40	17.25
	GM	19.92	19.44	18.78	17.82	16.26
	HM	19.71	19.17	18.40	17.25	15.33
23.5		17.63	16.79	15.67	14.10	11.75
	AM	20.56	20.14	19.58	18.80	17.63
	GM	20.35	19.86	19.19	18.20	16.62
	HM	20.14	19.58	18.80	17.63	15.67
24		18.00	17.14	16.00	14.40	12.00
	AM	21.00	20.57	20.00	19.20	18.00
	GM	20.78	20.28	19.60	18.59	16.97
	HM	20.57	20.00	19.20	18.00	16.00
24.5		18.38	17.50	16.33	14.70	12.25
	AM	21.44	21.00	20.42	19.60	18.38
	GM	21.22	20.71	20.00	18.98	17.32
	HM	21.00	20.42	19.60	18.38	16.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
25' 0"		**33' 4"**	**35' 0"**	**37' 6"**	**41' 8"**	**50' 0"**
	AM	29' 2"	30' 0"	31' 3"	33' 4"	37' 6"
	GM	28' 10 3/8"	29' 7"	30' 7 3/8"	32' 3 1/4"	35' 4 1/4"
	HM	28' 6 7/8"	29' 2"	30' 0"	31' 3"	33' 4"
25' 6"		**34' 0"**	**35' 8 3/8"**	**38' 3"**	**42' 6"**	**51' 0"**
	AM	29' 9"	30' 7 1/4"	31' 10 1/2"	34' 0"	38' 3"
	GM	29' 5 3/8"	30' 2 1/8"	31' 2 3/4"	32' 11"	36' 3/4"
	HM	29' 1 3/4"	29' 9"	30' 7 1/4"	31' 10 1/2"	34' 0"
26' 0"		**34' 8"**	**36' 4 3/4"**	**39' 0"**	**43' 4"**	**52' 0"**
	AM	30' 4"	31' 2 3/8"	32' 6"	34' 8"	39' 0"
	GM	30' 1/4"	30' 9 1/8"	31' 10 1/8"	33' 6 3/4"	36' 9 1/4"
	HM	29' 8 5/8"	30' 4"	31' 2 3/8"	32' 6"	34' 8"
26' 6"		**35' 4"**	**37' 1 1/4"**	**39' 9"**	**44' 2"**	**53' 0"**
	AM	30' 11"	31' 9 5/8"	33' 1 1/2"	35' 4"	39' 9"
	GM	30' 7 1/4"	31' 4 1/4"	32' 5 1/2"	34' 2 1/2"	37' 5 3/4"
	HM	30' 3 3/8"	30' 11"	31' 9 5/8"	33' 1 1/2"	35' 4"
27' 0"		**36' 0"**	**37' 9 5/8"**	**40' 6"**	**45' 0"**	**54' 0"**
	AM	31' 6"	32' 4 3/4"	33' 9"	36' 0"	40' 6"
	GM	31' 2 1/8"	31' 11 3/8"	33' 7/8"	34' 10 1/4"	38' 2 1/4"
	HM	30' 10 1/4"	31' 6"	32' 4 3/4"	33' 9"	36' 0"
27' 6"		**36' 8"**	**38' 6"**	**41' 3"**	**45' 10"**	**55' 0"**
	AM	32' 1"	33' 0"	34' 4 1/2"	36' 8"	41' 3"
	GM	31' 9"	32' 6 1/2"	33' 8 1/8"	35' 6"	38' 10 3/4"
	HM	31' 5 1/8"	32' 1"	33' 0"	34' 4 1/2"	36' 8"
28' 0"		**37' 4"**	**39' 2 3/8"**	**42' 0"**	**46' 8"**	**56' 0"**
	AM	32' 8"	33' 7 1/4"	35' 0"	37' 4"	42' 0"
	GM	32' 4"	33' 1 1/2"	34' 3 1/2"	36' 1 3/4"	39' 7 1/8"
	HM	32' 0"	32' 8"	33' 7 1/4"	35' 0"	37' 4"
28' 6"		**38' 0"**	**39' 10 3/4"**	**42' 9"**	**47' 6"**	**57' 0"**
	AM	33' 3"	34' 2 3/8"	35' 7 1/2"	38' 0"	42' 9"
	GM	32' 10 7/8"	33' 8 5/8"	34' 10 7/8"	36' 9 1/2"	40' 3 5/8"
	HM	32' 6 7/8"	33' 3"	34' 2 3/8"	35' 7 1/2"	38' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
25		**33.33**	**35.00**	**37.50**	**41.67**	**50.00**
	AM	29.17	30.00	31.25	33.33	37.50
	GM	28.87	29.58	30.62	32.27	35.36
	HM	28.57	29.17	30.00	31.25	33.33
25.5		**34.00**	**35.70**	**38.25**	**42.50**	**51.00**
	AM	29.75	30.60	31.88	34.00	38.25
	GM	29.44	30.17	31.23	32.92	36.06
	HM	29.14	29.75	30.60	31.88	34.00
26		**34.67**	**36.40**	**39.00**	**43.33**	**52.00**
	AM	30.33	31.20	32.50	34.67	39.00
	GM	30.02	30.76	31.84	33.57	36.77
	HM	29.71	30.33	31.20	32.50	34.67
26.5		**35.33**	**37.10**	**39.75**	**44.17**	**53.00**
	AM	30.92	31.80	33.13	35.33	39.75
	GM	30.60	31.36	32.46	34.21	37.48
	HM	30.29	30.92	31.80	33.13	35.33
27		**36.00**	**37.80**	**40.50**	**45.00**	**54.00**
	AM	31.50	32.40	33.75	36.00	40.50
	GM	31.18	31.95	33.07	34.86	38.18
	HM	30.86	31.50	32.40	33.75	36.00
27.5		**36.67**	**38.50**	**41.25**	**45.83**	**55.00**
	AM	32.08	33.00	34.38	36.67	41.25
	GM	31.75	32.54	33.68	35.50	38.89
	HM	31.43	32.08	33.00	34.38	36.67
28		**37.33**	**39.20**	**42.00**	**46.67**	**56.00**
	AM	32.67	33.60	35.00	37.33	42.00
	GM	32.33	33.13	34.29	36.15	39.60
	HM	32.00	32.67	33.60	35.00	37.33
28.5		**38.00**	**39.90**	**42.75**	**47.50**	**57.00**
	AM	33.25	34.20	35.63	38.00	42.75
	GM	32.91	33.72	34.91	36.79	40.31
	HM	32.57	33.25	34.20	35.63	38.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
25' 0"		18' 9"	17' 10 1/4"	16' 8"	15' 0"	12' 6"
	AM	21' 10 1/2"	21' 5 1/8"	20' 10"	20' 0"	18' 9"
	GM	21' 7 3/4"	21' 1 1/2"	20' 5"	19' 4 3/8"	17' 8 1/8"
	HM	21' 5 1/8"	20' 10"	20' 0"	18' 9"	16' 8"
25' 6"		19' 1 1/2"	18' 2 5/8"	17' 0"	15' 3 5/8"	12' 9"
	AM	22' 3 3/4"	21' 10 1/4"	21' 3"	20' 4 3/4"	19' 1 1/2"
	GM	22' 1"	21' 6 5/8"	20' 9 7/8"	19' 9"	18' 3/8"
	HM	21' 10 1/4"	21' 3"	20' 4 3/4"	19' 1 1/2"	17' 0"
26' 0"		19' 6"	18' 6 7/8"	17' 4"	15' 7 1/4"	13' 0"
	AM	22' 9"	22' 3 3/8"	21' 8"	20' 9 5/8"	19' 6"
	GM	22' 6 1/4"	21' 11 3/4"	21' 2 3/4"	20' 1 5/8"	18' 4 5/8"
	HM	22' 3 3/8"	21' 8"	20' 9 5/8"	19' 6"	17' 4"
26' 6"		19' 10 1/2"	18' 11 1/8"	17' 8"	15' 10 3/4"	13' 3"
	AM	23' 2 1/4"	22' 8 5/8"	22' 1"	21' 2 3/8"	19' 10 1/2"
	GM	22' 11 3/8"	22' 4 3/4"	21' 7 5/8"	20' 6 3/8"	18' 8 7/8"
	HM	22' 8 5/8"	22' 1"	21' 2 3/8"	19' 10 1/2"	17' 8"
27' 0"		20' 3"	19' 3 3/8"	18' 0"	16' 2 3/8"	13' 6"
	AM	23' 7 1/2"	23' 1 3/4"	22' 6"	21' 7 1/4"	20' 3"
	GM	23' 4 5/8"	22' 9 7/8"	22' 1/2"	20' 11"	19' 1 1/8"
	HM	23' 1 3/4"	22' 6"	21' 7 1/4"	20' 3"	18' 0"
27' 6"		20' 7 1/2"	19' 7 3/4"	18' 4"	16' 6"	13' 9"
	AM	24' 3/4"	23' 6 7/8"	22' 11"	22' 0"	20' 7 1/2"
	GM	23' 9 3/4"	23' 2 7/8"	22' 5 1/2"	21' 3 5/8"	19' 5 3/8"
	HM	23' 6 7/8"	22' 11"	22' 0"	20' 7 1/2"	18' 4"
28' 0"		21' 0"	20' 0"	18' 8"	16' 9 5/8"	14' 0"
	AM	24' 6"	24' 0"	23' 4"	22' 4 3/4"	21' 0"
	GM	24' 3"	23' 8"	22' 10 3/8"	21' 8 1/4"	19' 9 5/8"
	HM	24' 0"	23' 4"	22' 4 3/4"	21' 0"	18' 8"
28' 6"		21' 4 1/2"	20' 4 1/4"	19' 0"	17' 1 1/4"	14' 3"
	AM	24' 11 1/4"	24' 5 1/8"	23' 9"	22' 9 5/8"	21' 4 1/2"
	GM	24' 8 1/8"	24' 1"	23' 3 1/4"	22' 7/8"	20' 1 7/8"
	HM	24' 5 1/8"	23' 9"	22' 9 5/8"	21' 4 1/2"	19' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
25		18.75	17.86	16.67	15.00	12.50
	AM	21.88	21.43	20.83	20.00	18.75
	GM	21.65	21.13	20.41	19.36	17.68
	HM	21.43	20.83	20.00	18.75	16.67
25.5		19.13	18.21	17.00	15.30	12.75
	AM	22.31	21.86	21.25	20.40	19.13
	GM	22.08	21.55	20.82	19.75	18.03
	HM	21.86	21.25	20.40	19.13	17.00
26		19.50	18.57	17.33	15.60	13.00
	AM	22.75	22.29	21.67	20.80	19.50
	GM	22.52	21.97	21.23	20.14	18.38
	HM	22.29	21.67	20.80	19.50	17.33
26.5		19.88	18.93	17.67	15.90	13.25
	AM	23.19	22.71	22.08	21.20	19.88
	GM	22.95	22.40	21.64	20.53	18.74
	HM	22.71	22.08	21.20	19.88	17.67
27		20.25	19.29	18.00	16.20	13.50
	AM	23.63	23.14	22.50	21.60	20.25
	GM	23.38	22.82	22.05	20.91	19.09
	HM	23.14	22.50	21.60	20.25	18.00
27.5		20.63	19.64	18.33	16.50	13.75
	AM	24.06	23.57	22.92	22.00	20.63
	GM	23.82	23.24	22.45	21.30	19.45
	HM	23.57	22.92	22.00	20.63	18.33
28		21.00	20.00	18.67	16.80	14.00
	AM	24.50	24.00	23.33	22.40	21.00
	GM	24.25	23.66	22.86	21.69	19.80
	HM	24.00	23.33	22.40	21.00	18.67
28.5		21.38	20.36	19.00	17.10	14.25
	AM	24.94	24.43	23.75	22.80	21.38
	GM	24.68	24.09	23.27	22.08	20.15
	HM	24.43	23.75	22.80	21.38	19.00

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
29' 0"		**38' 8"**	**40' 7 1/4"**	**43' 6"**	**48' 4"**	**58' 0"**
	AM	33' 10"	34' 9 5/8"	36' 3"	38' 8"	43' 6"
	GM	33' 5 7/8"	34' 3 3/4"	35' 6 1/4"	37' 5 1/4"	41' 1/8"
	HM	33' 1 3/4"	33' 10"	34' 9 5/8"	36' 3"	38' 8"
29' 6"		**39' 4"**	**41' 3 5/8"**	**44' 3"**	**49' 2"**	**59' 0"**
	AM	34' 5"	35' 4 3/4"	36' 10 1/2"	39' 4"	44' 3"
	GM	34' 3/4"	34' 10 7/8"	36' 1 1/2"	38' 1"	41' 8 5/8"
	HM	33' 8 5/8"	34' 5"	35' 4 3/4"	36' 10 1/2"	39' 4"
30' 0"		**40' 0"**	**42' 0"**	**45' 0"**	**50' 0"**	**60' 0"**
	AM	35' 0"	36' 0"	37' 6"	40' 0"	45' 0"
	GM	34' 7 3/4"	35' 6"	36' 8 7/8"	38' 8 3/4"	42' 5 1/8"
	HM	34' 3 3/8"	35' 0"	36' 0"	37' 6"	40' 0"
30' 6"		**40' 8"**	**42' 8 3/8"**	**45' 9"**	**50' 10"**	**61' 0"**
	AM	35' 7"	36' 7 1/4"	38' 1 1/2"	40' 8"	45' 9"
	GM	35' 2 5/8"	36' 1"	37' 4 1/4"	39' 4 1/2"	43' 1 5/8"
	HM	34' 10 1/4"	35' 7"	36' 7 1/4"	38' 1 1/2"	40' 8"
31' 0"		**41' 4"**	**43' 4 3/4"**	**46' 6"**	**51' 8"**	**62' 0"**
	AM	36' 2"	37' 2 3/8"	38' 9"	41' 4"	46' 6"
	GM	35' 9 1/2"	36' 8 1/8"	37' 11 5/8"	40' 1/4"	43' 10 1/8"
	HM	35' 5 1/8"	36' 2"	37' 2 3/8"	38' 9"	41' 4"
31' 6"		**42' 0"**	**44' 1 1/4"**	**47' 3"**	**52' 6"**	**63' 0"**
	AM	36' 9"	37' 9 5/8"	39' 4 1/2"	42' 0"	47' 3"
	GM	36' 4 1/2"	37' 3 1/4"	38' 7"	40' 8"	44' 6 5/8"
	HM	36' 0"	36' 9"	37' 9 5/8"	39' 4 1/2"	42' 0"
32' 0"		**42' 8"**	**44' 9 5/8"**	**48' 0"**	**53' 4"**	**64' 0"**
	AM	37' 4"	38' 4 3/4"	40' 0"	42' 8"	48' 0"
	GM	36' 11 3/8"	37' 10 3/8"	39' 2 1/4"	41' 3 3/4"	45' 3"
	HM	36' 6 7/8"	37' 4"	38' 4 3/4"	40' 0"	42' 8"
32' 6"		**43' 4"**	**45' 6"**	**48' 9"**	**54' 2"**	**65' 0"**
	AM	37' 11"	39' 0"	40' 7 1/2"	43' 4"	48' 9"
	GM	37' 6 3/8"	38' 5 1/2"	39' 9 5/8"	41' 11 1/2"	45' 11 1/2"
	HM	37' 1 3/4"	37' 11"	39' 0"	40' 7 1/2"	43' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
29		**38.67**	**40.60**	**43.50**	**48.33**	**58.00**
	AM	33.83	34.80	36.25	38.67	43.50
	GM	33.49	34.31	35.52	37.44	41.01
	HM	33.14	33.83	34.80	36.25	38.67
29.5		**39.33**	**41.30**	**44.25**	**49.17**	**59.00**
	AM	34.42	35.40	36.88	39.33	44.25
	GM	34.06	34.90	36.13	38.08	41.72
	HM	33.71	34.42	35.40	36.87	39.33
30		**40.00**	**42.00**	**45.00**	**50.00**	**60.00**
	AM	35.00	36.00	37.50	40.00	45.00
	GM	34.64	35.50	36.74	38.73	42.43
	HM	34.29	35.00	36.00	37.50	40.00
30.5		**40.67**	**42.70**	**45.75**	**50.83**	**61.00**
	AM	35.58	36.60	38.13	40.67	45.75
	GM	35.22	36.09	37.35	39.38	43.13
	HM	34.86	35.58	36.60	38.12	40.67
31		**41.33**	**43.40**	**46.50**	**51.67**	**62.00**
	AM	36.17	37.20	38.75	41.33	46.50
	GM	35.80	36.68	37.97	40.02	43.84
	HM	35.43	36.17	37.20	38.75	41.33
31.5		**42.00**	**44.10**	**47.25**	**52.50**	**63.00**
	AM	36.75	37.80	39.38	42.00	47.25
	GM	36.37	37.27	38.58	40.67	44.55
	HM	36.00	36.75	37.80	39.37	42.00
32		**42.67**	**44.80**	**48.00**	**53.33**	**64.00**
	AM	37.33	38.40	40.00	42.67	48.00
	GM	36.95	37.86	39.19	41.31	45.25
	HM	36.57	37.33	38.40	40.00	42.67
32.5		**43.33**	**45.50**	**48.75**	**54.17**	**65.00**
	AM	37.92	39.00	40.63	43.33	48.75
	GM	37.53	38.45	39.80	41.96	45.96
	HM	37.14	37.92	39.00	40.62	43.33

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
29' 0"		**21' 9"**	**20' 8 5/8"**	**19' 4"**	**17' 4 3/4"**	**14' 6"**
	AM	25' 4 1/2"	24' 10 1/4"	24' 2"	23' 2 3/8"	21' 9"
	GM	25' 1 3/8"	24' 6 1/8"	23' 8 1/8"	22' 5 1/2"	20' 6 1/8"
	HM	24' 10 1/4"	24' 2"	23' 2 3/8"	21' 9"	19' 4"
29' 6"		**22' 1 1/2"**	**21' 7/8"**	**19' 8"**	**17' 8 3/8"**	**14' 9"**
	AM	25' 9 3/4"	25' 3 3/8"	24' 7"	23' 7 1/4"	22' 1 1/2"
	GM	25' 6 5/8"	24' 11 1/8"	24' 1"	22' 10 1/4"	20' 10 3/8"
	HM	25' 3 3/8"	24' 7"	23' 7 1/4"	22' 1 1/2"	19' 8"
30' 0"		**22' 6"**	**21' 5 1/8"**	**20' 0"**	**18' 0"**	**15' 0"**
	AM	26' 3"	25' 8 5/8"	25' 0"	24' 0"	22' 6"
	GM	25' 11 3/4"	25' 4 1/4"	24' 6"	23' 2 7/8"	21' 2 1/2"
	HM	25' 8 5/8"	25' 0"	24' 0"	22' 6"	20' 0"
30' 6"		**22' 10 1/2"**	**21' 9 3/8"**	**20' 4"**	**18' 3 5/8"**	**15' 3"**
	AM	26' 8 1/4"	26' 1 3/4"	25' 5"	24' 4 3/4"	22' 10 1/2"
	GM	26' 5"	25' 9 3/8"	24' 10 7/8"	23' 7 1/2"	21' 6 3/4"
	HM	26' 1 3/4"	25' 5"	24' 4 3/4"	22' 10 1/2"	20' 4"
31' 0"		**23' 3"**	**22' 1 3/4"**	**20' 8"**	**18' 7 1/4"**	**15' 6"**
	AM	27' 1 1/2"	26' 6 7/8"	25' 10"	24' 9 5/8"	23' 3"
	GM	26' 10 1/8"	26' 2 3/8"	25' 3 3/4"	24' 1/8"	21' 11"
	HM	26' 6 7/8"	25' 10"	24' 9 5/8"	23' 3"	20' 8"
31' 6"		**23' 7 1/2"**	**22' 6"**	**21' 0"**	**18' 10 3/4"**	**15' 9"**
	AM	27' 6 3/4"	27' 0"	26' 3"	25' 2 3/8"	23' 7 1/2"
	GM	27' 3 3/8"	26' 7 1/2"	25' 8 5/8"	24' 4 3/4"	22' 3 1/4"
	HM	27' 0"	26' 3"	25' 2 3/8"	23' 7 1/2"	21' 0"
32' 0"		**24' 0"**	**22' 10 1/4"**	**21' 4"**	**19' 2 3/8"**	**16' 0"**
	AM	28' 0"	27' 5 1/8"	26' 8"	25' 7 1/4"	24' 0"
	GM	27' 8 1/2"	27' 1/2"	26' 1 1/2"	24' 9 1/2"	22' 7 1/2"
	HM	27' 5 1/8"	26' 8"	25' 7 1/4"	24' 0"	21' 4"
32' 6"		**24' 4 1/2"**	**23' 2 5/8"**	**21' 8"**	**19' 6"**	**16' 3"**
	AM	28' 5 1/4"	27' 10 1/4"	27' 1"	26' 0"	24' 4 1/2"
	GM	28' 1 3/4"	27' 5 5/8"	26' 6 3/8"	25' 2 1/8"	22' 11 3/4"
	HM	27' 10 1/4"	27' 1"	26' 0"	24' 4 1/2"	21' 8"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
29		**21.75**	**20.71**	**19.33**	**17.40**	**14.50**
	AM	25.38	24.86	24.17	23.20	21.75
	GM	25.11	24.51	23.68	22.46	20.51
	HM	24.86	24.17	23.20	21.75	19.33
29.5		**22.13**	**21.07**	**19.67**	**17.70**	**14.75**
	AM	25.81	25.29	24.58	23.60	22.13
	GM	25.55	24.93	24.09	22.85	20.86
	HM	25.29	24.58	23.60	22.13	19.67
30		**22.50**	**21.43**	**20.00**	**18.00**	**15.00**
	AM	26.25	25.71	25.00	24.00	22.50
	GM	25.98	25.35	24.49	23.24	21.21
	HM	25.71	25.00	24.00	22.50	20.00
30.5		**22.88**	**21.79**	**20.33**	**18.30**	**15.25**
	AM	26.69	26.14	25.42	24.40	22.88
	GM	26.41	25.78	24.90	23.63	21.57
	HM	26.14	25.42	24.40	22.88	20.33
31		**23.25**	**22.14**	**20.67**	**18.60**	**15.50**
	AM	27.13	26.57	25.83	24.80	23.25
	GM	26.85	26.20	25.31	24.01	21.92
	HM	26.57	25.83	24.80	23.25	20.67
31.5		**23.63**	**22.50**	**21.00**	**18.90**	**15.75**
	AM	27.56	27.00	26.25	25.20	23.63
	GM	27.28	26.62	25.72	24.40	22.27
	HM	27.00	26.25	25.20	23.63	21.00
32		**24.00**	**22.86**	**21.33**	**19.20**	**16.00**
	AM	28.00	27.43	26.67	25.60	24.00
	GM	27.71	27.04	26.13	24.79	22.63
	HM	27.43	26.67	25.60	24.00	21.33
32.5		**24.38**	**23.21**	**21.67**	**19.50**	**16.25**
	AM	28.44	27.86	27.08	26.00	24.38
	GM	28.15	27.47	26.54	25.17	22.98
	HM	27.86	27.08	26.00	24.38	21.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
33' 0"		**44' 0"**	**46' 2 3/8"**	**49' 6"**	**55' 0"**	**66' 0"**
	AM	38' 6"	39' 7 1/4"	41' 3"	44' 0"	49' 6"
	GM	38' 1 1/4"	39' 1/2"	40' 5"	42' 7 1/4"	46' 8"
	HM	37' 8 5/8"	38' 6"	39' 7 1/4"	41' 3"	44' 0"
33' 6"		**44' 8"**	**46' 10 3/4"**	**50' 3"**	**55' 10"**	**67' 0"**
	AM	39' 1"	40' 2 3/8"	41' 10 1/2"	44' 8"	50' 3"
	GM	38' 8 1/4"	39' 7 5/8"	41' 3/8"	43' 3"	47' 4 1/2"
	HM	38' 3 3/8"	39' 1"	40' 2 3/8"	41' 10 1/2"	44' 8"
34' 0"		**45' 4"**	**47' 7 1/4"**	**51' 0"**	**56' 8"**	**68' 0"**
	AM	39' 8"	40' 9 5/8"	42' 6"	45' 4"	51' 0"
	GM	39' 3 1/8"	40' 2 3/4"	41' 7 3/4"	43' 10 3/4"	48' 1"
	HM	38' 10 1/4"	39' 8"	40' 9 5/8"	42' 6"	45' 4"
34' 6"		**46' 0"**	**48' 3 5/8"**	**51' 9"**	**57' 6"**	**69' 0"**
	AM	40' 3"	41' 4 3/4"	43' 1 1/2"	46' 0"	51' 9"
	GM	39' 10"	40' 9 7/8"	42' 3"	44' 6 1/2"	48' 9 1/2"
	HM	39' 5 1/8"	40' 3"	41' 4 3/4"	43' 1 1/2"	46' 0"
35' 0"		**46' 8"**	**49' 0"**	**52' 6"**	**58' 4"**	**70' 0"**
	AM	40' 10"	42' 0"	43' 9"	46' 8"	52' 6"
	GM	40' 5"	41' 5"	42' 10 3/8"	45' 2 1/4"	49' 6"
	HM	40' 0"	40' 10"	42' 0"	43' 9"	46' 8"
35' 6"		**47' 4"**	**49' 8 3/8"**	**53' 3"**	**59' 2"**	**71' 0"**
	AM	41' 5"	42' 7 1/4"	44' 4 1/2"	47' 4"	53' 3"
	GM	40' 11 7/8"	42' 0"	43' 5 3/4"	45' 10"	50' 2 1/2"
	HM	40' 6 7/8"	41' 5"	42' 7 1/4"	44' 4 1/2"	47' 4"
36' 0"		**48' 0"**	**50' 4 3/4"**	**54' 0"**	**60' 0"**	**72' 0"**
	AM	42' 0"	43' 2 3/8"	45' 0"	48' 0"	54' 0"
	GM	41' 6 7/8"	42' 7 1/8"	44' 1 1/8"	46' 5 3/4"	50' 11"
	HM	41' 1 3/4"	42' 0"	43' 2 3/8"	45' 0"	48' 0"
36' 6"		**48' 8"**	**51' 1 1/4"**	**54' 9"**	**60' 10"**	**73' 0"**
	AM	42' 7"	43' 9 5/8"	45' 7 1/2"	48' 8"	54' 9"
	GM	42' 1 3/4"	43' 2 1/4"	44' 8 1/2"	47' 1 1/2"	51' 7 3/8"
	HM	41' 8 5/8"	42' 7"	43' 9 5/8"	45' 7 1/2"	48' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
33		**44.00**	**46.20**	**49.50**	**55.00**	**66.00**
	AM	38.50	39.60	41.25	44.00	49.50
	GM	38.11	39.05	40.42	42.60	46.67
	HM	37.71	38.50	39.60	41.25	44.00
33.5		**44.67**	**46.90**	**50.25**	**55.83**	**67.00**
	AM	39.08	40.20	41.88	44.67	50.25
	GM	38.68	39.64	41.03	43.25	47.38
	HM	38.29	39.08	40.20	41.87	44.67
34		**45.33**	**47.60**	**51.00**	**56.67**	**68.00**
	AM	39.67	40.80	42.50	45.33	51.00
	GM	39.26	40.23	41.64	43.89	48.08
	HM	38.86	39.67	40.80	42.50	45.33
34.5		**46.00**	**48.30**	**51.75**	**57.50**	**69.00**
	AM	40.25	41.40	43.13	46.00	51.75
	GM	39.84	40.82	42.25	44.54	48.79
	HM	39.43	40.25	41.40	43.12	46.00
35		**46.67**	**49.00**	**52.50**	**58.33**	**70.00**
	AM	40.83	42.00	43.75	46.67	52.50
	GM	40.41	41.41	42.87	45.18	49.50
	HM	40.00	40.83	42.00	43.75	46.67
35.5		**47.33**	**49.70**	**53.25**	**59.17**	**71.00**
	AM	41.42	42.60	44.38	47.33	53.25
	GM	40.99	42.00	43.48	45.83	50.20
	HM	40.57	41.42	42.60	44.37	47.33
36		**48.00**	**50.40**	**54.00**	**60.00**	**72.00**
	AM	42.00	43.20	45.00	48.00	54.00
	GM	41.57	42.60	44.09	46.48	50.91
	HM	41.14	42.00	43.20	45.00	48.00
36.5		**48.67**	**51.10**	**54.75**	**60.83**	**73.00**
	AM	42.58	43.80	45.63	48.67	54.75
	GM	42.15	43.19	44.70	47.12	51.62
	HM	41.71	42.58	43.80	45.62	48.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
33' 0"		**24' 9"**	**23' 6 7/8"**	**22' 0"**	**19' 9 5/8"**	**16' 6"**
	AM	28' 10 1/2"	28' 3 3/8"	27' 6"	26' 4 3/4"	24' 9"
	GM	28' 7"	27' 10 5/8"	26' 11 3/8"	25' 6 3/4"	23' 4"
	HM	28' 3 3/8"	27' 6"	26' 4 3/4"	24' 9"	22' 0"
33' 6"		**25' 1 1/2"**	**23' 11 1/8"**	**22' 4"**	**20' 1 1/4"**	**16' 9"**
	AM	29' 3 3/4"	28' 8 5/8"	27' 11"	26' 9 5/8"	25' 1 1/2"
	GM	29' 1/8"	28' 3 3/4"	27' 4 1/4"	25' 11 3/8"	23' 8 1/4"
	HM	28' 8 5/8"	27' 11"	26' 9 5/8"	25' 1 1/2"	22' 4"
34' 0"		**25' 6"**	**24' 3 3/8"**	**22' 8"**	**20' 4 3/4"**	**17' 0"**
	AM	29' 9"	29' 1 3/4"	28' 4"	27' 2 3/8"	25' 6"
	GM	29' 5 3/8"	28' 8 7/8"	27' 9 1/8"	26' 4"	24' 1/2"
	HM	29' 1 3/4"	28' 4"	27' 2 3/8"	25' 6"	22' 8"
34' 6"		**25' 10 1/2"**	**24' 7 3/4"**	**23' 0"**	**20' 8 3/8"**	**17' 3"**
	AM	30' 2 1/4"	29' 6 7/8"	28' 9"	27' 7 1/4"	25' 10 1/2"
	GM	29' 10 1/2"	29' 1 7/8"	28' 2"	26' 8 5/8"	24' 4 3/4"
	HM	29' 6 7/8"	28' 9"	27' 7 1/4"	25' 10 1/2"	23' 0"
35' 0"		**26' 3"**	**25' 0"**	**23' 4"**	**21' 0"**	**17' 6"**
	AM	30' 7 1/2"	30' 0"	29' 2"	28' 0"	26' 3"
	GM	30' 3 3/4"	29' 7"	28' 6 7/8"	27' 1 3/8"	24' 9"
	HM	30' 0"	29' 2"	28' 0"	26' 3"	23' 4"
35' 6"		**26' 7 1/2"**	**25' 4 1/4"**	**23' 8"**	**21' 3 5/8"**	**17' 9"**
	AM	31' 3/4"	30' 5 1/8"	29' 7"	28' 4 3/4"	26' 7 1/2"
	GM	30' 8 7/8"	30' 0"	28' 11 7/8"	27' 6"	25' 1 1/4"
	HM	30' 5 1/8"	29' 7"	28' 4 3/4"	26' 7 1/2"	23' 8"
36' 0"		**27' 0"**	**25' 8 5/8"**	**24' 0"**	**21' 7 1/4"**	**18' 0"**
	AM	31' 6"	30' 10 1/4"	30' 0"	28' 9 5/8"	27' 0"
	GM	31' 2 1/8"	30' 5 1/8"	29' 4 3/4"	27' 10 5/8"	25' 5 1/2"
	HM	30' 10 1/4"	30' 0"	28' 9 5/8"	27' 0"	24' 0"
36' 6"		**27' 4 1/2"**	**26' 7/8"**	**24' 4"**	**21' 10 3/4"**	**18' 3"**
	AM	31' 11 1/4"	31' 3 3/8"	30' 5"	29' 2 3/8"	27' 4 1/2"
	GM	31' 7 3/8"	30' 10 1/8"	29' 9 5/8"	28' 3 1/4"	25' 9 3/4"
	HM	31' 3 3/8"	30' 5"	29' 2 3/8"	27' 4 1/2"	24' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
33		**24.75**	**23.57**	**22.00**	19.80	**16.50**
	AM	28.88	28.29	27.50	26.40	24.75
	GM	28.58	27.89	26.94	25.56	23.33
	HM	28.29	27.50	26.40	24.75	22.00
33.5		**25.13**	**23.93**	**22.33**	**20.10**	**16.75**
	AM	29.31	28.71	27.92	26.80	25.13
	GM	29.01	28.31	27.35	25.95	23.69
	HM	28.71	27.92	26.80	25.13	22.33
34		**25.50**	**24.29**	**22.67**	**20.40**	**17.00**
	AM	29.75	29.14	28.33	27.20	25.50
	GM	29.44	28.74	27.76	26.34	24.04
	HM	29.14	28.33	27.20	25.50	22.67
34.5		**25.88**	**24.64**	**23.00**	**20.70**	**17.25**
	AM	30.19	29.57	28.75	27.60	25.88
	GM	29.88	29.16	28.17	26.72	24.40
	HM	29.57	28.75	27.60	25.88	23.00
35		**26.25**	**25.00**	**23.33**	**21.00**	**17.50**
	AM	30.63	30.00	29.17	28.00	26.25
	GM	30.31	29.58	28.58	27.11	24.75
	HM	30.00	29.17	28.00	26.25	23.33
35.5		**26.63**	**25.36**	**23.67**	**21.30**	**17.75**
	AM	31.06	30.43	29.58	28.40	26.63
	GM	30.74	30.00	28.99	27.50	25.10
	HM	30.43	29.58	28.40	26.63	23.67
36		**27.00**	**25.71**	**24.00**	**21.60**	18.00
	AM	31.50	30.86	30.00	28.80	27.00
	GM	31.18	30.43	29.39	27.89	25.46
	HM	30.86	30.00	28.80	27.00	24.00
36.5		27.38	**26.07**	**24.33**	21.90	**18.25**
	AM	31.94	31.29	30.42	29.20	27.38
	GM	31.61	30.85	29.80	28.27	25.81
	HM	31.29	30.42	29.20	27.38	24.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
37' 0"		**49' 4"**	**51' 9 5/8"**	**55' 6"**	**61' 8"**	**74' 0"**
	AM	43' 2"	44' 4 3/4"	46' 3"	49' 4"	55' 6"
	GM	42' 8 5/8"	43' 9 3/8"	45' 3 3/4"	47' 9 1/4"	52' 3 7/8"
	HM	42' 3 3/8"	43' 2"	44' 4 3/4"	46' 3"	49' 4"
37' 6"		**50' 0"**	**52' 6"**	**56' 3"**	**62' 6"**	**75' 0"**
	AM	43' 9"	45' 0"	46' 10 1/2"	50' 0"	56' 3"
	GM	43' 3 5/8"	44' 4 1/2"	45' 11 1/8"	48' 5"	53' 3/8"
	HM	42' 10 1/4"	43' 9"	45' 0"	46' 10 1/2"	50' 0"
38' 0"		**50' 8"**	**53' 2 3/8"**	**57' 0"**	**63' 4"**	**76' 0"**
	AM	44' 4"	45' 7 1/4"	47' 6"	50' 8"	57' 0"
	GM	43' 10 1/2"	44' 11 1/2"	46' 6 1/2"	49' 3/4"	53' 8 7/8"
	HM	43' 5 1/8"	44' 4"	45' 7 1/4"	47' 6"	50' 8"
38' 6"		**51' 4"**	**53' 10 3/4"**	**57' 9"**	**64' 2"**	**77' 0"**
	AM	44' 11"	46' 2 3/8"	48' 1 1/2"	51' 4"	57' 9"
	GM	44' 5 1/2"	45' 6 5/8"	47' 1 7/8"	49' 8 1/2"	54' 5 3/8"
	HM	44' 0"	44' 11"	46' 2 3/8"	48' 1 1/2"	51' 4"
39' 0"		**52' 0"**	**54' 7 1/4"**	**58' 6"**	**65' 0"**	**78' 0"**
	AM	45' 6"	46' 9 5/8"	48' 9"	52' 0"	58' 6"
	GM	45' 3/8"	46' 1 3/4"	47' 9 1/8"	50' 4 1/8"	55' 1 7/8"
	HM	44' 6 7/8"	45' 6"	46' 9 5/8"	48' 9"	52' 0"
39' 6"		**52' 8"**	**55' 3 5/8"**	**59' 3"**	**65' 10"**	**79' 0"**
	AM	46' 1"	47' 4 3/4"	49' 4 1/2"	52' 8"	59' 3"
	GM	45' 7 3/8"	46' 8 7/8"	48' 4 1/2"	50' 11 7/8"	55' 10 3/8"
	HM	45' 1 3/4"	46' 1"	47' 4 3/4"	49' 4 1/2"	52' 8"
40' 0"		**53' 4"**	**56' 0"**	**60' 0"**	**66' 8"**	**80' 0"**
	AM	46' 8"	48' 0"	50' 0"	53' 4"	60' 0"
	GM	46' 2 1/4"	47' 4"	48' 11 7/8"	51' 7 5/8"	56' 6 7/8"
	HM	45' 8 5/8"	46' 8"	48' 0"	50' 0"	53' 4"
40' 6"		**54' 0"**	**56' 8 3/8"**	**60' 9"**	**67' 6"**	**81' 0"**
	AM	47' 3"	48' 7 1/4"	50' 7 1/2"	54' 0"	60' 9"
	GM	46' 9 1/8"	47' 11"	49' 7 1/4"	52' 3 3/8"	57' 3 1/4"
	HM	46' 3 3/8"	47' 3"	48' 7 1/4"	50' 7 1/2"	54' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
37		**49.33**	**51.80**	**55.50**	**61.67**	**74.00**
	AM	43.17	44.40	46.25	49.33	55.50
	GM	42.72	43.78	45.32	47.77	52.33
	HM	42.29	43.17	44.40	46.25	49.33
37.5		**50.00**	**52.50**	**56.25**	**62.50**	**75.00**
	AM	43.75	45.00	46.88	50.00	56.25
	GM	43.30	44.37	45.93	48.41	53.03
	HM	42.86	43.75	45.00	46.87	50.00
38		**50.67**	**53.20**	**57.00**	**63.33**	**76.00**
	AM	44.33	45.60	47.50	50.67	57.00
	GM	43.88	44.96	46.54	49.06	53.74
	HM	43.43	44.33	45.60	47.50	50.67
38.5		**51.33**	**53.90**	**57.75**	**64.17**	**77.00**
	AM	44.92	46.20	48.13	51.33	57.75
	GM	44.46	45.55	47.15	49.70	54.45
	HM	44.00	44.92	46.20	48.12	51.33
39		**52.00**	**54.60**	**58.50**	**65.00**	**78.00**
	AM	45.50	46.80	48.75	52.00	58.50
	GM	45.03	46.15	47.77	50.35	55.15
	HM	44.57	45.50	46.80	48.75	52.00
39.5		**52.67**	**55.30**	**59.25**	**65.83**	**79.00**
	AM	46.08	47.40	49.38	52.67	59.25
	GM	45.61	46.74	48.38	50.99	55.86
	HM	45.14	46.08	47.40	49.37	52.67
40		**53.33**	**56.00**	**60.00**	**66.67**	**80.00**
	AM	46.67	48.00	50.00	53.33	60.00
	GM	46.19	47.33	48.99	51.64	56.57
	HM	45.71	46.67	48.00	50.00	53.33
40.5		**54.00**	**56.70**	**60.75**	**67.50**	**81.00**
	AM	47.25	48.60	50.63	54.00	60.75
	GM	46.77	47.92	49.60	52.29	57.28
	HM	46.29	47.25	48.60	50.62	54.00

primary room length	secondary room length & different room heights					
		4:3	7:5	3:2	5:3	2:1
37' 0"		27' 9"	26' 5 1/8"	24' 8"	22' 2 3/8"	18' 6"
	AM	32' 4 1/2"	31' 8 5/8"	30' 10"	29' 7 1/4"	27' 9"
	GM	32' 1/2"	31' 3 1/4"	30' 2 1/2"	28' 7 7/8"	26' 2"
	HM	31' 8 5/8"	30' 10"	29' 7 1/4"	27' 9"	24' 8"
37' 6"		28' 1 1/2"	26' 9 3/8"	25' 0"	22' 6"	18' 9"
	AM	32' 9 3/4"	32' 1 3/4"	31' 3"	30' 0"	28' 1 1/2"
	GM	32' 5 3/4"	31' 8 3/8"	30' 7 3/8"	29' 5/8"	26' 6 1/4"
	HM	32' 1 3/4"	31' 3"	30' 0"	28' 1 1/2"	25' 0"
38' 0"		28' 6"	27' 1 3/4"	25' 4"	22' 9 5/8"	19' 0"
	AM	33' 3"	32' 6 7/8"	31' 8"	30' 4 3/4"	28' 6"
	GM	32' 10 7/8"	32' 1 3/8"	31' 3/8"	29' 5 1/4"	26' 10 1/2"
	HM	32' 6 7/8"	31' 8"	30' 4 3/4"	28' 6"	25' 4"
38' 6"		28' 10 1/2"	27' 6"	25' 8"	23' 1 1/4"	19' 3"
	AM	33' 8 1/4"	33' 0"	32' 1"	30' 9 5/8"	28' 10 1/2"
	GM	33' 4 1/8"	32' 6 1/2"	31' 5 1/4"	29' 9 7/8"	27' 2 5/8"
	HM	33' 0"	32' 1"	30' 9 5/8"	28' 10 1/2"	25' 8"
39' 0"		29' 3"	27' 10 1/4"	26' 0"	23' 4 3/4"	19' 6"
	AM	34' 1 1/2"	33' 5 1/8"	32' 6"	31' 2 3/8"	29' 3"
	GM	33' 9 1/4"	32' 11 1/2"	31' 10 1/8"	30' 2 1/2"	27' 6 7/8"
	HM	33' 5 1/8"	32' 6"	31' 2 3/8"	29' 3"	26' 0"
39' 6"		29' 7 1/2"	28' 2 5/8"	26' 4"	23' 8 3/8"	19' 9"
	AM	34' 6 3/4"	33' 10 1/4"	32' 11"	31' 7 1/4"	29' 7 1/2"
	GM	34' 2 1/2"	33' 4 5/8"	32' 3"	30' 7 1/8"	27' 11 1/8"
	HM	33' 10 1/4"	32' 11"	31' 7 1/4"	29' 7 1/2"	26' 4"
40' 0"		30' 0"	28' 6 7/8"	26' 8"	24' 0"	20' 0"
	AM	35' 0"	34' 3 3/8"	33' 4"	32' 0"	30' 0"
	GM	34' 7 3/4"	33' 9 5/8"	32' 7 7/8"	30' 11 3/4"	28' 3 3/8"
	HM	34' 3 3/8"	33' 4"	32' 0"	30' 0"	26' 8"
40' 6"		30' 4 1/2"	28' 11 1/8"	27' 0"	24' 3 5/8"	20' 3"
	AM	35' 5 1/4"	34' 8 5/8"	33' 9"	32' 4 3/4"	30' 4 1/2"
	GM	35' 7/8"	34' 2 3/4"	33' 7/8"	31' 4 1/2"	28' 7 5/8"
	HM	34' 8 5/8"	33' 9"	32' 4 3/4"	30' 4 1/2"	27' 0"

primary room length	decimal equivalent values					
		4:3	7:5	3:2	5:3	2:1
37		27.75	26.43	24.67	22.20	18.50
	AM	32.38	31.71	30.83	29.60	27.75
	GM	32.04	31.27	30.21	28.66	26.16
	HM	31.71	30.83	29.60	27.75	24.67
37.5		28.13	26.79	25.00	22.50	18.75
	AM	32.81	32.14	31.25	30.00	28.13
	GM	32.48	31.69	30.62	29.05	26.52
	HM	32.14	31.25	30.00	28.13	25.00
38		28.50	27.14	25.33	22.80	19.00
	AM	33.25	32.57	31.67	30.40	28.50
	GM	32.91	32.12	31.03	29.43	26.87
	HM	32.57	31.67	30.40	28.50	25.33
38.5		28.88	27.50	25.67	23.10	19.25
	AM	33.69	33.00	32.08	30.80	28.88
	GM	33.34	32.54	31.44	29.82	27.22
	HM	33.00	32.08	30.80	28.88	25.67
39		29.25	27.86	26.00	23.40	19.50
	AM	34.13	33.43	32.50	31.20	29.25
	GM	33.77	32.96	31.84	30.21	27.58
	HM	33.43	32.50	31.20	29.25	26.00
39.5		29.63	28.21	26.33	23.70	19.75
	AM	34.56	33.86	32.92	31.60	29.63
	GM	34.21	33.38	32.25	30.60	27.93
	HM	33.86	32.92	31.60	29.63	26.33
40		30.00	28.57	26.67	24.00	20.00
	AM	35.00	34.29	33.33	32.00	30.00
	GM	34.64	33.81	32.66	30.98	28.28
	HM	34.29	33.33	32.00	30.00	26.67
40.5		30.38	28.93	27.00	24.30	20.25
	AM	35.44	34.71	33.75	32.40	30.38
	GM	35.07	34.23	33.07	31.37	28.64
	HM	34.71	33.75	32.40	30.38	27.00

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
41' 0"		**54' 8"**	**57' 4 3/4"**	**61' 6"**	**68' 4"**	**82' 0"**
	AM	47' 10"	49' 2 3/8"	51' 3"	54' 8"	61' 6"
	GM	47' 4 1/8"	48' 6 1/8"	50' 2 5/8"	52' 11 1/8"	57' 11 3/4"
	HM	46' 10 1/4"	47' 10"	49' 2 3/8"	51' 3"	54' 8"
41' 6"		**55' 4"**	**58' 1 1/4"**	**62' 3"**	**69' 2"**	**83' 0"**
	AM	48' 5"	49' 9 5/8"	51' 10 1/2"	55' 4"	62' 3"
	GM	47' 11"	49' 1 1/4"	50' 9 7/8"	53' 6 7/8"	58' 8 1/4"
	HM	47' 5 1/8"	48' 5"	49' 9 5/8"	51' 10 1/2"	55' 4"
42' 0"		**56' 0"**	**58' 9 5/8"**	**63' 0"**	**70' 0"**	**84' 0"**
	AM	49' 0"	50' 4 3/4"	52' 6"	56' 0"	63' 0"
	GM	48' 6"	49' 8 3/8"	51' 5 1/4"	54' 2 5/8"	59' 4 3/4"
	HM	48' 0"	49' 0"	50' 4 3/4"	52' 6"	56' 0"
42' 6"		**56' 8"**	**59' 6"**	**63' 9"**	**70' 10"**	**85' 0"**
	AM	49' 7"	51' 0"	53' 1 1/2"	56' 8"	63' 9"
	GM	49' 7/8"	50' 3 1/2"	52' 5/8"	54' 10 3/8"	60' 1 1/4"
	HM	48' 6 7/8"	49' 7"	51' 0"	53' 1 1/2"	56' 8"
43' 0"		**57' 4"**	**60' 2 3/8"**	**64' 6"**	**71' 8"**	**86' 0"**
	AM	50' 2"	51' 7 1/4"	53' 9"	57' 4"	64' 6"
	GM	49' 7 7/8"	50' 10 1/2"	52' 8"	55' 6 1/8"	60' 9 3/4"
	HM	49' 1 3/4"	50' 2"	51' 7 1/4"	53' 9"	57' 4"
43' 6"		**58' 0"**	**60' 10 3/4"**	**65' 3"**	**72' 6"**	**87' 0"**
	AM	50' 9"	52' 2 3/8"	54' 4 1/2"	58' 0"	65' 3"
	GM	50' 2 3/4"	51' 5 5/8"	53' 3 3/8"	56' 1 7/8"	61' 6 1/4"
	HM	49' 8 5/8"	50' 9"	52' 2 3/8"	54' 4 1/2"	58' 0"
44' 0"		**58' 8"**	**61' 7 1/4"**	**66' 0"**	**73' 4"**	**88' 0"**
	AM	51' 4"	52' 9 5/8"	55' 0"	58' 8"	66' 0"
	GM	50' 9 5/8"	52' 3/4"	53' 10 5/8"	56' 9 5/8"	62' 2 3/4"
	HM	50' 3 3/8"	51' 4"	52' 9 5/8"	55' 0"	58' 8"
44' 6"		**59' 4"**	**62' 3 5/8"**	**66' 9"**	**74' 2"**	**89' 0"**
	AM	51' 11"	53' 4 3/4"	55' 7 1/2"	59' 4"	66' 9"
	GM	51' 4 5/8"	52' 7 7/8"	54' 6"	57' 5 3/8"	62' 11 1/4"
	HM	50' 10 1/4"	51' 11"	53' 4 3/4"	55' 7 1/2"	59' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
41		**54.67**	**57.40**	**61.50**	**68.33**	**82.00**
	AM	47.83	49.20	51.25	54.67	61.50
	GM	47.34	48.51	50.21	52.93	57.98
	HM	46.86	47.83	49.20	51.25	54.67
41.5		**55.33**	**58.10**	**62.25**	**69.17**	**83.00**
	AM	48.42	49.80	51.88	55.33	62.25
	GM	47.92	49.10	50.83	53.58	58.69
	HM	47.43	48.42	49.80	51.87	55.33
42		**56.00**	**58.80**	**63.00**	**70.00**	**84.00**
	AM	49.00	50.40	52.50	56.00	63.00
	GM	48.50	49.70	51.44	54.22	59.40
	HM	48.00	49.00	50.40	52.50	56.00
42.5		**56.67**	**59.50**	**63.75**	**70.83**	**85.00**
	AM	49.58	51.00	53.13	56.67	63.75
	GM	49.07	50.29	52.05	54.87	60.10
	HM	48.57	49.58	51.00	53.12	56.67
43		**57.33**	**60.20**	**64.50**	**71.67**	**86.00**
	AM	50.17	51.60	53.75	57.33	64.50
	GM	49.65	50.88	52.66	55.51	60.81
	HM	49.14	50.17	51.60	53.75	57.33
43.5		**58.00**	**60.90**	**65.25**	**72.50**	**87.00**
	AM	50.75	52.20	54.38	58.00	65.25
	GM	50.23	51.47	53.28	56.16	61.52
	HM	49.71	50.75	52.20	54.37	58.00
44		**58.67**	**61.60**	**66.00**	**73.33**	**88.00**
	AM	51.33	52.80	55.00	58.67	66.00
	GM	50.81	52.06	53.89	56.80	62.23
	HM	50.29	51.33	52.80	55.00	58.67
44.5		**59.33**	**62.30**	**66.75**	**74.17**	**89.00**
	AM	51.92	53.40	55.63	59.33	66.75
	GM	51.38	52.65	54.50	57.45	62.93
	HM	50.86	51.92	53.40	55.62	59.33

primary room length	secondary room length & different room heights					
		4:3	7:5	3:2	5:3	2:1
41' 0"		30' 9"	29' 3 3/8"	27' 4"	24' 7 1/4"	20' 6"
	AM	35' 10 1/2"	35' 1 3/4"	34' 2"	32' 9 5/8"	30' 9"
	GM	35' 6 1/8"	34' 7 7/8"	33' 5 3/4"	31' 9 1/8"	28' 11 7/8"
	HM	35' 1 3/4"	34' 2"	32' 9 5/8"	30' 9"	27' 4"
41' 6"		31' 1 1/2"	29' 7 3/4"	27' 8"	24' 10 3/4"	20' 9"
	AM	36' 3 3/4"	35' 6 7/8"	34' 7"	33' 2 3/8"	31' 1 1/2"
	GM	35' 11 1/4"	35' 7/8"	33' 10 5/8"	32' 1 3/4"	29' 4 1/8"
	HM	35' 6 7/8"	34' 7"	33' 2 3/8"	31' 1 1/2"	27' 8"
42' 0"		31' 6"	30' 0"	28' 0"	25' 2 3/8"	21' 0"
	AM	36' 9"	36' 0"	35' 0"	33' 7 1/4"	31' 6"
	GM	36' 4 1/2"	35' 6"	34' 3 1/2"	32' 6 3/8"	29' 8 3/8"
	HM	36' 0"	35' 0"	33' 7 1/4"	31' 6"	28' 0"
42' 6"		31' 10 1/2"	30' 4 1/4"	28' 4"	25' 6"	21' 3"
	AM	37' 2 1/4"	36' 5 1/8"	35' 5"	34' 0"	31' 10 1/2"
	GM	36' 9 5/8"	35' 11"	34' 8 3/8"	32' 11"	30' 5/8"
	HM	36' 5 1/8"	35' 5"	34' 0"	31' 10 1/2"	28' 4"
43' 0"		32' 3"	30' 8 5/8"	28' 8"	25' 9 5/8"	21' 6"
	AM	37' 7 1/2"	36' 10 1/4"	35' 10"	34' 4 3/4"	32' 3"
	GM	37' 2 7/8"	36' 4 1/8"	35' 1 1/4"	33' 3 3/4"	30' 4 7/8"
	HM	36' 10 1/4"	35' 10"	34' 4 3/4"	32' 3"	28' 8"
43' 6"		32' 7 1/2"	31' 7/8"	29' 0"	26' 1 1/4"	21' 9"
	AM	38' 3/4"	37' 3 3/8"	36' 3"	34' 9 5/8"	32' 7 1/2"
	GM	37' 8 1/8"	36' 9 1/8"	35' 6 1/4"	33' 8 3/8"	30' 9 1/8"
	HM	37' 3 3/8"	36' 3"	34' 9 5/8"	32' 7 1/2"	29' 0"
44' 0"		33' 0"	31' 5 1/8"	29' 4"	26' 4 3/4"	22' 0"
	AM	38' 6"	37' 8 5/8"	36' 8"	35' 2 3/8"	33' 0"
	GM	38' 1 1/4"	37' 2 1/4"	35' 11 1/8"	34' 1"	31' 1 3/8"
	HM	37' 8 5/8"	36' 8"	35' 2 3/8"	33' 0"	29' 4"
44' 6"		33' 4 1/2"	31' 9 3/8"	29' 8"	26' 8 3/8"	22' 3"
	AM	38' 11 1/4"	38' 1 3/4"	37' 1"	35' 7 1/4"	33' 4 1/2"
	GM	38' 6 1/2"	37' 7 1/4"	36' 4"	34' 5 5/8"	31' 5 5/8"
	HM	38' 1 3/4"	37' 1"	35' 7 1/4"	33' 4 1/2"	29' 8"

primary room length	decimal equivalent values					
		4:3	7:5	3:2	5:3	2:1
41		30.75	29.29	27.33	24.60	20.50
	AM	35.88	35.14	34.17	32.80	30.75
	GM	35.51	34.65	33.48	31.76	28.99
	HM	35.14	34.17	32.80	30.75	27.33
41.5		31.13	29.64	27.67	24.90	20.75
	AM	36.31	35.57	34.58	33.20	31.13
	GM	35.94	35.07	33.88	32.15	29.34
	HM	35.57	34.58	33.20	31.13	27.67
42		31.50	30.00	28.00	25.20	21.00
	AM	36.75	36.00	35.00	33.60	31.50
	GM	36.37	35.50	34.29	32.53	29.70
	HM	36.00	35.00	33.60	31.50	28.00
42.5		31.88	30.36	28.33	25.50	21.25
	AM	37.19	36.43	35.42	34.00	31.88
	GM	36.81	35.92	34.70	32.92	30.05
	HM	36.43	35.42	34.00	31.88	28.33
43		32.25	30.71	28.67	25.80	21.50
	AM	37.63	36.86	35.83	34.40	32.25
	GM	37.24	36.34	35.11	33.31	30.41
	HM	36.86	35.83	34.40	32.25	28.67
43.5		32.63	31.07	29.00	26.10	21.75
	AM	38.06	37.29	36.25	34.80	32.63
	GM	37.67	36.76	35.52	33.69	30.76
	HM	37.29	36.25	34.80	32.63	29.00
44		33.00	31.43	29.33	26.40	22.00
	AM	38.50	37.71	36.67	35.20	33.00
	GM	38.11	37.19	35.93	34.08	31.11
	HM	37.71	36.67	35.20	33.00	29.33
44.5		33.38	31.79	29.67	26.70	22.25
	AM	38.94	38.14	37.08	35.60	33.38
	GM	38.54	37.61	36.33	34.47	31.47
	HM	38.14	37.08	35.60	33.38	29.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
45' 0"		**60' 0"**	**63' 0"**	**67' 6"**	**75' 0"**	**90' 0"**
	AM	52' 6"	54' 0"	56' 3"	60' 0"	67' 6"
	GM	51' 11 1/2"	53' 2 7/8"	55' 1 3/8"	58' 1 1/8"	63' 7 5/8"
	HM	51' 5 1/8"	52' 6"	54' 0"	56' 3"	60' 0"
45' 6"		**60' 8"**	**63' 8 3/8"**	**68' 3"**	**75' 10"**	**91' 0"**
	AM	53' 1"	54' 7 1/4"	56' 10 1/2"	60' 8"	68' 3"
	GM	52' 6 1/2"	53' 10"	55' 8 3/4"	58' 8 7/8"	64' 4 1/8"
	HM	52' 0"	53' 1"	54' 7 1/4"	56' 10 1/2"	60' 8"
46' 0"		**61' 4"**	**64' 4 3/4"**	**69' 0"**	**76' 8"**	**92' 0"**
	AM	53' 8"	55' 2 3/8"	57' 6"	61' 4"	69' 0"
	GM	53' 1 3/8"	54' 5 1/8"	56' 4"	59' 4 5/8"	65' 5/8"
	HM	52' 6 7/8"	53' 8"	55' 2 3/8"	57' 6"	61' 4"
46' 6"		**62' 0"**	**65' 1 1/4"**	**69' 9"**	**77' 6"**	**93' 0"**
	AM	54' 3"	55' 9 5/8"	58' 1 1/2"	62' 0"	69' 9"
	GM	53' 8 3/8"	55' 1/4"	56' 11 3/8"	60' 3/8"	65' 9 1/8"
	HM	53' 1 3/4"	54' 3"	55' 9 5/8"	58' 1 1/2"	62' 0"
47' 0"		**62' 8"**	**65' 9 5/8"**	**70' 6"**	**78' 4"**	**94' 0"**
	AM	54' 10"	56' 4 3/4"	58' 9"	62' 8"	70' 6"
	GM	54' 3 1/4"	55' 7 3/8"	57' 6 3/4"	60' 8 1/8"	66' 5 5/8"
	HM	53' 8 5/8"	54' 10"	56' 4 3/4"	58' 9"	62' 8"
47' 6"		**63' 4"**	**66' 6"**	**71' 3"**	**79' 2"**	**95' 0"**
	AM	55' 5"	57' 0"	59' 4 1/2"	63' 4"	71' 3"
	GM	54' 10 1/8"	56' 2 3/8"	58' 2 1/8"	61' 3 7/8"	67' 2 1/8"
	HM	54' 3 3/8"	55' 5"	57' 0"	59' 4 1/2"	63' 4"
48' 0"		64' 0"	67' 2 3/8"	72' 0"	80' 0"	96' 0"
	AM	56' 0"	57' 7 1/4"	60' 0"	64' 0"	72' 0"
	GM	55' 5 1/8"	56' 9 1/2"	58' 9 1/2"	61' 11 5/8"	67' 10 5/8"
	HM	54' 10 1/4"	56' 0"	57' 7 1/4"	60' 0"	64' 0"
48' 6"		64' 8"	**67' 10 3/4"**	**72' 9"**	**80' 10"**	**97' 0"**
	AM	56' 7"	58' 2 3/8"	60' 7 1/2"	64' 8"	72' 9"
	GM	56' 0"	57' 4 5/8"	59' 4 3/4"	62' 7 3/8"	68' 7 1/8"
	HM	55' 5 1/8"	56' 7"	58' 2 3/8"	60' 7 1/2"	64' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
45		**60.00**	**63.00**	**67.50**	**75.00**	**90.00**
	AM	52.50	54.00	56.25	60.00	67.50
	GM	51.96	53.24	55.11	58.09	63.64
	HM	51.43	52.50	54.00	56.25	60.00
45.5		**60.67**	**63.70**	**68.25**	**75.83**	**91.00**
	AM	53.08	54.60	56.88	60.67	68.25
	GM	52.54	53.84	55.73	58.74	64.35
	HM	52.00	53.08	54.60	56.87	60.67
46		**61.33**	**64.40**	**69.00**	**76.67**	**92.00**
	AM	53.67	55.20	57.50	61.33	69.00
	GM	53.12	54.43	56.34	59.39	65.05
	HM	52.57	53.67	55.20	57.50	61.33
46.5		**62.00**	**65.10**	**69.75**	**77.50**	**93.00**
	AM	54.25	55.80	58.13	62.00	69.75
	GM	53.69	55.02	56.95	60.03	65.76
	HM	53.14	54.25	55.80	58.12	62.00
47		**62.67**	**65.80**	**70.50**	**78.33**	**94.00**
	AM	54.83	56.40	58.75	62.67	70.50
	GM	54.27	55.61	57.56	60.68	66.47
	HM	53.71	54.83	56.40	58.75	62.67
47.5		**63.33**	**66.50**	**71.25**	**79.17**	**95.00**
	AM	55.42	57.00	59.38	63.33	71.25
	GM	54.85	56.20	58.18	61.32	67.18
	HM	54.29	55.42	57.00	59.37	63.33
48		**64.00**	**67.20**	**72.00**	**80.00**	**96.00**
	AM	56.00	57.60	60.00	64.00	72.00
	GM	55.43	56.79	58.79	61.97	67.88
	HM	54.86	56.00	57.60	60.00	64.00
48.5		**64.67**	**67.90**	**72.75**	**80.83**	**97.00**
	AM	56.58	58.20	60.63	64.67	72.75
	GM	56.00	57.39	59.40	62.61	68.59
	HM	55.43	56.58	58.20	60.62	64.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
45' 0"		**33' 9"**	**32' 1 3/4"**	**30' 0"**	**27' 0"**	**22' 6"**
	AM	39' 4 1/2"	38' 6 7/8"	37' 6"	36' 0"	33' 9"
	GM	38' 11 5/8"	38' 3/8"	36' 8 7/8"	34' 10 1/4"	31' 9 7/8"
	HM	38' 6 7/8"	37' 6"	36' 0"	33' 9"	30' 0"
45' 6"		**34' 1 1/2"**	**32' 6"**	**30' 4"**	**27' 3 5/8"**	**22' 9"**
	AM	39' 9 3/4"	39' 0"	37' 11"	36' 4 3/4"	34' 1 1/2"
	GM	39' 4 7/8"	38' 5 1/2"	37' 1 3/4"	35' 2 7/8"	32' 2 1/8"
	HM	39' 0"	37' 11"	36' 4 3/4"	34' 1 1/2"	30' 4"
46' 0"		**34' 6"**	**32' 10 1/4"**	**30' 8"**	**27' 7 1/4"**	**23' 0"**
	AM	40' 3"	39' 5 1/8"	38' 4"	36' 9 5/8"	34' 6"
	GM	39' 10"	38' 10 1/2"	37' 6 3/4"	35' 7 5/8"	32' 6 3/8"
	HM	39' 5 1/8"	38' 4"	36' 9 5/8"	34' 6"	30' 8"
46' 6"		**34' 10 1/2"**	**33' 2 5/8"**	**31' 0"**	**27' 10 3/4"**	**23' 3"**
	AM	40' 8 1/4"	39' 10 1/4"	38' 9"	37' 2 3/8"	34' 10 1/2"
	GM	40' 3 1/4"	39' 3 5/8"	37' 11 5/8"	36' 1/4"	32' 10 5/8"
	HM	39' 10 1/4"	38' 9"	37' 2 3/8"	34' 10 1/2"	31' 0"
47' 0"		**35' 3"**	**33' 6 7/8"**	**31' 4"**	**28' 2 3/8"**	**23' 6"**
	AM	41' 1 1/2"	40' 3 3/8"	39' 2"	37' 7 1/4"	35' 3"
	GM	40' 8 1/2"	39' 8 5/8"	38' 4 1/2"	36' 4 7/8"	33' 2 3/4"
	HM	40' 3 3/8"	39' 2"	37' 7 1/4"	35' 3"	31' 4"
47' 6"		**35' 7 1/2"**	**33' 11 1/8"**	**31' 8"**	**28' 6"**	**23' 9"**
	AM	41' 6 3/4"	40' 8 5/8"	39' 7"	38' 0"	35' 7 1/2"
	GM	41' 1 5/8"	40' 1 3/4"	38' 9 3/8"	36' 9 1/2"	33' 7"
	HM	40' 8 5/8"	39' 7"	38' 0"	35' 7 1/2"	31' 8"
48' 0"		**36' 0"**	**34' 3 3/8"**	**32' 0"**	**28' 9 5/8"**	**24' 0"**
	AM	42' 0"	41' 1 3/4"	40' 0"	38' 4 3/4"	36' 0"
	GM	41' 6 7/8"	40' 6 3/4"	39' 2 1/4"	37' 2 1/8"	33' 11 1/4"
	HM	41' 1 3/4"	40' 0"	38' 4 3/4"	36' 0"	32' 0"
48' 6"		**36' 4 1/2"**	**34' 7 3/4"**	**32' 4"**	**29' 1 1/4"**	**24' 3"**
	AM	42' 5 1/4"	41' 6 7/8"	40' 5"	38' 9 5/8"	36' 4 1/2"
	GM	42' 0"	40' 11 7/8"	39' 7 1/4"	37' 6 7/8"	34' 3 1/2"
	HM	41' 6 7/8"	40' 5"	38' 9 5/8"	36' 4 1/2"	32' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
45		**33.75**	**32.14**	**30.00**	**27.00**	**22.50**
	AM	39.38	38.57	37.50	36.00	33.75
	GM	38.97	38.03	36.74	34.86	31.82
	HM	38.57	37.50	36.00	33.75	30.00
45.5		**34.13**	**32.50**	**30.33**	**27.30**	**22.75**
	AM	39.81	39.00	37.92	36.40	34.13
	GM	39.40	38.45	37.15	35.24	32.17
	HM	39.00	37.92	36.40	34.13	30.33
46		**34.50**	**32.86**	**30.67**	**27.60**	**23.00**
	AM	40.25	39.43	38.33	36.80	34.50
	GM	39.84	38.88	37.56	35.63	32.53
	HM	39.43	38.33	36.80	34.50	30.67
46.5		**34.88**	**33.21**	**31.00**	**27.90**	**23.25**
	AM	40.69	39.86	38.75	37.20	34.88
	GM	40.27	39.30	37.97	36.02	32.88
	HM	39.86	38.75	37.20	34.88	31.00
47		**35.25**	**33.57**	**31.33**	**28.20**	**23.50**
	AM	41.13	40.29	39.17	37.60	35.25
	GM	40.70	39.72	38.38	36.41	33.23
	HM	40.29	39.17	37.60	35.25	31.33
47.5		**35.63**	**33.93**	**31.67**	**28.50**	**23.75**
	AM	41.56	40.71	39.58	38.00	35.63
	GM	41.14	40.14	38.78	36.79	33.59
	HM	40.71	39.58	38.00	35.63	31.67
48		**36.00**	**34.29**	**32.00**	**28.80**	**24.00**
	AM	42.00	41.14	40.00	38.40	36.00
	GM	41.57	40.57	39.19	37.18	33.94
	HM	41.14	40.00	38.40	36.00	32.00
48.5		**36.38**	**34.64**	**32.33**	**29.10**	**24.25**
	AM	42.44	41.57	40.42	38.80	36.38
	GM	42.00	40.99	39.60	37.57	34.29
	HM	41.57	40.42	38.80	36.38	32.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
49' 0"		65' 4"	68' 7 1/4"	73' 6"	81' 8"	98' 0"
	AM	57' 2"	58' 9 5/8"	61' 3"	65' 4"	73' 6"
	GM	56' 7"	57' 11 3/4"	60' 1/8"	63' 3 1/8"	69' 3 1/2"
	HM	56' 0"	57' 2"	58' 9 5/8"	61' 3"	65' 4"
49' 6"		66' 0"	69' 3 5/8"	74' 3"	82' 6"	99' 0"
	AM	57' 9"	59' 4 3/4"	61' 10 1/2"	66' 0"	74' 3"
	GM	57' 1 7/8"	58' 6 7/8"	60' 7 1/2"	63' 10 7/8"	70' 0"
	HM	56' 6 7/8"	57' 9"	59' 4 3/4"	61' 10 1/2"	66' 0"
50' 0"		66' 8"	70' 0"	75' 0"	83' 4"	100' 0"
	AM	58' 4"	60' 0"	62' 6"	66' 8"	75' 0"
	GM	57' 8 7/8"	59' 1 7/8"	61' 2 7/8"	64' 6 5/8"	70' 8 1/2"
	HM	57' 1 3/4"	58' 4"	60' 0"	62' 6"	66' 8"
50' 6"		67' 4"	70' 8 3/8"	75' 9"	84' 2"	101' 0"
	AM	58' 11"	60' 7 1/4"	63' 1 1/2"	67' 4"	75' 9"
	GM	58' 3 3/4"	59' 9"	61' 10 1/4"	65' 2 3/8"	71' 5"
	HM	57' 8 5/8"	58' 11"	60' 7 1/4"	63' 1 1/2"	67' 4"
51' 0"		68' 0"	71' 4 3/4"	76' 6"	85' 0"	102' 0"
	AM	59' 6"	61' 2 3/8"	63' 9"	68' 0"	76' 6"
	GM	58' 10 5/8"	60' 4 1/8"	62' 5 1/2"	65' 10 1/8"	72' 1 1/2"
	HM	58' 3 3/8"	59' 6"	61' 2 3/8"	63' 9"	68' 0"
51' 6"		68' 8"	72' 1 1/4"	77' 3"	85' 10"	103' 0"
	AM	60' 1"	61' 9 5/8"	64' 4 1/2"	68' 8"	77' 3"
	GM	59' 5 5/8"	60' 11 1/4"	63' 7/8"	66' 5 7/8"	72' 10"
	HM	58' 10 1/4"	60' 1"	61' 9 5/8"	64' 4 1/2"	68' 8"
52' 0"		69' 4"	72' 9 5/8"	78' 0"	86' 8"	104' 0"
	AM	60' 8"	62' 4 3/4"	65' 0"	69' 4"	78' 0"
	GM	60' 1/2"	61' 6 3/8"	63' 8 1/4"	67' 1 5/8"	73' 6 1/2"
	HM	59' 5 1/8"	60' 8"	62' 4 3/4"	65' 0"	69' 4"
52' 6"		70' 0"	73' 6"	78' 9"	87' 6"	105' 0"
	AM	61' 3"	63' 0"	65' 7 1/2"	70' 0"	78' 9"
	GM	60' 7 1/2"	62' 1 3/8"	64' 3 5/8"	67' 9 3/8"	74' 3"
	HM	60' 0"	61' 3"	63' 0"	65' 7 1/2"	70' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
49		65.33	68.60	73.50	81.67	98.00
	AM	57.17	58.80	61.25	65.33	73.50
	GM	56.58	57.98	60.01	63.26	69.30
	HM	56.00	57.17	58.80	61.25	65.33
49.5		66.00	69.30	74.25	82.50	99.00
	AM	57.75	59.40	61.88	66.00	74.25
	GM	57.16	58.57	60.62	63.90	70.00
	HM	56.57	57.75	59.40	61.87	66.00
50		66.67	70.00	75.00	83.33	100.00
	AM	58.33	60.00	62.50	66.67	75.00
	GM	57.74	59.16	61.24	64.55	70.71
	HM	57.14	58.33	60.00	62.50	66.67
50.5		67.33	70.70	75.75	84.17	101.00
	AM	58.92	60.60	63.13	67.33	75.75
	GM	58.31	59.75	61.85	65.20	71.42
	HM	57.71	58.92	60.60	63.12	67.33
51		68.00	71.40	76.50	85.00	102.00
	AM	59.50	61.20	63.75	68.00	76.50
	GM	58.89	60.34	62.46	65.84	72.12
	HM	58.29	59.50	61.20	63.75	68.00
51.5		68.67	72.10	77.25	85.83	103.00
	AM	60.08	61.80	64.38	68.67	77.25
	GM	59.47	60.94	63.07	66.49	72.83
	HM	58.86	60.08	61.80	64.37	68.67
52		69.33	72.80	78.00	86.67	104.00
	AM	60.67	62.40	65.00	69.33	78.00
	GM	60.04	61.53	63.69	67.13	73.54
	HM	59.43	60.67	62.40	65.00	69.33
52.5		70.00	73.50	78.75	87.50	105.00
	AM	61.25	63.00	65.63	70.00	78.75
	GM	60.62	62.12	64.30	67.78	74.25
	HM	60.00	61.25	63.00	65.62	70.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
49' 0"		**36' 9"**	**35' 0"**	**32' 8"**	**29' 4 3/4"**	**24' 6"**
	AM	42' 10 1/2"	42' 0"	40' 10"	39' 2 3/8"	36' 9"
	GM	42' 5 1/4"	41' 5"	40' 1/8"	37' 11 1/2"	34' 7 3/4"
	HM	42' 0"	40' 10"	39' 2 3/8"	36' 9"	32' 8"
49' 6"		**37' 1 1/2"**	**35' 4 1/4"**	**33' 0"**	**29' 8 3/8"**	**24' 9"**
	AM	43' 3 3/4"	42' 5 1/8"	41' 3"	39' 7 1/4"	37' 1 1/2"
	GM	42' 10 3/8"	41' 10"	40' 5"	38' 4 1/8"	35' 0"
	HM	42' 5 1/8"	41' 3"	39' 7 1/4"	37' 1 1/2"	33' 0"
50' 0"		**37' 6"**	**35' 8 5/8"**	**33' 4"**	**30' 0"**	**25' 0"**
	AM	43' 9"	42' 10 1/4"	41' 8"	40' 0"	37' 6"
	GM	43' 3 5/8"	42' 3 1/8"	40' 9 7/8"	38' 8 3/4"	35' 4 1/4"
	HM	42' 10 1/4"	41' 8"	40' 0"	37' 6"	33' 4"
50' 6"		**37' 10 1/2"**	**36' 7/8"**	**33' 8"**	**30' 3 5/8"**	**25' 3"**
	AM	44' 2 1/4"	43' 3 3/8"	42' 1"	40' 4 3/4"	37' 10 1/2"
	GM	43' 8 3/4"	42' 8 1/8"	41' 2 3/4"	39' 1 3/8"	35' 8 1/2"
	HM	43' 3 3/8"	42' 1"	40' 4 3/4"	37' 10 1/2"	33' 8"
51' 0"		**38' 3"**	**36' 5 1/8"**	**34' 0"**	**30' 7 1/4"**	**25' 6"**
	AM	44' 7 1/2"	43' 8 5/8"	42' 6"	40' 9 5/8"	38' 3"
	GM	44' 2"	43' 1 1/4"	41' 7 3/4"	39' 6"	36' 3/4"
	HM	43' 8 5/8"	42' 6"	40' 9 5/8"	38' 3"	34' 0"
51' 6"		**38' 7 1/2"**	**36' 9 3/8"**	**34' 4"**	**30' 10 3/4"**	**25' 9"**
	AM	45' 3/4"	44' 1 3/4"	42' 11"	41' 2 3/8"	38' 7 1/2"
	GM	44' 7 1/4"	43' 6 1/4"	42' 5/8"	39' 10 3/4"	36' 5"
	HM	44' 1 3/4"	42' 11"	41' 2 3/8"	38' 7 1/2"	34' 4"
52' 0"		**39' 0"**	**37' 1 3/4"**	**34' 8"**	**31' 2 3/8"**	**26' 0"**
	AM	45' 6"	44' 6 7/8"	43' 4"	41' 7 1/4"	39' 0"
	GM	45' 3/8"	43' 11 3/8"	42' 5 1/2"	40' 3 3/8"	36' 9 1/4"
	HM	44' 6 7/8"	43' 4"	41' 7 1/4"	39' 0"	34' 8"
52' 6"		**39' 4 1/2"**	**37' 6"**	**35' 0"**	**31' 6"**	**26' 3"**
	AM	45' 11 1/4"	45' 0"	43' 9"	42' 0"	39' 4 1/2"
	GM	45' 5 5/8"	44' 4 1/2"	42' 10 3/8"	40' 8"	37' 1 1/2"
	HM	45' 0"	43' 9"	42' 0"	39' 4 1/2"	35' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
49		**36.75**	**35.00**	**32.67**	**29.40**	**24.50**
	AM	42.88	42.00	40.83	39.20	36.75
	GM	42.44	41.41	40.01	37.96	34.65
	HM	42.00	40.83	39.20	36.75	32.67
49.5		**37.13**	**35.36**	**33.00**	**29.70**	**24.75**
	AM	43.31	42.43	41.25	39.60	37.13
	GM	42.87	41.84	40.42	38.34	35.00
	HM	42.43	41.25	39.60	37.13	33.00
50		**37.50**	**35.71**	**33.33**	**30.00**	**25.00**
	AM	43.75	42.86	41.67	40.00	37.50
	GM	43.30	42.26	40.82	38.73	35.36
	HM	42.86	41.67	40.00	37.50	33.33
50.5		**37.88**	**36.07**	**33.67**	**30.30**	**25.25**
	AM	44.19	43.29	42.08	40.40	37.88
	GM	43.73	42.68	41.23	39.12	35.71
	HM	43.29	42.08	40.40	37.88	33.67
51		**38.25**	**36.43**	**34.00**	**30.60**	**25.50**
	AM	44.63	43.71	42.50	40.80	38.25
	GM	44.17	43.10	41.64	39.50	36.06
	HM	43.71	42.50	40.80	38.25	34.00
51.5		**38.63**	**36.79**	**34.33**	**30.90**	**25.75**
	AM	45.06	44.14	42.92	41.20	38.63
	GM	44.60	43.53	42.05	39.89	36.42
	HM	44.14	42.92	41.20	38.63	34.33
52		**39.00**	**37.14**	**34.67**	**31.20**	**26.00**
	AM	45.50	44.57	43.33	41.60	39.00
	GM	45.03	43.95	42.46	40.28	36.77
	HM	44.57	43.33	41.60	39.00	34.67
52.5		**39.38**	**37.50**	**35.00**	**31.50**	**26.25**
	AM	45.94	45.00	43.75	42.00	39.38
	GM	45.47	44.37	42.87	40.67	37.12
	HM	45.00	43.75	42.00	39.38	35.00

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
53' 0"		**70' 8"**	**74' 2 3/8"**	**79' 6"**	**88' 4"**	**106' 0"**
	AM	61' 10"	63' 7 1/4"	66' 3"	70' 8"	79' 6"
	GM	61' 2 3/8"	62' 8 1/2"	64' 11"	68' 5 1/8"	74' 11 1/2"
	HM	60' 6 7/8"	61' 10"	63' 7 1/4"	66' 3"	70' 8"
53' 6"		**71' 4"**	**74' 10 3/4"**	**80' 3"**	**89' 2"**	**107' 0"**
	AM	62' 5"	64' 2 3/8"	66' 10 1/2"	71' 4"	80' 3"
	GM	61' 9 3/8"	63' 3 5/8"	65' 6 1/4"	69' 7/8"	75' 7 7/8"
	HM	61' 1 3/4"	62' 5"	64' 2 3/8"	66' 10 1/2"	71' 4"
54' 0"		**72' 0"**	**75' 7 1/4"**	**81' 0"**	**90' 0"**	**108' 0"**
	AM	63' 0"	64' 9 5/8"	67' 6"	72' 0"	81' 0"
	GM	62' 4 1/4"	63' 10 3/4"	66' 1 5/8"	69' 8 5/8"	76' 4 3/8"
	HM	61' 8 5/8"	63' 0"	64' 9 5/8"	67' 6"	72' 0"
54' 6"		**72' 8"**	**76' 3 5/8"**	**81' 9"**	**90' 10"**	**109' 0"**
	AM	63' 7"	65' 4 3/4"	68' 1 1/2"	72' 8"	81' 9"
	GM	62' 11 1/8"	64' 5 7/8"	66' 9"	70' 4 1/4"	77' 7/8"
	HM	62' 3 3/8"	63' 7"	65' 4 3/4"	68' 1 1/2"	72' 8"
55' 0"		**73' 4"**	**77' 0"**	**82' 6"**	**91' 8"**	**110' 0"**
	AM	64' 2"	66' 0"	68' 9"	73' 4"	82' 6"
	GM	63' 6 1/8"	65' 7/8"	67' 4 3/8"	71' 0"	77' 9 3/8"
	HM	62' 10 1/4"	64' 2"	66' 0"	68' 9"	73' 4"
55' 6"		74' 0"	**77' 8 3/8"**	**83' 3"**	**92' 6"**	**111' 0"**
	AM	64' 9"	66' 7 1/4"	69' 4 1/2"	74' 0"	83' 3"
	GM	64' 1"	65' 8"	67' 11 5/8"	71' 7 3/4"	78' 5 7/8"
	HM	63' 5 1/8"	64' 9"	66' 7 1/4"	69' 4 1/2"	74' 0"
56' 0"		74' 8"	**78' 4 3/4"**	84' 0"	93' 4"	**112' 0"**
	AM	65' 4"	67' 2 3/8"	70' 0"	74' 8"	84' 0"
	GM	64' 8"	66' 3 1/8"	68' 7"	72' 3 1/2"	79' 2 3/8"
	HM	64' 0"	65' 4"	67' 2 3/8"	70' 0"	74' 8"
56' 6"		**75' 4"**	**79' 1 1/4"**	**84' 9"**	94' 2"	**113' 0"**
	AM	65' 11"	67' 9 5/8"	70' 7 1/2"	75' 4"	84' 9"
	GM	65' 2 7/8"	66' 10 1/4"	69' 2 3/8"	72' 11 1/4"	79' 10 7/8"
	HM	64' 6 7/8"	65' 11"	67' 9 5/8"	70' 7 1/2"	75' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
53		**70.67**	**74.20**	**79.50**	**88.33**	**106.00**
	AM	61.83	63.60	66.25	70.67	79.50
	GM	61.20	62.71	64.91	68.42	74.95
	HM	60.57	61.83	63.60	66.25	70.67
53.5		**71.33**	**74.90**	**80.25**	**89.17**	**107.00**
	AM	62.42	64.20	66.88	71.33	80.25
	GM	61.78	63.30	65.52	69.07	75.66
	HM	61.14	62.42	64.20	66.87	71.33
54		**72.00**	**75.60**	**81.00**	**90.00**	**108.00**
	AM	63.00	64.80	67.50	72.00	81.00
	GM	62.35	63.89	66.14	69.71	76.37
	HM	61.71	63.00	64.80	67.50	72.00
54.5		**72.67**	**76.30**	**81.75**	**90.83**	**109.00**
	AM	63.58	65.40	68.13	72.67	81.75
	GM	62.93	64.49	66.75	70.36	77.07
	HM	62.29	63.58	65.40	68.12	72.67
55		**73.33**	**77.00**	**82.50**	**91.67**	**110.00**
	AM	64.17	66.00	68.75	73.33	82.50
	GM	63.51	65.08	67.36	71.00	77.78
	HM	62.86	64.17	66.00	68.75	73.33
55.5		**74.00**	**77.70**	**83.25**	**92.50**	**111.00**
	AM	64.75	66.60	69.38	74.00	83.25
	GM	64.09	65.67	67.97	71.65	78.49
	HM	63.43	64.75	66.60	69.37	74.00
56		**74.67**	**78.40**	**84.00**	**93.33**	**112.00**
	AM	65.33	67.20	70.00	74.67	84.00
	GM	64.66	66.26	68.59	72.30	79.20
	HM	64.00	65.33	67.20	70.00	74.67
56.5		**75.33**	**79.10**	**84.75**	**94.17**	**113.00**
	AM	65.92	67.80	70.63	75.33	84.75
	GM	65.24	66.85	69.20	72.94	79.90
	HM	64.57	65.92	67.80	70.62	75.33

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
53' 0"		**39' 9"**	**37' 10 1/4"**	**35' 4"**	**31' 9 5/8"**	**26' 6"**
	AM	46' 4 1/2"	45' 5 1/8"	44' 2"	42' 4 3/4"	39' 9"
	GM	45' 10 3/4"	44' 9 1/2"	43' 3 1/4"	41' 5/8"	37' 5 3/4"
	HM	45' 5 1/8"	44' 2"	42' 4 3/4"	39' 9"	35' 4"
53' 6"		**40' 1 1/2"**	**38' 2 5/8"**	**35' 8"**	**32' 1 1/4"**	**26' 9"**
	AM	46' 9 3/4"	45' 10 1/4"	44' 7"	42' 9 5/8"	40' 1 1/2"
	GM	46' 4"	45' 2 5/8"	43' 8 1/4"	41' 5 1/4"	37' 10"
	HM	45' 10 1/4"	44' 7"	42' 9 5/8"	40' 1 1/2"	35' 8"
54' 0"		**40' 6"**	**38' 6 7/8"**	**36' 0"**	**32' 4 3/4"**	**27' 0"**
	AM	47' 3"	46' 3 3/8"	45' 0"	43' 2 3/8"	40' 6"
	GM	46' 9 1/8"	45' 7 5/8"	44' 1 1/8"	41' 10"	38' 2 1/4"
	HM	46' 3 3/8"	45' 0"	43' 2 3/8"	40' 6"	36' 0"
54' 6"		**40' 10 1/2"**	**38' 11 1/8"**	**36' 4"**	**32' 8 3/8"**	**27' 3"**
	AM	47' 8 1/4"	46' 8 5/8"	45' 5"	43' 7 1/4"	40' 10 1/2"
	GM	47' 2 3/8"	46' 3/4"	44' 6"	42' 2 5/8"	38' 6 1/2"
	HM	46' 8 5/8"	45' 5"	43' 7 1/4"	40' 10 1/2"	36' 4"
55' 0"		**41' 3"**	**39' 3 3/8"**	**36' 8"**	**33' 0"**	**27' 6"**
	AM	48' 1 1/2"	47' 1 3/4"	45' 10"	44' 0"	41' 3"
	GM	47' 7 5/8"	46' 5 3/4"	44' 10 7/8"	42' 7 1/4"	38' 10 3/4"
	HM	47' 1 3/4"	45' 10"	44' 0"	41' 3"	36' 8"
55' 6"		**41' 7 1/2"**	**39' 7 3/4"**	**37' 0"**	**33' 3 5/8"**	**27' 9"**
	AM	48' 6 3/4"	47' 6 7/8"	46' 3"	44' 4 3/4"	41' 7 1/2"
	GM	48' 3/4"	46' 10 7/8"	45' 3 3/4"	42' 11 7/8"	39' 2 7/8"
	HM	47' 6 7/8"	46' 3"	44' 4 3/4"	41' 7 1/2"	37' 0"
56' 0"		**42' 0"**	**40' 0"**	**37' 4"**	**33' 7 1/4"**	**28' 0"**
	AM	49' 0"	48' 0"	46' 8"	44' 9 5/8"	42' 0"
	GM	48' 6"	47' 4"	45' 8 5/8"	43' 4 1/2"	39' 7 1/8"
	HM	48' 0"	46' 8"	44' 9 5/8"	42' 0"	37' 4"
56' 6"		**42' 4 1/2"**	**40' 4 1/4"**	**37' 8"**	**33' 10 3/4"**	**28' 3"**
	AM	49' 5 1/4"	48' 5 1/8"	47' 1"	45' 2 3/8"	42' 4 1/2"
	GM	48' 11 1/8"	47' 9"	46' 1 5/8"	43' 9 1/8"	39' 11 3/8"
	HM	48' 5 1/8"	47' 1"	45' 2 3/8"	42' 4 1/2"	37' 8"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
53		**39.75**	**37.86**	**35.33**	**31.80**	**26.50**
	AM	46.38	45.43	44.17	42.40	39.75
	GM	45.90	44.79	43.27	41.05	37.48
	HM	45.43	44.17	42.40	39.75	35.33
53.5		**40.13**	**38.21**	**35.67**	**32.10**	**26.75**
	AM	46.81	45.86	44.58	42.80	40.13
	GM	46.33	45.22	43.68	41.44	37.83
	HM	45.86	44.58	42.80	40.13	35.67
54		**40.50**	**38.57**	**36.00**	**32.40**	**27.00**
	AM	47.25	46.29	45.00	43.20	40.50
	GM	46.77	45.64	44.09	41.83	38.18
	HM	46.29	45.00	43.20	40.50	36.00
54.5		40.88	**38.93**	**36.33**	32.70	27.25
	AM	47.69	46.71	45.42	43.60	40.88
	GM	47.20	46.06	44.50	42.22	38.54
	HM	46.71	45.42	43.60	40.88	36.33
55		**41.25**	**39.29**	**36.67**	33.00	**27.50**
	AM	48.13	47.14	45.83	44.00	41.25
	GM	47.63	46.48	44.91	42.60	38.89
	HM	47.14	45.83	44.00	41.25	36.67
55.5		**41.63**	**39.64**	**37.00**	**33.30**	**27.75**
	AM	48.56	47.57	46.25	44.40	41.63
	GM	48.06	46.91	45.32	42.99	39.24
	HM	47.57	46.25	44.40	41.63	37.00
56		**42.00**	**40.00**	**37.33**	**33.60**	**28.00**
	AM	49.00	48.00	46.67	44.80	42.00
	GM	48.50	47.33	45.72	43.38	39.60
	HM	48.00	46.67	44.80	42.00	37.33
56.5		42.38	**40.36**	37.67	33.90	**28.25**
	AM	49.44	48.43	47.08	45.20	42.38
	GM	48.93	47.75	46.13	43.76	39.95
	HM	48.43	47.08	45.20	42.38	37.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
57' 0"		76' 0"	79' 9 5/8"	85' 6"	95' 0"	114' 0"
	AM	66' 6"	68' 4 3/4"	71' 3"	76' 0"	85' 6"
	GM	65' 9 7/8"	67' 5 3/8"	69' 9 3/4"	73' 7"	80' 7 3/8"
	HM	65' 1 3/4"	66' 6"	68' 4 3/4"	71' 3"	76' 0"
57' 6"		76' 8"	80' 6"	86' 3"	95' 10"	115' 0"
	AM	67' 1"	69' 0"	71' 10 1/2"	76' 8"	86' 3"
	GM	66' 4 3/4"	68' 3/8"	70' 5 1/8"	74' 2 3/4"	81' 3 3/4"
	HM	65' 8 5/8"	67' 1"	69' 0"	71' 10 1/2"	76' 8"
58' 0"		77' 4"	81' 2 3/8"	87' 0"	96' 8"	116' 0"
	AM	67' 8"	69' 7 1/4"	72' 6"	77' 4"	87' 0"
	GM	66' 11 5/8"	68' 7 1/2"	71' 3/8"	74' 10 1/2"	82' 1/4"
	HM	66' 3 3/8"	67' 8"	69' 7 1/4"	72' 6"	77' 4"
58' 6"		78' 0"	81' 10 3/4"	87' 9"	97' 6"	117' 0"
	AM	68' 3"	70' 2 3/8"	73' 1 1/2"	78' 0"	87' 9"
	GM	67' 6 5/8"	69' 2 5/8"	71' 7 3/4"	75' 6 1/4"	82' 8 3/4"
	HM	66' 10 1/4"	68' 3"	70' 2 3/8"	73' 1 1/2"	78' 0"
59' 0"		78' 8"	82' 7 1/4"	88' 6"	98' 4"	118' 0"
	AM	68' 10"	70' 9 5/8"	73' 9"	78' 8"	88' 6"
	GM	68' 1 1/2"	69' 9 3/4"	72' 3 1/8"	76' 2"	83' 5 1/4"
	HM	67' 5 1/8"	68' 10"	70' 9 5/8"	73' 9"	78' 8"
59' 6"		79' 4"	83' 3 5/8"	89' 3"	99' 2"	119' 0"
	AM	69' 5"	71' 4 3/4"	74' 4 1/2"	79' 4"	89' 3"
	GM	68' 8 1/2"	70' 4 7/8"	72' 10 1/2"	76' 9 3/4"	84' 1 3/4"
	HM	68' 0"	69' 5"	71' 4 3/4"	74' 4 1/2"	79' 4"
60' 0"		80' 0"	84' 0"	90' 0"	100' 0"	120' 0"
	AM	70' 0"	72' 0"	75' 0"	80' 0"	90' 0"
	GM	69' 3 3/8"	70' 11 7/8"	73' 5 7/8"	77' 5 1/2"	84' 10 1/4"
	HM	68' 6 7/8"	70' 0"	72' 0"	75' 0"	80' 0"
60' 6"		80' 8"	84' 8 3/8"	90' 9"	100' 10"	121' 0"
	AM	70' 7"	72' 7 1/4"	75' 7 1/2"	80' 8"	90' 9"
	GM	69' 10 3/8"	71' 7"	74' 1 1/8"	78' 1 1/4"	85' 6 3/4"
	HM	69' 1 3/4"	70' 7"	72' 7 1/4"	75' 7 1/2"	80' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
57		76.00	79.80	85.50	95.00	114.00
	AM	66.50	68.40	71.25	76.00	85.50
	GM	65.82	67.44	69.81	73.59	80.61
	HM	65.14	66.50	68.40	71.25	76.00
57.5		76.67	80.50	86.25	95.83	115.00
	AM	67.08	69.00	71.88	76.67	86.25
	GM	66.40	68.03	70.42	74.23	81.32
	HM	65.71	67.08	69.00	71.87	76.67
58		77.33	81.20	87.00	96.67	116.00
	AM	67.67	69.60	72.50	77.33	87.00
	GM	66.97	68.63	71.04	74.88	82.02
	HM	66.29	67.67	69.60	72.50	77.33
58.5		78.00	81.90	87.75	97.50	117.00
	AM	68.25	70.20	73.13	78.00	87.75
	GM	67.55	69.22	71.65	75.52	82.73
	HM	66.86	68.25	70.20	73.12	78.00
59		78.67	82.60	88.50	98.33	118.00
	AM	68.83	70.80	73.75	78.67	88.50
	GM	68.13	69.81	72.26	76.17	83.44
	HM	67.43	68.83	70.80	73.75	78.67
59.5		79.33	83.30	89.25	99.17	119.00
	AM	69.42	71.40	74.38	79.33	89.25
	GM	68.70	70.40	72.87	76.81	84.15
	HM	68.00	69.42	71.40	74.37	79.33
60		80.00	84.00	90.00	100.00	120.00
	AM	70.00	72.00	75.00	80.00	90.00
	GM	69.28	70.99	73.48	77.46	84.85
	HM	68.57	70.00	72.00	75.00	80.00
60.5		80.67	84.70	90.75	100.83	121.00
	AM	70.58	72.60	75.63	80.67	90.75
	GM	69.86	71.58	74.10	78.11	85.56
	HM	69.14	70.58	72.60	75.62	80.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
57' 0"		42' 9"	40' 8 5/8"	38' 0"	34' 2 3/8"	28' 6"
	AM	49' 10 1/2"	48' 10 1/4"	47' 6"	45' 7 1/4"	42' 9"
	GM	49' 4 3/8"	48' 2 1/8"	46' 6 1/2"	44' 1 7/8"	40' 3 5/8"
	HM	48' 10 1/4"	47' 6"	45' 7 1/4"	42' 9"	38' 0"
57' 6"		43' 1 1/2"	41' 7/8"	38' 4"	34' 6"	28' 9"
	AM	50' 3 3/4"	49' 3 3/8"	47' 11"	46' 0"	43' 1 1/2"
	GM	49' 9 1/2"	48' 7 1/8"	46' 11 3/8"	44' 6 1/2"	40' 7 7/8"
	HM	49' 3 3/8"	47' 11"	46' 0"	43' 1 1/2"	38' 4"
58' 0"		43' 6"	41' 5 1/8"	38' 8"	34' 9 5/8"	29' 0"
	AM	50' 9"	49' 8 5/8"	48' 4"	46' 4 3/4"	43' 6"
	GM	50' 2 3/4"	49' 1/4"	47' 4 1/4"	44' 11 1/8"	41' 1/8"
	HM	49' 8 5/8"	48' 4"	46' 4 3/4"	43' 6"	38' 8"
58' 6"		43' 10 1/2"	41' 9 3/8"	39' 0"	35' 1 1/4"	29' 3"
	AM	51' 2 1/4"	50' 1 3/4"	48' 9"	46' 9 5/8"	43' 10 1/2"
	GM	50' 8"	49' 5 1/4"	47' 9 1/8"	45' 3 3/4"	41' 4 3/8"
	HM	50' 1 3/4"	48' 9"	46' 9 5/8"	43' 10 1/2"	39' 0"
59' 0"		44' 3"	42' 1 3/4"	39' 4"	35' 4 3/4"	29' 6"
	AM	51' 7 1/2"	50' 6 7/8"	49' 2"	47' 2 3/8"	44' 3"
	GM	51' 1 1/8"	49' 10 3/8"	48' 2 1/8"	45' 8 3/8"	41' 8 5/8"
	HM	50' 6 7/8"	49' 2"	47' 2 3/8"	44' 3"	39' 4"
59' 6"		44' 7 1/2"	42' 6"	39' 8"	35' 8 3/8"	29' 9"
	AM	52' 3/4"	51' 0"	49' 7"	47' 7 1/4"	44' 7 1/2"
	GM	51' 6 3/8"	50' 3 1/2"	48' 7"	46' 1"	42' 7/8"
	HM	51' 0"	49' 7"	47' 7 1/4"	44' 7 1/2"	39' 8"
60' 0"		45' 0"	42' 10 1/4"	40' 0"	36' 0"	30' 0"
	AM	52' 6"	51' 5 1/8"	50' 0"	48' 0"	45' 0"
	GM	51' 11 1/2"	50' 8 1/2"	48' 11 7/8"	46' 5 3/4"	42' 5 1/8"
	HM	51' 5 1/8"	50' 0"	48' 0"	45' 0"	40' 0"
60' 6"		45' 4 1/2"	43' 2 5/8"	40' 4"	36' 3 5/8"	30' 3"
	AM	52' 11 1/4"	51' 10 1/4"	50' 5"	48' 4 3/4"	45' 4 1/2"
	GM	52' 4 3/4"	51' 1 5/8"	49' 4 3/4"	46' 10 3/8"	42' 9 3/8"
	HM	51' 10 1/4"	50' 5"	48' 4 3/4"	45' 4 1/2"	40' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
57		42.75	40.71	38.00	34.20	28.50
	AM	49.88	48.86	47.50	45.60	42.75
	GM	49.36	48.17	46.54	44.15	40.31
	HM	48.86	47.50	45.60	42.75	38.00
57.5		43.13	41.07	38.33	34.50	28.75
	AM	50.31	49.29	47.92	46.00	43.13
	GM	49.80	48.60	46.95	44.54	40.66
	HM	49.29	47.92	46.00	43.13	38.33
58		43.50	41.43	38.67	34.80	29.00
	AM	50.75	49.71	48.33	46.40	43.50
	GM	50.23	49.02	47.36	44.93	41.01
	HM	49.71	48.33	46.40	43.50	38.67
58.5		43.88	41.79	39.00	35.10	29.25
	AM	51.19	50.14	48.75	46.80	43.88
	GM	50.66	49.44	47.77	45.31	41.37
	HM	50.14	48.75	46.80	43.88	39.00
59		44.25	42.14	39.33	35.40	29.50
	AM	51.63	50.57	49.17	47.20	44.25
	GM	51.10	49.86	48.17	45.70	41.72
	HM	50.57	49.17	47.20	44.25	39.33
59.5		44.63	42.50	39.67	35.70	29.75
	AM	52.06	51.00	49.58	47.60	44.63
	GM	51.53	50.29	48.58	46.09	42.07
	HM	51.00	49.58	47.60	44.63	39.67
60		45.00	42.86	40.00	36.00	30.00
	AM	52.50	51.43	50.00	48.00	45.00
	GM	51.96	50.71	48.99	46.48	42.43
	HM	51.43	50.00	48.00	45.00	40.00
60.5		45.38	43.21	40.33	36.30	30.25
	AM	52.94	51.86	50.42	48.40	45.38
	GM	52.39	51.13	49.40	46.86	42.78
	HM	51.86	50.42	48.40	45.38	40.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
61' 0"		81' 4"	85' 4 3/4"	91' 6"	101' 8"	122' 0"
	AM	71' 2"	73' 2 3/8"	76' 3"	81' 4"	91' 6"
	GM	70' 5 1/4"	72' 2 1/8"	74' 8 1/2"	78' 9"	86' 3 1/4"
	HM	69' 8 5/8"	71' 2"	73' 2 3/8"	76' 3"	81' 4"
61' 6"		82' 0"	86' 1 1/4"	92' 3"	102' 6"	123' 0"
	AM	71' 9"	73' 9 5/8"	76' 10 1/2"	82' 0"	92' 3"
	GM	71' 1/8"	72' 9 1/4"	75' 3 7/8"	79' 4 3/4"	86' 11 3/4"
	HM	70' 3 3/8"	71' 9"	73' 9 5/8"	76' 10 1/2"	82' 0"
62' 0"		82' 8"	86' 9 5/8"	93' 0"	103' 4"	124' 0"
	AM	72' 4"	74' 4 3/4"	77' 6"	82' 8"	93' 0"
	GM	71' 7 1/8"	73' 4 3/8"	75' 11 1/4"	80' 1/2"	87' 8 1/8"
	HM	70' 10 1/4"	72' 4"	74' 4 3/4"	77' 6"	82' 8"
62' 6"		83' 4"	87' 6"	93' 9"	104' 2"	125' 0"
	AM	72' 11"	75' 0"	78' 1 1/2"	83' 4"	93' 9"
	GM	72' 2"	73' 11 3/8"	76' 6 1/2"	80' 8 1/4"	88' 4 5/8"
	HM	71' 5 1/8"	72' 11"	75' 0"	78' 1 1/2"	83' 4"
63' 0"		84' 0"	88' 2 3/8"	94' 6"	105' 0"	126' 0"
	AM	73' 6"	75' 7 1/4"	78' 9"	84' 0"	94' 6"
	GM	72' 9"	74' 6 1/2"	77' 1 7/8"	81' 4"	89' 1 1/8"
	HM	72' 0"	73' 6"	75' 7 1/4"	78' 9"	84' 0"
63' 6"		84' 8"	88' 10 3/4"	95' 3"	105' 10"	127' 0"
	AM	74' 1"	76' 2 3/8"	79' 4 1/2"	84' 8"	95' 3"
	GM	73' 3 7/8"	75' 1 5/8"	77' 9 1/4"	81' 11 3/4"	89' 9 5/8"
	HM	72' 6 7/8"	74' 1"	76' 2 3/8"	79' 4 1/2"	84' 8"
64' 0"		85' 4"	89' 7 1/4"	96' 0"	106' 8"	128' 0"
	AM	74' 8"	76' 9 5/8"	80' 0"	85' 4"	96' 0"
	GM	73' 10 3/4"	75' 8 3/4"	78' 4 5/8"	82' 7 1/2"	90' 6 1/8"
	HM	73' 1 3/4"	74' 8"	76' 9 5/8"	80' 0"	85' 4"
64' 6"		86' 0"	90' 3 5/8"	96' 9"	107' 6"	129' 0"
	AM	75' 3"	77' 4 3/4"	80' 7 1/2"	86' 0"	96' 9"
	GM	74' 5 3/4"	76' 3 3/4"	79' 0"	83' 3 1/4"	91' 2 5/8"
	HM	73' 8 5/8"	75' 3"	77' 4 3/4"	80' 7 1/2"	86' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
61		81.33	85.40	91.50	101.67	122.00
	AM	71.17	73.20	76.25	81.33	91.50
	GM	70.44	72.18	74.71	78.75	86.27
	HM	69.71	71.17	73.20	76.25	81.33
61.5		82.00	86.10	92.25	102.50	123.00
	AM	71.75	73.80	76.88	82.00	92.25
	GM	71.01	72.77	75.32	79.40	86.97
	HM	70.29	71.75	73.80	76.87	82.00
62		82.67	86.80	93.00	103.33	124.00
	AM	72.33	74.40	77.50	82.67	93.00
	GM	71.59	73.36	75.93	80.04	87.68
	HM	70.86	72.33	74.40	77.50	82.67
62.5		83.33	87.50	93.75	104.17	125.00
	AM	72.92	75.00	78.13	83.33	93.75
	GM	72.17	73.95	76.55	80.69	88.39
	HM	71.43	72.92	75.00	78.12	83.33
63		84.00	88.20	94.50	105.00	126.00
	AM	73.50	75.60	78.75	84.00	94.50
	GM	72.75	74.54	77.16	81.33	89.10
	HM	72.00	73.50	75.60	78.75	84.00
63.5		84.67	88.90	95.25	105.83	127.00
	AM	74.08	76.20	79.38	84.67	95.25
	GM	73.32	75.13	77.77	81.98	89.80
	HM	72.57	74.08	76.20	79.37	84.67
64		85.33	89.60	96.00	106.67	128.00
	AM	74.67	76.80	80.00	85.33	96.00
	GM	73.90	75.73	78.38	82.62	90.51
	HM	73.14	74.67	76.80	80.00	85.33
64.5		86.00	90.30	96.75	107.50	129.00
	AM	75.25	77.40	80.63	86.00	96.75
	GM	74.48	76.32	79.00	83.27	91.22
	HM	73.71	75.25	77.40	80.62	86.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
61' 0"		**45' 9"**	**43' 6 7/8"**	**40' 8"**	**36' 7 1/4"**	**30' 6"**
	AM	53' 4 1/2"	52' 3 3/8"	50' 10"	48' 9 5/8"	45' 9"
	GM	52' 9 7/8"	51' 6 5/8"	49' 9 5/8"	47' 3"	43' 1 5/8"
	HM	52' 3 3/8"	50' 10"	48' 9 5/8"	45' 9"	40' 8"
61' 6"		**46' 1 1/2"**	**43' 11 1/8"**	**41' 0"**	**36' 10 3/4"**	**30' 9"**
	AM	53' 9 3/4"	52' 8 5/8"	51' 3"	49' 2 3/8"	46' 1 1/2"
	GM	53' 3 1/8"	51' 11 3/4"	50' 2 5/8"	47' 7 5/8"	43' 5 7/8"
	HM	52' 8 5/8"	51' 3"	49' 2 3/8"	46' 1 1/2"	41' 0"
62' 0"		**46' 6"**	**44' 3 3/8"**	**41' 4"**	**37' 2 3/8"**	**31' 0"**
	AM	54' 3"	53' 1 3/4"	51' 8"	49' 7 1/4"	46' 6"
	GM	53' 8 3/8"	52' 4 3/4"	50' 7 1/2"	48' 1/4"	43' 10 1/8"
	HM	53' 1 3/4"	51' 8"	49' 7 1/4"	46' 6"	41' 4"
62' 6"		**46' 10 1/2"**	**44' 7 3/4"**	**41' 8"**	**37' 6"**	**31' 3"**
	AM	54' 8 1/4"	53' 6 7/8"	52' 1"	50' 0"	46' 10 1/2"
	GM	54' 1 1/2"	52' 9 7/8"	51' 3/8"	48' 5"	44' 2 3/8"
	HM	53' 6 7/8"	52' 1"	50' 0"	46' 10 1/2"	41' 8"
63' 0"		**47' 3"**	**45' 0"**	**42' 0"**	**37' 9 5/8"**	**31' 6"**
	AM	55' 1 1/2"	54' 0"	52' 6"	50' 4 3/4"	47' 3"
	GM	54' 6 3/4"	53' 2 7/8"	51' 5 1/4"	48' 9 5/8"	44' 6 5/8"
	HM	54' 0"	52' 6"	50' 4 3/4"	47' 3"	42' 0"
63' 6"		**47' 7 1/2"**	**45' 4 1/4"**	**42' 4"**	**38' 1 1/4"**	**31' 9"**
	AM	55' 6 3/4"	54' 5 1/8"	52' 11"	50' 9 5/8"	47' 7 1/2"
	GM	54' 11 7/8"	53' 8"	51' 10 1/8"	49' 2 1/4"	44' 10 7/8"
	HM	54' 5 1/8"	52' 11"	50' 9 5/8"	47' 7 1/2"	42' 4"
64' 0"		**48' 0"**	**45' 8 5/8"**	**42' 8"**	**38' 4 3/4"**	**32' 0"**
	AM	56' 0"	54' 10 1/4"	53' 4"	51' 2 3/8"	48' 0"
	GM	55' 5 1/8"	54' 1 1/8"	52' 3 1/8"	49' 6 7/8"	45' 3"
	HM	54' 10 1/4"	53' 4"	51' 2 3/8"	48' 0"	42' 8"
64' 6"		**48' 4 1/2"**	**46' 7/8"**	**43' 0"**	**38' 8 3/8"**	**32' 3"**
	AM	56' 5 1/4"	55' 3 3/8"	53' 9"	51' 7 1/4"	48' 4 1/2"
	GM	55' 10 1/4"	54' 6 1/8"	52' 8"	49' 11 1/2"	45' 7 1/4"
	HM	55' 3 3/8"	53' 9"	51' 7 1/4"	48' 4 1/2"	43' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
61		**45.75**	**43.57**	**40.67**	**36.60**	**30.50**
	AM	53.38	52.29	50.83	48.80	45.75
	GM	52.83	51.55	49.81	47.25	43.13
	HM	52.29	50.83	48.80	45.75	40.67
61.5		**46.13**	**43.93**	**41.00**	**36.90**	**30.75**
	AM	53.81	52.71	51.25	49.20	46.13
	GM	53.26	51.98	50.21	47.64	43.49
	HM	52.71	51.25	49.20	46.13	41.00
62		**46.50**	**44.29**	**41.33**	**37.20**	**31.00**
	AM	54.25	53.14	51.67	49.60	46.50
	GM	53.69	52.40	50.62	48.02	43.84
	HM	53.14	51.67	49.60	46.50	41.33
62.5		**46.88**	**44.64**	**41.67**	**37.50**	**31.25**
	AM	54.69	53.57	52.08	50.00	46.88
	GM	54.13	52.82	51.03	48.41	44.19
	HM	53.57	52.08	50.00	46.88	41.67
63		**47.25**	**45.00**	**42.00**	**37.80**	**31.50**
	AM	55.13	54.00	52.50	50.40	47.25
	GM	54.56	53.24	51.44	48.80	44.55
	HM	54.00	52.50	50.40	47.25	42.00
63.5		**47.63**	**45.36**	**42.33**	**38.10**	**31.75**
	AM	55.56	54.43	52.92	50.80	47.63
	GM	54.99	53.67	51.85	49.19	44.90
	HM	54.43	52.92	50.80	47.63	42.33
64		**48.00**	**45.71**	**42.67**	**38.40**	32.00
	AM	56.00	54.86	53.33	51.20	48.00
	GM	55.43	54.09	52.26	49.57	45.25
	HM	54.86	53.33	51.20	48.00	42.67
64.5		**48.38**	**46.07**	**43.00**	**38.70**	**32.25**
	AM	56.44	55.29	53.75	51.60	48.38
	GM	55.86	54.51	52.66	49.96	45.61
	HM	55.29	53.75	51.60	48.38	43.00

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
65' 0"		**86' 8"**	**91' 0"**	**97' 6"**	**108' 4"**	130' 0"
	AM	75' 10"	78' 0"	81' 3"	86' 8"	97' 6"
	GM	75' 5/8"	76' 10 7/8"	79' 7 1/4"	83' 11"	91' 11 1/8"
	HM	74' 3 3/8"	75' 10"	78' 0"	81' 3"	86' 8"
65' 6"		**87' 4"**	**91' 8 3/8"**	**98' 3"**	**109' 2"**	**131' 0"**
	AM	76' 5"	78' 7 1/4"	81' 10 1/2"	87' 4"	98' 3"
	GM	75' 7 5/8"	77' 6"	80' 2 5/8"	84' 6 3/4"	92' 7 5/8"
	HM	74' 10 1/4"	76' 5"	78' 7 1/4"	81' 10 1/2"	87' 4"
66' 0"		**88' 0"**	**92' 4 3/4"**	**99' 0"**	**110' 0"**	**132' 0"**
	AM	77' 0"	79' 2 3/8"	82' 6"	88' 0"	99' 0"
	GM	76' 2 1/2"	78' 1 1/8"	80' 10"	85' 2 1/2"	93' 4"
	HM	75' 5 1/8"	77' 0"	79' 2 3/8"	82' 6"	88' 0"
66' 6"		**88' 8"**	**93' 1 1/4"**	**99' 9"**	**110' 10"**	**133' 0"**
	AM	77' 7"	79' 9 5/8"	83' 1 1/2"	88' 8"	99' 9"
	GM	76' 9 1/2"	78' 8 1/4"	81' 5 3/8"	85' 10 1/4"	94' 1/2"
	HM	76' 0"	77' 7"	79' 9 5/8"	83' 1 1/2"	88' 8"
67' 0"		**89' 4"**	**93' 9 5/8"**	**100' 6"**	**111' 8"**	**134' 0"**
	AM	78' 2"	80' 4 3/4"	83' 9"	89' 4"	100' 6"
	GM	77' 4 3/8"	79' 3 1/4"	82' 3/4"	86' 6"	94' 9"
	HM	76' 6 7/8"	78' 2"	80' 4 3/4"	83' 9"	89' 4"
67' 6"		**90' 0"**	**94' 6"**	**101' 3"**	**112' 6"**	**135' 0"**
	AM	78' 9"	81' 0"	84' 4 1/2"	90' 0"	101' 3"
	GM	77' 11 1/4"	79' 10 3/8"	82' 8"	87' 1 3/4"	95' 5 1/2"
	HM	77' 1 3/4"	78' 9"	81' 0"	84' 4 1/2"	90' 0"
68' 0"		**90' 8"**	**95' 2 3/8"**	**102' 0"**	**113' 4"**	**136' 0"**
	AM	79' 4"	81' 7 1/4"	85' 0"	90' 8"	102' 0"
	GM	78' 6 1/4"	80' 5 1/2"	83' 3 3/8"	87' 9 1/2"	96' 2"
	HM	77' 8 5/8"	79' 4"	81' 7 1/4"	85' 0"	90' 8"
68' 6"		**91' 4"**	**95' 10 3/4"**	**102' 9"**	**114' 2"**	**137' 0"**
	AM	79' 11"	82' 2 3/8"	85' 7 1/2"	91' 4"	102' 9"
	GM	79' 1 1/8"	81' 5/8"	83' 10 3/4"	88' 5 1/4"	96' 10 1/2"
	HM	78' 3 3/8"	79' 11"	82' 2 3/8"	85' 7 1/2"	91' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
65		**86.67**	**91.00**	**97.50**	**108.33**	**130.00**
	AM	75.83	78.00	81.25	86.67	97.50
	GM	75.06	76.91	79.61	83.91	91.92
	HM	74.29	75.83	78.00	81.25	86.67
65.5		**87.33**	**91.70**	**98.25**	**109.17**	**131.00**
	AM	76.42	78.60	81.88	87.33	98.25
	GM	75.63	77.50	80.22	84.56	92.63
	HM	74.86	76.42	78.60	81.87	87.33
66		**88.00**	**92.40**	**99.00**	**110.00**	**132.00**
	AM	77.00	79.20	82.50	88.00	99.00
	GM	76.21	78.09	80.83	85.21	93.34
	HM	75.43	77.00	79.20	82.50	88.00
66.5		**88.67**	**93.10**	**99.75**	**110.83**	**133.00**
	AM	77.58	79.80	83.13	88.67	99.75
	GM	76.79	78.68	81.45	85.85	94.05
	HM	76.00	77.58	79.80	83.12	88.67
67		**89.33**	**93.80**	**100.50**	**111.67**	**134.00**
	AM	78.17	80.40	83.75	89.33	100.50
	GM	77.36	79.28	82.06	86.50	94.75
	HM	76.57	78.17	80.40	83.75	89.33
67.5		**90.00**	**94.50**	**101.25**	**112.50**	**135.00**
	AM	78.75	81.00	84.38	90.00	101.25
	GM	77.94	79.87	82.67	87.14	95.46
	HM	77.14	78.75	81.00	84.37	90.00
68		**90.67**	**95.20**	**102.00**	**113.33**	**136.00**
	AM	79.33	81.60	85.00	90.67	102.00
	GM	78.52	80.46	83.28	87.79	96.17
	HM	77.71	79.33	81.60	85.00	90.67
68.5		**91.33**	**95.90**	**102.75**	**114.17**	**137.00**
	AM	79.92	82.20	85.63	91.33	102.75
	GM	79.10	81.05	83.90	88.43	96.87
	HM	78.29	79.92	82.20	85.62	91.33

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
65' 0"		48' 9"	46' 5 1/8"	43' 4"	39' 0"	32' 6"
	AM	56' 10 1/2"	55' 8 5/8"	54' 2"	52' 0"	48' 9"
	GM	56' 3 1/2"	54' 11 1/4"	53' 7/8"	50' 4 1/8"	45' 11 1/2"
	HM	55' 8 5/8"	54' 2"	52' 0"	48' 9"	43' 4"
65' 6"		49' 1 1/2"	46' 9 3/8"	43' 8"	39' 3 5/8"	32' 9"
	AM	57' 3 3/4"	56' 1 3/4"	54' 7"	52' 4 3/4"	49' 1 1/2"
	GM	56' 8 3/4"	55' 4 1/4"	53' 5 3/4"	50' 8 7/8"	46' 3 3/4"
	HM	56' 1 3/4"	54' 7"	52' 4 3/4"	49' 1 1/2"	43' 8"
66' 0"		49' 6"	47' 1 3/4"	44' 0"	39' 7 1/4"	33' 0"
	AM	57' 9"	56' 6 7/8"	55' 0"	52' 9 5/8"	49' 6"
	GM	57' 1 7/8"	55' 9 3/8"	53' 10 5/8"	51' 1 1/2"	46' 8"
	HM	56' 6 7/8"	55' 0"	52' 9 5/8"	49' 6"	44' 0"
66' 6"		49' 10 1/2"	47' 6"	44' 4"	39' 10 3/4"	33' 3"
	AM	58' 2 1/4"	57' 0"	55' 5"	53' 2 3/8"	49' 10 1/2"
	GM	57' 7 1/8"	56' 2 3/8"	54' 3 5/8"	51' 6 1/8"	47' 1/4"
	HM	57' 0"	55' 5"	53' 2 3/8"	49' 10 1/2"	44' 4"
67' 0"		50' 3"	47' 10 1/4"	44' 8"	40' 2 3/8"	33' 6"
	AM	58' 7 1/2"	57' 5 1/8"	55' 10"	53' 7 1/4"	50' 3"
	GM	58' 1/4"	56' 7 1/2"	54' 8 1/2"	51' 10 3/4"	47' 4 1/2"
	HM	57' 5 1/8"	55' 10"	53' 7 1/4"	50' 3"	44' 8"
67' 6"		50' 7 1/2"	48' 2 5/8"	45' 0"	40' 6"	33' 9"
	AM	59' 3/4"	57' 10 1/4"	56' 3"	54' 0"	50' 7 1/2"
	GM	58' 5 1/2"	57' 5/8"	55' 1 3/8"	52' 3 3/8"	47' 8 3/4"
	HM	57' 10 1/4"	56' 3"	54' 0"	50' 7 1/2"	45' 0"
68' 0"		51' 0"	48' 6 7/8"	45' 4"	40' 9 5/8"	34' 0"
	AM	59' 6"	58' 3 3/8"	56' 8"	54' 4 3/4"	51' 0"
	GM	58' 10 5/8"	57' 5 5/8"	55' 6 1/4"	52' 8 1/8"	48' 1"
	HM	58' 3 3/8"	56' 8"	54' 4 3/4"	51' 0"	45' 4"
68' 6"		51' 4 1/2"	48' 11 1/8"	45' 8"	41' 1 1/4"	34' 3"
	AM	59' 11 1/4"	58' 8 5/8"	57' 1"	54' 9 5/8"	51' 4 1/2"
	GM	59' 3 7/8"	57' 10 3/4"	55' 11 1/8"	53' 3/4"	48' 5 1/4"
	HM	58' 8 5/8"	57' 1"	54' 9 5/8"	51' 4 1/2"	45' 8"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
65		48.75	46.43	43.33	39.00	32.50
	AM	56.88	55.71	54.17	52.00	48.75
	GM	56.29	54.94	53.07	50.35	45.96
	HM	55.71	54.17	52.00	48.75	43.33
65.5		49.13	46.79	43.67	39.30	32.75
	AM	57.31	56.14	54.58	52.40	49.13
	GM	56.72	55.36	53.48	50.74	46.32
	HM	56.14	54.58	52.40	49.13	43.67
66		49.50	47.14	44.00	39.60	33.00
	AM	57.75	56.57	55.00	52.80	49.50
	GM	57.16	55.78	53.89	51.12	46.67
	HM	56.57	55.00	52.80	49.50	44.00
66.5		49.88	47.50	44.33	39.90	33.25
	AM	58.19	57.00	55.42	53.20	49.88
	GM	57.59	56.20	54.30	51.51	47.02
	HM	57.00	55.42	53.20	49.88	44.33
67		50.25	47.86	44.67	40.20	33.50
	AM	58.63	57.43	55.83	53.60	50.25
	GM	58.02	56.63	54.71	51.90	47.38
	HM	57.43	55.83	53.60	50.25	44.67
67.5		50.63	48.21	45.00	40.50	33.75
	AM	59.06	57.86	56.25	54.00	50.63
	GM	58.46	57.05	55.11	52.29	47.73
	HM	57.86	56.25	54.00	50.63	45.00
68		51.00	48.57	45.33	40.80	34.00
	AM	59.50	58.29	56.67	54.40	51.00
	GM	58.89	57.47	55.52	52.67	48.08
	HM	58.29	56.67	54.40	51.00	45.33
68.5		51.38	48.93	45.67	41.10	34.25
	AM	59.94	58.71	57.08	54.80	51.38
	GM	59.32	57.89	55.93	53.06	48.44
	HM	58.71	57.08	54.80	51.38	45.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
69' 0"		**92' 0"**	**96' 7 1/4"**	**103' 6"**	**115' 0"**	**138' 0"**
	AM	80' 6"	82' 9 5/8"	86' 3"	92' 0"	103' 6"
	GM	79' 8 1/8"	81' 7 3/4"	84' 6 1/8"	89' 1"	97' 7"
	HM	78' 10 1/4"	80' 6"	82' 9 5/8"	86' 3"	92' 0"
69' 6"		**92' 8"**	**97' 3 5/8"**	**104' 3"**	**115' 10"**	**139' 0"**
	AM	81' 1"	83' 4 3/4"	86' 10 1/2"	92' 8"	104' 3"
	GM	80' 3"	82' 2 3/4"	85' 1 3/8"	89' 8 3/4"	98' 3 1/2"
	HM	79' 5 1/8"	81' 1"	83' 4 3/4"	86' 10 1/2"	92' 8"
70' 0"		**93' 4"**	**98' 0"**	**105' 0"**	**116' 8"**	**140' 0"**
	AM	81' 8"	84' 0"	87' 6"	93' 4"	105' 0"
	GM	80' 10"	82' 9 7/8"	85' 8 3/4"	90' 4 3/8"	99' 0"
	HM	80' 0"	81' 8"	84' 0"	87' 6"	93' 4"
70' 6"		**94' 0"**	**98' 8 3/8"**	**105' 9"**	**117' 6"**	**141' 0"**
	AM	82' 3"	84' 7 1/4"	88' 1 1/2"	94' 0"	105' 9"
	GM	81' 4 7/8"	83' 5"	86' 4 1/8"	91' 1/8"	99' 8 3/8"
	HM	80' 6 7/8"	82' 3"	84' 7 1/4"	88' 1 1/2"	94' 0"
71' 0"		**94' 8"**	**99' 4 3/4"**	**106' 6"**	**118' 4"**	**142' 0"**
	AM	82' 10"	85' 2 3/8"	88' 9"	94' 8"	106' 6"
	GM	81' 11 3/4"	84' 1/8"	86' 11 1/2"	91' 7 7/8"	100' 4 7/8"
	HM	81' 1 3/4"	82' 10"	85' 2 3/8"	88' 9"	94' 8"
71' 6"		**95' 4"**	**100' 1 1/4"**	**107' 3"**	**119' 2"**	**143' 0"**
	AM	83' 5"	85' 9 5/8"	89' 4 1/2"	95' 4"	107' 3"
	GM	82' 6 3/4"	84' 7 1/4"	87' 6 7/8"	92' 3 5/8"	101' 1 3/8"
	HM	81' 8 5/8"	83' 5"	85' 9 5/8"	89' 4 1/2"	95' 4"
72' 0"		**96' 0"**	**100' 9 5/8"**	**108' 0"**	**120' 0"**	**144' 0"**
	AM	84' 0"	86' 4 3/4"	90' 0"	96' 0"	108' 0"
	GM	83' 1 5/8"	85' 2 1/4"	88' 2 1/8"	92' 11 3/8"	101' 9 7/8"
	HM	82' 3 3/8"	84' 0"	86' 4 3/4"	90' 0"	96' 0"
72' 6"		**96' 8"**	**101' 6"**	**108' 9"**	**120' 10"**	**145' 0"**
	AM	84' 7"	87' 0"	90' 7 1/2"	96' 8"	108' 9"
	GM	83' 8 5/8"	85' 9 3/8"	88' 9 1/2"	93' 7 1/8"	102' 6 3/8"
	HM	82' 10 1/4"	84' 7"	87' 0"	90' 7 1/2"	96' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
69		**92.00**	**96.60**	**103.50**	**115.00**	**138.00**
	AM	80.50	82.80	86.25	92.00	**103.50**
	GM	79.67	81.64	84.51	89.08	97.58
	HM	78.86	80.50	82.80	86.25	92.00
69.5		**92.67**	**97.30**	**104.25**	**115.83**	**139.00**
	AM	81.08	83.40	86.88	92.67	104.25
	GM	80.25	82.23	85.12	89.72	98.29
	HM	79.43	81.08	83.40	86.87	92.67
70		**93.33**	**98.00**	**105.00**	**116.67**	**140.00**
	AM	81.67	84.00	87.50	93.33	105.00
	GM	80.83	82.83	85.73	90.37	98.99
	HM	80.00	81.67	84.00	87.50	93.33
70.5		**94.00**	**98.70**	**105.75**	**117.50**	**141.00**
	AM	82.25	84.60	88.13	94.00	105.75
	GM	81.41	83.42	86.34	91.02	99.70
	HM	80.57	82.25	84.60	88.12	94.00
71		**94.67**	**99.40**	**106.50**	**118.33**	**142.00**
	AM	82.83	85.20	88.75	94.67	106.50
	GM	81.98	84.01	86.96	91.66	100.41
	HM	81.14	82.83	85.20	88.75	94.67
71.5		**95.33**	**100.10**	**107.25**	**119.17**	**143.00**
	AM	83.42	85.80	89.38	95.33	107.25
	GM	82.56	84.60	87.57	92.31	101.12
	HM	81.71	83.42	85.80	89.37	95.33
72		**96.00**	**100.80**	**108.00**	**120.00**	**144.00**
	AM	84.00	86.40	90.00	96.00	108.00
	GM	83.14	85.19	88.18	92.95	101.82
	HM	82.29	84.00	86.40	90.00	96.00
72.5		**96.67**	**101.50**	**108.75**	**120.83**	**145.00**
	AM	84.58	87.00	90.63	96.67	108.75
	GM	83.72	85.78	88.79	93.60	102.53
	HM	82.86	84.58	87.00	90.62	96.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
69' 0"		**51' 9"**	**49' 3 3/8"**	**46' 0"**	**41' 4 3/4"**	**34' 6"**
	AM	60' 4 1/2"	59' 1 3/4"	57' 6"	55' 2 3/8"	51' 9"
	GM	59' 9 1/8"	58' 3 3/4"	56' 4"	53' 5 3/8"	48' 9 1/2"
	HM	59' 1 3/4"	57' 6"	55' 2 3/8"	51' 9"	46' 0"
69' 6"		**52' 1 1/2"**	**49' 7 3/4"**	**46' 4"**	**41' 8 3/8"**	**34' 9"**
	AM	60' 9 3/4"	59' 6 7/8"	57' 11"	55' 7 1/4"	52' 1 1/2"
	GM	60' 2 1/4"	58' 8 7/8"	56' 9"	53' 10"	49' 1 3/4"
	HM	59' 6 7/8"	57' 11"	55' 7 1/4"	52' 1 1/2"	46' 4"
70' 0"		**52' 6"**	**50' 0"**	**46' 8"**	**42' 0"**	**35' 0"**
	AM	61' 3"	60' 0"	58' 4"	56' 0"	52' 6"
	GM	60' 7 1/2"	59' 1 7/8"	57' 1 7/8"	54' 2 5/8"	49' 6"
	HM	60' 0"	58' 4"	56' 0"	52' 6"	46' 8"
70' 6"		**52' 10 1/2"**	**50' 4 1/4"**	**47' 0"**	**42' 3 5/8"**	**35' 3"**
	AM	61' 8 1/4"	60' 5 1/8"	58' 9"	56' 4 3/4"	52' 10 1/2"
	GM	61' 5/8"	59' 7"	57' 6 3/4"	54' 7 1/4"	49' 10 1/4"
	HM	60' 5 1/8"	58' 9"	56' 4 3/4"	52' 10 1/2"	47' 0"
71' 0"		**53' 3"**	**50' 8 5/8"**	**47' 4"**	**42' 7 1/4"**	**35' 6"**
	AM	62' 1 1/2"	60' 10 1/4"	59' 2"	56' 9 5/8"	53' 3"
	GM	61' 5 7/8"	60' 1/8"	57' 11 5/8"	55' 0"	50' 2 1/2"
	HM	60' 10 1/4"	59' 2"	56' 9 5/8"	53' 3"	47' 4"
71' 6"		**53' 7 1/2"**	**51' 7/8"**	**47' 8"**	**42' 10 3/4"**	**35' 9"**
	AM	62' 6 3/4"	61' 3 3/8"	59' 7"	57' 2 3/8"	53' 7 1/2"
	GM	61' 11"	60' 5 1/8"	58' 4 1/2"	55' 4 5/8"	50' 6 3/4"
	HM	61' 3 3/8"	59' 7"	57' 2 3/8"	53' 7 1/2"	47' 8"
72' 0"		**54' 0"**	**51' 5 1/8"**	**48' 0"**	**43' 2 3/8"**	**36' 0"**
	AM	63' 0"	61' 8 5/8"	60' 0"	57' 7 1/4"	54' 0"
	GM	62' 4 1/4"	60' 10 1/4"	58' 9 1/2"	55' 9 1/4"	50' 11"
	HM	61' 8 5/8"	60' 0"	57' 7 1/4"	54' 0"	48' 0"
72' 6"		**54' 4 1/2"**	**51' 9 3/8"**	**48' 4"**	**43' 6"**	**36' 3"**
	AM	63' 5 1/4"	62' 1 3/4"	60' 5"	58' 0"	54' 4 1/2"
	GM	62' 9 1/2"	61' 3 1/4"	59' 2 3/8"	56' 1 7/8"	51' 3 1/8"
	HM	62' 1 3/4"	60' 5"	58' 0"	54' 4 1/2"	48' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
69		**51.75**	**49.29**	**46.00**	**41.40**	**34.50**
	AM	60.38	59.14	57.50	55.20	51.75
	GM	59.76	58.32	56.34	53.45	48.79
	HM	59.14	57.50	55.20	51.75	46.00
69.5		**52.13**	**49.64**	**46.33**	**41.70**	**34.75**
	AM	60.81	59.57	57.92	55.60	52.13
	GM	60.19	58.74	56.75	53.83	49.14
	HM	59.57	57.92	55.60	52.13	46.33
70		**52.50**	**50.00**	**46.67**	**42.00**	**35.00**
	AM	61.25	60.00	58.33	56.00	52.50
	GM	60.62	59.16	57.15	54.22	49.50
	HM	60.00	58.33	56.00	52.50	46.67
70.5		**52.88**	**50.36**	**47.00**	**42.30**	**35.25**
	AM	61.69	60.43	58.75	56.40	52.88
	GM	61.05	59.58	57.56	54.61	49.85
	HM	60.43	58.75	56.40	52.88	47.00
71		**53.25**	**50.71**	**47.33**	**42.60**	**35.50**
	AM	62.13	60.86	59.17	56.80	53.25
	GM	61.49	60.01	57.97	55.00	50.20
	HM	60.86	59.17	56.80	53.25	47.33
71.5		**53.63**	**51.07**	**47.67**	**42.90**	**35.75**
	AM	62.56	61.29	59.58	57.20	53.63
	GM	61.92	60.43	58.38	55.38	50.56
	HM	61.29	59.58	57.20	53.63	47.67
72		**54.00**	**51.43**	**48.00**	**43.20**	**36.00**
	AM	63.00	61.71	60.00	57.60	54.00
	GM	62.35	60.85	58.79	55.77	50.91
	HM	61.71	60.00	57.60	54.00	48.00
72.5		**54.38**	**51.79**	**48.33**	**43.50**	**36.25**
	AM	63.44	62.14	60.42	58.00	54.38
	GM	62.79	61.27	59.20	56.16	51.27
	HM	62.14	60.42	58.00	54.38	48.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
73' 0"		**97' 4"**	**102' 2 3/8"**	**109' 6"**	**121' 8"**	**146' 0"**
	AM	85' 2"	87' 7 1/4"	91' 3"	97' 4"	109' 6"
	GM	84' 3 1/2"	86' 4 1/2"	89' 4 7/8"	94' 2 7/8"	103' 2 7/8"
	HM	83' 5 1/8"	85' 2"	87' 7 1/4"	91' 3"	97' 4"
73' 6"		**98' 0"**	**102' 10 3/4"**	**110' 3"**	**122' 6"**	**147' 0"**
	AM	85' 9"	88' 2 3/8"	91' 10 1/2"	98' 0"	110' 3"
	GM	84' 10 1/2"	86' 11 5/8"	90' 1/4"	94' 10 5/8"	103' 11 3/8"
	HM	84' 0"	85' 9"	88' 2 3/8"	91' 10 1/2"	98' 0"
74' 0"		**98' 8"**	**103' 7 1/4"**	**111' 0"**	**123' 4"**	**148' 0"**
	AM	86' 4"	88' 9 5/8"	92' 6"	98' 8"	111' 0"
	GM	85' 5 3/8"	87' 6 3/4"	90' 7 5/8"	95' 6 3/8"	104' 7 7/8"
	HM	84' 6 7/8"	86' 4"	88' 9 5/8"	92' 6"	98' 8"
74' 6"		**99' 4"**	**104' 3 5/8"**	**111' 9"**	**124' 2"**	**149' 0"**
	AM	86' 11"	89' 4 3/4"	93' 1 1/2"	99' 4"	111' 9"
	GM	86' 1/4"	88' 1 3/4"	91' 2 7/8"	96' 2 1/8"	105' 4 1/4"
	HM	85' 1 3/4"	86' 11"	89' 4 3/4"	93' 1 1/2"	99' 4"
75' 0"		**100' 0"**	**105' 0"**	**112' 6"**	**125' 0"**	**150' 0"**
	AM	87' 6"	90' 0"	93' 9"	100' 0"	112' 6"
	GM	86' 7 1/4"	88' 8 7/8"	91' 10 1/4"	96' 9 7/8"	106' 3/4"
	HM	85' 8 5/8"	87' 6"	90' 0"	93' 9"	100' 0"
75' 6"		**100' 8"**	**105' 8 3/8"**	**113' 3"**	**125' 10"**	**151' 0"**
	AM	88' 1"	90' 7 1/4"	94' 4 1/2"	100' 8"	113' 3"
	GM	87' 2 1/8"	89' 4"	92' 5 5/8"	97' 5 5/8"	106' 9 1/4"
	HM	86' 3 3/8"	88' 1"	90' 7 1/4"	94' 4 1/2"	100' 8"
76' 0"		**101' 4"**	**106' 4 3/4"**	**114' 0"**	**126' 8"**	**152' 0"**
	AM	88' 8"	91' 2 3/8"	95' 0"	101' 4"	114' 0"
	GM	87' 9 1/8"	89' 11 1/8"	93' 1"	98' 1 3/8"	107' 5 3/4"
	HM	86' 10 1/4"	88' 8"	91' 2 3/8"	95' 0"	101' 4"
76' 6"		**102' 0"**	**107' 1 1/4"**	**114' 9"**	**127' 6"**	**153' 0"**
	AM	89' 3"	91' 9 5/8"	95' 7 1/2"	102' 0"	114' 9"
	GM	88' 4"	90' 6 1/4"	93' 8 3/8"	98' 9 1/8"	108' 2 1/4"
	HM	87' 5 1/8"	89' 3"	91' 9 5/8"	95' 7 1/2"	102' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
73		**97.33**	**102.20**	**109.50**	**121.67**	**146.00**
	AM	85.17	87.60	91.25	97.33	109.50
	GM	84.29	86.37	89.41	94.24	103.24
	HM	83.43	85.17	87.60	91.25	97.33
73.5		**98.00**	**102.90**	**110.25**	**122.50**	**147.00**
	AM	85.75	88.20	91.88	98.00	110.25
	GM	84.87	86.97	90.02	94.89	103.94
	HM	84.00	85.75	88.20	91.87	98.00
74		**98.67**	**103.60**	**111.00**	**123.33**	**148.00**
	AM	86.33	88.80	92.50	98.67	111.00
	GM	85.45	87.56	90.63	95.53	104.65
	HM	84.57	86.33	88.80	92.50	98.67.
74.5		**99.33**	**104.30**	**111.75**	**124.17**	**149.00**
	AM	86.92	89.40	93.13	99.33	111.75
	GM	86.03	88.15	91.24	96.18	105.36
	HM	85.14	86.92	89.40	93.12	99.33
75		**100.00**	**105.00**	**112.50**	**125.00**	**150.00**
	AM	87.50	90.00	93.75	100.00	112.50
	GM	86.60	88.74	91.86	96.82	106.07
	HM	85.71	87.50	90.00	93.75	100.00
75.5		**100.67**	**105.70**	**113.25**	**125.83**	**151.00**
	AM	88.08	90.60	94.38	100.67	113.25
	GM	87.18	89.33	92.47	97.47	106.77
	HM	86.29	88.08	90.60	94.37	100.67
76		**101.33**	**106.40**	**114.00**	**126.67**	**152.00**
	AM	88.67	91.20	95.00	101.33	114.00
	GM	87.76	89.92	93.08	98.12	107.48
	HM	86.86	88.67	91.20	95.00	101.33
76.5		**102.00**	**107.10**	**114.75**	**127.50**	**153.00**
	AM	89.25	91.80	95.63	102.00	114.75
	GM	88.33	90.52	93.69	98.76	108.19
	HM	87.43	89.25	91.80	95.62	102.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
73' 0"		**54' 9"**	**52' 1 3/4"**	**48' 8"**	**43' 9 5/8"**	**36' 6"**
	AM	63' 10 1/2"	62' 6 7/8"	60' 10"	58' 4 3/4"	54' 9"
	GM	63' 2 5/8"	61' 8 3/8"	59' 7 1/4"	56' 6 1/2"	51' 7 3/8"
	HM	62' 6 7/8"	60' 10"	58' 4 3/4"	54' 9"	48' 8"
73' 6"		**55' 1 1/2"**	**52' 6"**	**49' 0"**	**44' 1 1/4"**	**36' 9"**
	AM	64' 3 3/4"	63' 0"	61' 3"	58' 9 5/8"	55' 1 1/2"
	GM	63' 7 7/8"	62' 1 3/8"	60' 1/8"	56' 11 1/4"	51' 11 5/8"
	HM	63' 0"	61' 3"	58' 9 5/8"	55' 1 1/2"	49' 0"
74' 0"		**55' 6"**	**52' 10 1/4"**	**49' 4"**	**44' 4 3/4"**	**37' 0"**
	AM	64' 9"	63' 5 1/8"	61' 8"	59' 2 3/8"	55' 6"
	GM	64' 1"	62' 6 1/2"	60' 5"	57' 3 7/8"	52' 3 7/8"
	HM	63' 5 1/8"	61' 8"	59' 2 3/8"	55' 6"	49' 4"
74' 6"		**55' 10 1/2"**	**53' 2 5/8"**	**49' 8"**	**44' 8 3/8"**	**37' 3"**
	AM	65' 2 1/4"	63' 10 1/4"	62' 1"	59' 7 1/4"	55' 10 1/2"
	GM	64' 6 1/4"	62' 11 5/8"	60' 10"	57' 8 1/2"	52' 8 1/8"
	HM	63' 10 1/4"	62' 1"	59' 7 1/4"	55' 10 1/2"	49' 8"
75' 0"		**56' 3"**	**53' 6 7/8"**	**50' 0"**	**45' 0"**	**37' 6"**
	AM	65' 7 1/2"	64' 3 3/8"	62' 6"	60' 0"	56' 3"
	GM	64' 11 3/8"	63' 4 5/8"	61' 2 7/8"	58' 1 1/8"	53' 3/8"
	HM	64' 3 3/8"	62' 6"	60' 0"	56' 3"	50' 0"
75' 6"		**56' 7 1/2"**	**53' 11 1/8"**	**50' 4"**	**45' 3 5/8"**	**37' 9"**
	AM	66' 3/4"	64' 8 5/8"	62' 11"	60' 4 3/4"	56' 7 1/2"
	GM	65' 4 5/8"	63' 9 3/4"	61' 7 3/4"	58' 5 3/4"	53' 4 5/8"
	HM	64' 8 5/8"	62' 11"	60' 4 3/4"	56' 7 1/2"	50' 4"
76' 0"		**57' 0"**	**54' 3 3/8"**	**50' 8"**	**45' 7 1/4"**	**38' 0"**
	AM	66' 6"	65' 1 3/4"	63' 4"	60' 9 5/8"	57' 0"
	GM	65' 9 7/8"	64' 2 3/4"	62' 5/8"	58' 10 3/8"	53' 8 7/8"
	HM	65' 1 3/4"	63' 4"	60' 9 5/8"	57' 0"	50' 8"
76' 6"		**57' 4 1/2"**	**54' 7 3/4"**	**51' 0"**	**45' 10 3/4"**	**38' 3"**
	AM	66' 11 1/4"	65' 6 7/8"	63' 9"	61' 2 3/8"	57' 4 1/2"
	GM	66' 3"	64' 7 7/8"	62' 5 1/2"	59' 3 1/8"	54' 1 1/8"
	HM	65' 6 7/8"	63' 9"	61' 2 3/8"	57' 4 1/2"	51' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
73		**54.75**	**52.14**	**48.67**	**43.80**	**36.50**
	AM	63.88	62.57	60.83	58.40	54.75
	GM	63.22	61.70	59.60	56.55	51.62
	HM	62.57	60.83	58.40	54.75	48.67
73.5		**55.13**	**52.50**	**49.00**	**44.10**	**36.75**
	AM	64.31	63.00	61.25	58.80	55.13
	GM	63.65	62.12	60.01	56.93	51.97
	HM	63.00	61.25	58.80	55.13	49.00
74		**55.50**	**52.86**	**49.33**	**44.40**	**37.00**
	AM	64.75	63.43	61.67	59.20	55.50
	GM	64.09	62.54	60.42	57.32	52.33
	HM	63.43	61.67	59.20	55.50	49.33
74.5		**55.88**	**53.21**	**49.67**	**44.70**	**37.25**
	AM	65.19	63.86	62.08	59.60	55.88
	GM	64.52	62.96	60.83	57.71	52.68
	HM	63.86	62.08	59.60	55.88	49.67
75		**56.25**	**53.57**	**50.00**	**45.00**	**37.50**
	AM	65.63	64.29	62.50	60.00	56.25
	GM	64.95	63.39	61.24	58.09	53.03
	HM	64.29	62.50	60.00	56.25	50.00
75.5		**56.63**	**53.93**	**50.33**	**45.30**	**37.75**
	AM	66.06	64.71	62.92	60.40	56.63
	GM	65.38	63.81	61.65	58.48	53.39
	HM	64.71	62.92	60.40	56.63	50.33
76		**57.00**	**54.29**	**50.67**	**45.60**	**38.00**
	AM	66.50	65.14	63.33	60.80	57.00
	GM	65.82	64.23	62.05	58.87	53.74
	HM	65.14	63.33	60.80	57.00	50.67
76.5		**57.38**	**54.64**	**51.00**	**45.90**	**38.25**
	AM	66.94	65.57	63.75	61.20	57.38
	GM	66.25	64.65	62.46	59.26	54.09
	HM	65.57	63.75	61.20	57.38	51.00

primary room length	secondary room length & different room heights					
		3:4	5:7	2:3	3:5	1:2
77' 0"		**102' 8"**	**107' 9 5/8"**	**115' 6"**	**128' 4"**	**154' 0"**
	AM	89' 10"	92' 4 3/4"	96' 3"	102' 8"	115' 6"
	GM	88' 11"	91' 1 1/4"	94' 3 5/8"	99' 4 7/8"	108' 10 3/4"
	HM	88' 0"	89' 10"	92' 4 3/4"	96' 3"	102' 8"
77' 6"		**103' 4"**	**108' 6"**	**116' 3"**	**129' 2"**	**155' 0"**
	AM	90' 5"	93' 0"	96' 10 1/2"	103' 4"	116' 3"
	GM	89' 5 7/8"	91' 8 3/8"	94' 11"	100' 5/8"	109' 7 1/4"
	HM	88' 6 7/8"	90' 5"	93' 0"	96' 10 1/2"	103' 4"
78' 0"		**104' 0"**	**109' 2 3/8"**	**117' 0"**	**130' 0"**	**156' 0"**
	AM	91' 0"	93' 7 1/4"	97' 6"	104' 0"	117' 0"
	GM	90' 3/4"	92' 3 1/2"	95' 6 3/8"	100' 8 3/8"	110' 3 3/4"
	HM	89' 1 3/4"	91' 0"	93' 7 1/4"	97' 6"	104' 0"
78' 6"		**104' 8"**	**109' 10 3/4"**	**117' 9"**	**130' 10"**	**157' 0"**
	AM	91' 7"	94' 2 3/8"	98' 1 1/2"	104' 8"	117' 9"
	GM	90' 7 3/4"	92' 10 5/8"	96' 1 3/4"	101' 4 1/8"	111' 1/4"
	HM	89' 8 5/8"	91' 7"	94' 2 3/8"	98' 1 1/2"	104' 8"
79' 0"		**105' 4"**	**110' 7 1/4"**	**118' 6"**	**131' 8"**	**158' 0"**
	AM	92' 2"	94' 9 5/8"	98' 9"	105' 4"	118' 6"
	GM	91' 2 5/8"	93' 5 3/4"	96' 9"	101' 11 7/8"	111' 8 5/8"
	HM	90' 3 3/8"	92' 2"	94' 9 5/8"	98' 9"	105' 4"
79' 6"		**106' 0"**	**111' 3 5/8"**	**119' 3"**	**132' 6"**	**159' 0"**
	AM	92' 9"	95' 4 3/4"	99' 4 1/2"	106' 0"	119' 3"
	GM	91' 9 5/8"	94' 3/4"	97' 4 3/8"	102' 7 5/8"	112' 5 1/8"
	HM	90' 10 1/4"	92' 9"	95' 4 3/4"	99' 4 1/2"	106' 0"
80' 0"		**106' 8"**	**112' 0"**	**120' 0"**	**133' 4"**	**160' 0"**
	AM	93' 4"	96' 0"	100' 0"	106' 8"	120' 0"
	GM	92' 4 1/2"	94' 7 7/8"	97' 11 3/4"	103' 3 3/8"	113' 1 5/8"
	HM	91' 5 1/8"	93' 4"	96' 0"	100' 0"	106' 8"
80' 6"		**107' 4"**	**112' 8 3/8"**	**120' 9"**	**134' 2"**	**161' 0"**
	AM	93' 11"	96' 7 1/4"	100' 7 1/2"	107' 4"	120' 9"
	GM	92' 11 1/2"	95' 3"	98' 7 1/8"	103' 11 1/8"	113' 10 1/8"
	HM	92' 0"	93' 11"	96' 7 1/4"	100' 7 1/2"	107' 4"

primary room length	decimal equivalent values					
		3:4	5:7	2:3	3:5	1:2
77		**102.67**	**107.80**	**115.50**	**128.33**	**154.00**
	AM	89.83	92.40	96.25	102.67	115.50
	GM	88.91	91.11	94.31	99.41	108.89
	HM	88.00	89.83	92.40	96.25	102.67
77.5		**103.33**	**108.50**	**116.25**	**129.17**	**155.00**
	AM	90.42	93.00	96.88	103.33	116.25
	GM	89.49	91.70	94.92	100.05	109.60
	HM	88.57	90.42	93.00	96.87	103.33
78		**104.00**	**109.20**	**117.00**	**130.00**	**156.00**
	AM	91.00	93.60	97.50	104.00	117.00
	GM	90.07	92.29	95.53	100.70	110.31
	HM	89.14	91.00	93.60	97.50	104.00
78.5		**104.67**	**109.90**	**117.75**	**130.83**	**157.00**
	AM	91.58	94.20	98.13	104.67	117.75
	GM	90.64	92.88	96.14	101.34	111.02
	HM	89.71	91.58	94.20	98.12	104.67
79		**105.33**	**110.60**	**118.50**	**131.67**	**158.00**
	AM	92.17	94.80	98.75	105.33	118.50
	GM	91.22	93.47	96.75	101.99	111.72
	HM	90.29	92.17	94.80	98.75	105.33
79.5		**106.00**	**111.30**	**119.25**	**132.50**	**159.00**
	AM	92.75	95.40	99.38	106.00	119.25
	GM	91.80	94.07	97.37	102.63	112.43
	HM	90.86	92.75	95.40	99.37	106.00
80		**106.67**	**112.00**	**120.00**	**133.33**	**160.00**
	AM	93.33	96.00	100.00	106.67	120.00
	GM	92.38	94.66	97.98	103.28	113.14
	HM	91.43	93.33	96.00	100.00	106.67
80.5		**107.33**	**112.70**	**120.75**	**134.17**	**161.00**
	AM	93.92	96.60	100.63	107.33	120.75
	GM	92.95	95.25	98.59	103.93	113.84
	HM	92.00	93.92	96.60	100.63	107.33

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
77' 0"		57' 9"	55' 0"	51' 4"	46' 2 3/8"	38' 6"
	AM	67' 4 1/2"	66' 0"	64' 2"	61' 7 1/4"	57' 9"
	GM	66' 8 1/4"	65' 7/8"	62' 10 1/2"	59' 7 3/4"	54' 5 3/8"
	HM	66' 0"	64' 2"	61' 7 1/4"	57' 9"	51' 4"
77' 6"		58' 1 1/2"	55' 4 1/4"	51' 8"	46' 6"	38' 9"
	AM	67' 9 3/4"	66' 5 1/8"	64' 7"	62' 0"	58' 1 1/2"
	GM	67' 1 3/8"	65' 6"	63' 3 3/8"	60' 3/8"	54' 9 5/8"
	HM	66' 5 1/8"	64' 7"	62' 0"	58' 1 1/2"	51' 8"
78' 0"		58' 6"	55' 8 5/8"	52' 0"	46' 9 5/8"	39' 0"
	AM	68' 3"	66' 10 1/4"	65' 0"	62' 4 3/4"	58' 6"
	GM	67' 6 5/8"	65' 11 1/8"	63' 8 1/4"	60' 5"	55' 1 7/8"
	HM	66' 10 1/4"	65' 0"	62' 4 3/4"	58' 6"	52' 0"
78' 6"		58' 10 1/2"	56' 7/8"	52' 4"	47' 1 1/4"	39' 3"
	AM	68' 8 1/4"	67' 3 3/8"	65' 5"	62' 9 5/8"	58' 10 1/2"
	GM	67' 11 3/4"	66' 4 1/8"	64' 1 1/8"	60' 9 5/8"	55' 6 1/8"
	HM	67' 3 3/8"	65' 5"	62' 9 5/8"	58' 10 1/2"	52' 4"
79' 0"		59' 3"	56' 5 1/8"	52' 8"	47' 4 3/4"	39' 6"
	AM	69' 1 1/2"	67' 8 5/8"	65' 10"	63' 2 3/8"	59' 3"
	GM	68' 5"	66' 9 1/4"	64' 6"	61' 2 3/8"	55' 10 3/8"
	HM	67' 8 5/8"	65' 10"	63' 2 3/8"	59' 3"	52' 8"
79' 6"		59' 7 1/2"	56' 9 3/8"	53' 0"	47' 8 3/8"	39' 9"
	AM	69' 6 3/4"	68' 1 3/4"	66' 3"	63' 7 1/4"	59' 7 1/2"
	GM	68' 10 1/4"	67' 2 1/4"	64' 11"	61' 7"	56' 2 5/8"
	HM	68' 1 3/4"	66' 3"	63' 7 1/4"	59' 7 1/2"	53' 0"
80' 0"		60' 0"	57' 1 3/4"	53' 4"	48' 0"	40' 0"
	AM	70' 0"	68' 6 7/8"	66' 8"	64' 0"	60' 0"
	GM	69' 3 3/8"	67' 7 3/8"	65' 3 7/8"	61' 11 5/8"	56' 6 7/8"
	HM	68' 6 7/8"	66' 8"	64' 0"	60' 0"	53' 4"
80' 6"		60' 4 1/2"	57' 6"	53' 8"	48' 3 5/8"	40' 3"
	AM	70' 5 1/4"	69' 0"	67' 1"	64' 4 3/4"	60' 4 1/2"
	GM	69' 8 5/8"	68' 3/8"	65' 8 3/4"	62' 4 1/4"	56' 11 1/8"
	HM	69' 0"	67' 1"	64' 4 3/4"	60' 4 1/2"	53' 8"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
77		57.75	55.00	51.33	46.20	38.50
	AM	67.38	66.00	64.17	61.60	57.75
	GM	66.68	65.08	62.87	59.64	54.45
	HM	66.00	64.17	61.60	57.75	51.33
77.5		58.13	55.36	51.67	46.50	38.75
	AM	67.81	66.43	64.58	62.00	58.13
	GM	67.12	65.50	63.28	60.03	54.80
	HM	66.43	64.58	62.00	58.13	51.67
78		58.50	55.71	52.00	46.80	39.00
	AM	68.25	66.86	65.00	62.40	58.50
	GM	67.55	65.92	63.69	60.42	55.15
	HM	66.86	65.00	62.40	58.50	52.00
78.5		58.88	56.07	52.33	47.10	39.25
	AM	68.69	67.29	65.42	62.80	58.88
	GM	67.98	66.34	64.09	60.81	55.51
	HM	67.29	65.42	62.80	58.88	52.33
79		59.25	56.43	52.67	47.40	39.50
	AM	69.13	67.71	65.83	63.20	59.25
	GM	68.42	66.77	64.50	61.19	55.86
	HM	67.71	65.83	63.20	59.25	52.67
79.5		59.63	56.79	53.00	47.70	39.75
	AM	69.56	68.14	66.25	63.60	59.63
	GM	68.85	67.19	64.91	61.58	56.21
	HM	68.14	66.25	63.60	59.63	53.00
80		60.00	57.14	53.33	48.00	40.00
	AM	70.00	68.57	66.67	64.00	60.00
	GM	69.28	67.61	65.32	61.97	56.57
	HM	68.57	66.67	64.00	60.00	53.33
80.5		60.38	57.50	53.67	48.30	40.25
	AM	70.44	69.00	67.08	64.40	60.38
	GM	69.72	68.03	65.73	62.36	56.92
	HM	69.00	67.08	64.40	60.38	53.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
81' 0"		**108' 0"**	**113' 4 3/4"**	**121' 6"**	**135' 0"**	**162' 0"**
	AM	94' 6"	97' 2 3/8"	101' 3"	108' 0"	121' 6"
	GM	93' 6 3/8"	95' 10 1/8"	99' 2 1/2"	104' 6 7/8"	114' 6 5/8"
	HM	92' 6 7/8"	94' 6"	97' 2 3/8"	101' 3"	108' 0"
81' 6"		**108' 8"**	**114' 1 1/4"**	**122' 3"**	**135' 10"**	**163' 0"**
	AM	95' 1"	97' 9 5/8"	101' 10 1/2"	108' 8"	122' 3"
	GM	94' 1 1/4"	96' 5 1/8"	99' 9 3/4"	105' 2 5/8"	115' 3 1/8"
	HM	93' 1 3/4"	95' 1"	97' 9 5/8"	101' 10 1/2"	108' 8"
82' 0"		**109' 4"**	**114' 9 5/8"**	**123' 0"**	**136' 8"**	**164' 0"**
	AM	95' 8"	98' 4 3/4"	102' 6"	109' 4"	123' 0"
	GM	94' 8 1/4"	97' 1/4"	100' 5 1/8"	105' 10 3/8"	115' 11 5/8"
	HM	93' 8 5/8"	95' 8"	98' 4 3/4"	102' 6"	109' 4"
82' 6"		**110' 0"**	**115' 6"**	**123' 9"**	**137' 6"**	**165' 0"**
	AM	96' 3"	99' 0"	103' 1 1/2"	110' 0"	123' 9"
	GM	95' 3 1/8"	97' 7 3/8"	101' 1/2"	106' 6 1/8"	116' 8 1/8"
	HM	94' 3 3/8"	96' 3"	99' 0"	103' 1 1/2"	110' 0"
83' 0"		**110' 8"**	**116' 2 3/8"**	**124' 6"**	**138' 4"**	**166' 0"**
	AM	96' 10"	99' 7 1/4"	103' 9"	110' 8"	124' 6"
	GM	95' 10 1/8"	98' 2 1/2"	101' 7 7/8"	107' 1 7/8"	117' 4 1/2"
	HM	94' 10 1/4"	96' 10"	99' 7 1/4"	103' 9"	110' 8"
83' 6"		**111' 4"**	**116' 10 3/4"**	**125' 3"**	**139' 2"**	**167' 0"**
	AM	97' 5"	100' 2 3/8"	104' 4 1/2"	111' 4"	125' 3"
	GM	96' 5"	98' 9 5/8"	102' 3 1/4"	107' 9 5/8"	118' 1"
	HM	95' 5 1/8"	97' 5"	100' 2 3/8"	104' 4 1/2"	111' 4"
84' 0"		**112' 0"**	**117' 7 1/4"**	**126' 0"**	**140' 0"**	**168' 0"**
	AM	98' 0"	100' 9 5/8"	105' 0"	112' 0"	126' 0"
	GM	97' 0"	99' 4 5/8"	102' 10 1/2"	108' 5 3/8"	118' 9 1/2"
	HM	96' 0"	98' 0"	100' 9 5/8"	105' 0"	112' 0"
84' 6"		**112' 8"**	**118' 3 5/8"**	**126' 9"**	**140' 10"**	**169' 0"**
	AM	98' 7"	101' 4 3/4"	105' 7 1/2"	112' 8"	126' 9"
	GM	97' 6 7/8"	99' 11 3/4"	103' 5 7/8"	109' 1 1/8"	119' 6"
	HM	96' 6 7/8"	98' 7"	101' 4 3/4"	105' 7 1/2"	112' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
81		**108.00**	**113.40**	**121.50**	**135.00**	**162.00**
	AM	94.50	97.20	101.25	108.00	121.50
	GM	93.53	95.84	99.20	104.57	114.55
	HM	92.57	94.50	97.20	101.25	108.00
81.5		**108.67**	**114.10**	**122.25**	**135.83**	**163.00**
	AM	95.08	97.80	101.88	108.67	122.25
	GM	94.11	96.43	99.82	105.22	115.26
	HM	93.14	95.08	97.80	101.88	108.67
82		**109.33**	**114.80**	**123.00**	**136.67**	**164.00**
	AM	95.67	98.40	102.50	109.33	123.00
	GM	94.69	97.02	100.43	105.86	115.97
	HM	93.71	95.67	98.40	102.50	109.33
82.5		**110.00**	**115.50**	**123.75**	**137.50**	**165.00**
	AM	96.25	99.00	103.13	110.00	123.75
	GM	95.26	97.62	101.04	106.51	116.67
	HM	94.29	96.25	99.00	103.13	110.00
83		**110.67**	**116.20**	**124.50**	**138.33**	**166.00**
	AM	96.83	99.60	103.75	110.67	124.50
	GM	95.84	98.21	101.65	107.15	117.38
	HM	94.86	96.83	99.60	103.75	110.67
83.5		**111.33**	**116.90**	**125.25**	**139.17**	**167.00**
	AM	97.42	100.20	104.38	111.33	125.25
	GM	96.42	98.80	102.27	107.80	118.09
	HM	95.43	97.42	100.20	104.38	111.33
84		**112.00**	**117.60**	**126.00**	**140.00**	**168.00**
	AM	98.00	100.80	105.00	112.00	126.00
	GM	96.99	99.39	102.88	108.44	118.79
	HM	96.00	98.00	100.80	105.00	112.00
84.5		**112.67**	**118.30**	**126.75**	**140.83**	**169.00**
	AM	98.58	101.40	105.63	112.67	126.75
	GM	97.57	99.98	103.49	109.09	119.50
	HM	96.57	98.58	101.40	105.63	112.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
81' 0"		**60' 9"**	**57' 10 1/4"**	**54' 0"**	**48' 7 1/4"**	**40' 6"**
	AM	70' 10 1/2"	69' 5 1/8"	67' 6"	64' 9 5/8"	60' 9"
	GM	70' 1 3/4"	68' 5 1/2"	66' 1 5/8"	62' 8 7/8"	57' 3 1/4"
	HM	69' 5 1/8"	67' 6"	64' 9 5/8"	60' 9"	54' 0"
81' 6"		**61' 1 1/2"**	**58' 2 5/8"**	**54' 4"**	**48' 10 3/4"**	**40' 9"**
	AM	71' 3 3/4"	69' 10 1/4"	67' 11"	65' 2 3/8"	61' 1 1/2"
	GM	70' 7"	68' 10 1/2"	66' 6 1/2"	63' 1 1/2"	57' 7 1/2"
	HM	69' 10 1/4"	67' 11"	65' 2 3/8"	61' 1 1/2"	54' 4"
82' 0"		**61' 6"**	**58' 6 7/8"**	**54' 8"**	**49' 2 3/8"**	**41' 0"**
	AM	71' 9"	70' 3 3/8"	68' 4"	65' 7 1/4"	61' 6"
	GM	71' 1/8"	69' 3 5/8"	66' 11 3/8"	63' 6 1/4"	57' 11 3/4"
	HM	70' 3 3/8"	68' 4"	65' 7 1/4"	61' 6"	54' 8"
82' 6"		**61' 10 1/2"**	**58' 11 1/8"**	**55' 0"**	**49' 6"**	**41' 3"**
	AM	72' 2 1/4"	70' 8 5/8"	68' 9"	66' 0"	61' 10 1/2"
	GM	71' 5 3/8"	69' 8 3/4"	67' 4 3/8"	63' 10 7/8"	58' 4"
	HM	70' 8 5/8"	68' 9"	66' 0"	61' 10 1/2"	55' 0"
83' 0"		**62' 3"**	**59' 3 3/8"**	**55' 4"**	**49' 9 5/8"**	**41' 6"**
	AM	72' 7 1/2"	71' 1 3/4"	69' 2"	66' 4 3/4"	62' 3"
	GM	71' 10 1/2"	70' 1 3/4"	67' 9 1/4"	64' 3 1/2"	58' 8 1/4"
	HM	71' 1 3/4"	69' 2"	66' 4 3/4"	62' 3"	55' 4"
83' 6"		**62' 7 1/2"**	**59' 7 3/4"**	**55' 8"**	**50' 1 1/4"**	**41' 9"**
	AM	73' 3/4"	71' 6 7/8"	69' 7"	66' 9 5/8"	62' 7 1/2"
	GM	72' 3 3/4"	70' 6 7/8"	68' 2 1/8"	64' 8 1/8"	59' 1/2"
	HM	71' 6 7/8"	69' 7"	66' 9 5/8"	62' 7 1/2"	55' 8"
84' 0"		**63' 0"**	**60' 0"**	**56' 0"**	**50' 4 3/4"**	**42' 0"**
	AM	73' 6"	72' 0"	70' 0"	67' 2 3/8"	63' 0"
	GM	72' 9"	70' 11 7/8"	68' 7"	65' 3/4"	59' 4 3/4"
	HM	72' 0"	70' 0"	67' 2 3/8"	63' 0"	56' 0"
84' 6"		**63' 4 1/2"**	**60' 4 1/4"**	**56' 4"**	**50' 8 3/8"**	**42' 3"**
	AM	73' 11 1/4"	72' 5 1/8"	70' 5"	67' 7 1/4"	63' 4 1/2"
	GM	73' 2 1/8"	71' 5"	68' 11 7/8"	65' 5 1/2"	59' 9"
	HM	72' 5 1/8"	70' 5"	67' 7 1/4"	63' 4 1/2"	56' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
81		**60.75**	**57.86**	**54.00**	**48.60**	**40.50**
	AM	70.88	69.43	67.50	64.80	60.75
	GM	70.15	68.46	66.14	62.74	57.28
	HM	69.43	67.50	64.80	60.75	54.00
81.5		**61.13**	**58.21**	**54.33**	**48.90**	**40.75**
	AM	71.31	69.86	67.92	65.20	61.13
	GM	70.58	68.88	66.54	63.13	57.63
	HM	69.86	67.92	65.20	61.13	54.33
82		**61.50**	**58.57**	**54.67**	**49.20**	**41.00**
	AM	71.75	70.29	68.33	65.60	61.50
	GM	71.01	69.30	66.95	63.52	57.98
	HM	70.29	68.33	65.60	61.50	54.67
82.5		**61.88**	**58.93**	**55.00**	**49.50**	**41.25**
	AM	72.19	70.71	68.75	66.00	61.88
	GM	71.45	69.73	67.36	63.90	58.34
	HM	70.71	68.75	66.00	61.88	55.00
83		**62.25**	**59.29**	**55.33**	**49.80**	**41.50**
	AM	72.63	71.14	69.17	66.40	62.25
	GM	71.88	70.15	67.77	64.29	58.69
	HM	71.14	69.17	66.40	62.25	55.33
83.5		**62.63**	**59.64**	**55.67**	**50.10**	**41.75**
	AM	73.06	71.57	69.58	66.80	62.63
	GM	72.31	70.57	68.18	64.68	59.04
	HM	71.57	69.58	66.80	62.63	55.67
84		**63.00**	**60.00**	**56.00**	**50.40**	**42.00**
	AM	73.50	72.00	70.00	67.20	63.00
	GM	72.75	70.99	68.59	65.07	59.40
	HM	72.00	70.00	67.20	63.00	56.00
84.5		**63.38**	**60.36**	**56.33**	**50.70**	**42.25**
	AM	73.94	72.43	70.42	67.60	63.38
	GM	73.18	71.42	68.99	65.45	59.75
	HM	72.43	70.42	67.60	63.38	56.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
85' 0"		**113' 4"**	**119' 0"**	**127' 6"**	**141' 8"**	**170' 0"**
	AM	99' 2"	102' 0"	106' 3"	113' 4"	127' 6"
	GM	98' 1 3/4"	100' 6 7/8"	104' 1 1/4"	109' 8 7/8"	120' 2 1/2"
	HM	97' 1 3/4"	99' 2"	102' 0"	106' 3"	113' 4"
85' 6"		**114' 0"**	**119' 8 3/8"**	**128' 3"**	**142' 6"**	**171' 0"**
	AM	99' 9"	102' 7 1/4"	106' 10 1/2"	114' 0"	128' 3"
	GM	98' 8 3/4"	101' 2"	104' 8 5/8"	110' 4 1/2"	120' 11"
	HM	97' 8 5/8"	99' 9"	102' 7 1/4"	106' 10 1/2"	114' 0"
86' 0"		**114' 8"**	**120' 4 3/4"**	**129' 0"**	**143' 4"**	**172' 0"**
	AM	100' 4"	103' 2 3/8"	107' 6"	114' 8"	129' 0"
	GM	99' 3 5/8"	101' 9 1/8"	105' 3 7/8"	111' 1/4"	121' 7 1/2"
	HM	98' 3 3/8"	100' 4"	103' 2 3/8"	107' 6"	114' 8"
86' 6"		**115' 4"**	**121' 1 1/4"**	**129' 9"**	**144' 2"**	**173' 0"**
	AM	100' 11"	103' 9 5/8"	108' 1 1/2"	115' 4"	129' 9"
	GM	99' 10 5/8"	102' 4 1/8"	105' 11 1/4"	111' 8"	122' 4"
	HM	98' 10 1/4"	100' 11"	103' 9 5/8"	108' 1 1/2"	115' 4"
87' 0"		**116' 0"**	**121' 9 5/8"**	**130' 6"**	**145' 0"**	**174' 0"**
	AM	101' 6"	104' 4 3/4"	108' 9"	116' 0"	130' 6"
	GM	100' 5 1/2"	102' 11 1/4"	106' 6 5/8"	112' 3 3/4"	123' 1/2"
	HM	99' 5 1/8"	101' 6"	104' 4 3/4"	108' 9"	116' 0"
87' 6"		**116' 8"**	**122' 6"**	**131' 3"**	**145' 10"**	**175' 0"**
	AM	102' 1"	105' 0"	109' 4 1/2"	116' 8"	131' 3"
	GM	101' 3/8"	103' 6 3/8"	107' 2"	112' 11 1/2"	123' 8 7/8"
	HM	100' 0"	102' 1"	105' 0"	109' 4 1/2"	116' 8"
88' 0"		**117' 4"**	**123' 2 3/8"**	**132' 0"**	**146' 8"**	**176' 0"**
	AM	102' 8"	105' 7 1/4"	110' 0"	117' 4"	132' 0"
	GM	101' 7 3/8"	104' 1 1/2"	107' 9 3/8"	113' 7 1/4"	124' 5 3/8"
	HM	100' 6 7/8"	102' 8"	105' 7 1/4"	110' 0"	117' 4"
88' 6"		**118' 0"**	**123' 10 3/4"**	**132' 9"**	**147' 6"**	**177' 0"**
	AM	103' 3"	106' 2 3/8"	110' 7 1/2"	118' 0"	132' 9"
	GM	102' 2 1/4"	104' 8 5/8"	108' 4 5/8"	114' 3"	125' 1 7/8"
	HM	101' 1 3/4"	103' 3"	106' 2 3/8"	110' 7 1/2"	118' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
85		**113.33**	**119.00**	**127.50**	**141.67**	**170.00**
	AM	99.17	102.00	106.25	113.33	127.50
	GM	98.15	100.57	104.10	109.73	120.21
	HM	97.14	99.17	102.00	106.25	113.33
85.5		**114.00**	**119.70**	**128.25**	**142.50**	**171.00**
	AM	99.75	102.60	106.88	114.00	128.25
	GM	98.73	101.16	104.72	110.38	120.92
	HM	97.71	99.75	102.60	106.88	114.00
86		**114.67**	**120.40**	**129.00**	**143.33**	**172.00**
	AM	100.33	103.20	107.50	114.67	129.00
	GM	99.30	101.76	105.33	111.03	121.62
	HM	98.29	100.33	103.20	107.50	114.67
86.5		**115.33**	**121.10**	**129.75**	**144.17**	**173.00**
	AM	100.92	103.80	108.13	115.33	129.75
	GM	99.88	102.35	105.94	111.67	122.33
	HM	98.86	100.92	103.80	108.13	115.33
87		**116.00**	**121.80**	**130.50**	**145.00**	**174.00**
	AM	101.50	104.40	108.75	116.00	130.50
	GM	100.46	102.94	106.55	112.32	123.04
	HM	99.43	101.50	104.40	108.75	116.00
87.5		**116.67**	**122.50**	**131.25**	**145.83**	**175.00**
	AM	102.08	105.00	109.38	116.67	131.25
	GM	101.04	103.53	107.17	112.96	123.74
	HM	100.00	102.08	105.00	109.38	116.67
88		**117.33**	**123.20**	**132.00**	**146.67**	**176.00**
	AM	102.67	105.60	110.00	117.33	132.00
	GM	101.61	104.12	107.78	113.61	124.45
	HM	100.57	102.67	105.60	110.00	117.33
88.5		**118.00**	**123.90**	**132.75**	**147.50**	**177.00**
	AM	103.25	106.20	110.63	118.00	132.75
	GM	102.19	104.71	108.39	114.25	125.16
	HM	101.14	103.25	106.20	110.63	118.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
85' 0"		63' 9"	60' 8 5/8"	56' 8"	51' 0"	42' 6"
	AM	74' 4 1/2"	72' 10 1/4"	70' 10"	68' 0"	63' 9"
	GM	73' 7 3/8"	71' 10"	69' 4 7/8"	65' 10 1/8"	60' 1 1/4"
	HM	72' 10 1/4"	70' 10"	68' 0"	63' 9"	56' 8"
85' 6"		64' 1 1/2"	61' 7/8"	57' 0"	51' 3 5/8"	42' 9"
	AM	74' 9 3/4"	73' 3 3/8"	71' 3"	68' 4 3/4"	64' 1 1/2"
	GM	74' 1/2"	72' 3 1/8"	69' 9 3/4"	66' 2 3/4"	60' 5 1/2"
	HM	73' 3 3/8"	71' 3"	68' 4 3/4"	64' 1 1/2"	57' 0"
86' 0"		64' 6"	61' 5 1/8"	57' 4"	51' 7 1/4"	43' 0"
	AM	75' 3"	73' 8 5/8"	71' 8"	68' 9 5/8"	64' 6"
	GM	74' 5 3/4"	72' 8 1/4"	70' 2 5/8"	66' 7 3/8"	60' 9 3/4"
	HM	73' 8 5/8"	71' 8"	68' 9 5/8"	64' 6"	57' 4"
86' 6"		64' 10 1/2"	61' 9 3/8"	57' 8"	51' 10 3/4"	43' 3"
	AM	75' 8 1/4"	74' 1 3/4"	72' 1"	69' 2 3/8"	64' 10 1/2"
	GM	74' 10 7/8"	73' 1 1/4"	70' 7 1/2"	67' 0"	61' 2"
	HM	74' 1 3/4"	72' 1"	69' 2 3/8"	64' 10 1/2"	57' 8"
87' 0"		65' 3"	62' 1 3/4"	58' 0"	52' 2 3/8"	43' 6"
	AM	76' 1 1/2"	74' 6 7/8"	72' 6"	69' 7 1/4"	65' 3"
	GM	75' 4 1/8"	73' 6 3/8"	71' 3/8"	67' 4 5/8"	61' 6 1/4"
	HM	74' 6 7/8"	72' 6"	69' 7 1/4"	65' 3"	58' 0"
87' 6"		65' 7 1/2"	62' 6"	58' 4"	52' 6"	43' 9"
	AM	76' 6 3/4"	75' 0"	72' 11"	70' 0"	65' 7 1/2"
	GM	75' 9 3/8"	73' 11 3/8"	71' 5 3/8"	67' 9 3/8"	61' 10 1/2"
	HM	75' 0"	72' 11"	70' 0"	65' 7 1/2"	58' 4"
88' 0"		66' 0"	62' 10 1/4"	58' 8"	52' 9 5/8"	44' 0"
	AM	77' 0"	75' 5 1/8"	73' 4"	70' 4 3/4"	66' 0"
	GM	76' 2 1/2"	74' 4 1/2"	71' 10 1/4"	68' 2"	62' 2 3/4"
	HM	75' 5 1/8"	73' 4"	70' 4 3/4"	66' 0"	58' 8"
88' 6"		66' 4 1/2"	63' 2 5/8"	59' 0"	53' 1 1/4"	44' 3"
	AM	77' 5 1/4"	75' 10 1/4"	73' 9"	70' 9 5/8"	66' 4 1/2"
	GM	76' 7 3/4"	74' 9 1/2"	72' 3 1/8"	68' 6 5/8"	62' 7"
	HM	75' 10 1/4"	73' 9"	70' 9 5/8"	66' 4 1/2"	59' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
85		63.75	60.71	56.67	51.00	42.50
	AM	74.38	72.86	70.83	68.00	63.75
	GM	73.61	71.84	69.40	65.84	60.10
	HM	72.86	70.83	68.00	63.75	56.67
85.5		64.13	61.07	57.00	51.30	42.75
	AM	74.81	73.29	71.25	68.40	64.13
	GM	74.05	72.26	69.81	66.23	60.46
	HM	73.29	71.25	68.40	64.13	57.00
86		64.50	61.43	57.33	51.60	43.00
	AM	75.25	73.71	71.67	68.80	64.50
	GM	74.48	72.68	70.22	66.62	60.81
	HM	73.71	71.67	68.80	64.50	57.33
86.5		64.88	61.79	57.67	51.90	43.25
	AM	75.69	74.14	72.08	69.20	64.88
	GM	74.91	73.11	70.63	67.00	61.16
	HM	74.14	72.08	69.20	64.88	57.67
87		65.25	62.14	58.00	52.20	43.50
	AM	76.13	74.57	72.50	69.60	65.25
	GM	75.34	73.53	71.04	67.39	61.52
	HM	74.57	72.50	69.60	65.25	58.00
87.5		65.63	62.50	58.33	52.50	43.75
	AM	76.56	75.00	72.92	70.00	65.63
	GM	75.78	73.95	71.44	67.78	61.87
	HM	75.00	72.92	70.00	65.63	58.33
88		66.00	62.86	58.67	52.80	44.00
	AM	77.00	75.43	73.33	70.40	66.00
	GM	76.21	74.37	71.85	68.16	62.23
	HM	75.43	73.33	70.40	66.00	58.67
88.5		66.38	63.21	59.00	53.10	44.25
	AM	77.44	75.86	73.75	70.80	66.38
	GM	76.64	74.80	72.26	68.55	62.58
	HM	75.86	73.75	70.80	66.38	59.00

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
89' 0"		**118' 8"**	**124' 7 1/4"**	**133' 6"**	**148' 4"**	**178' 0"**
	AM	103' 10"	106' 9 5/8"	111' 3"	118' 8"	133' 6"
	GM	102' 9 1/4"	105' 3 5/8"	109' 0"	114' 10 3/4"	125' 10 3/8"
	HM	101' 8 5/8"	103' 10"	106' 9 5/8"	111' 3"	118' 8"
89' 6"		**119' 4"**	**125' 3 5/8"**	**134' 3"**	**149' 2"**	**179' 0"**
	AM	104' 5"	107' 4 3/4"	111' 10 1/2"	119' 4"	134' 3"
	GM	103' 4 1/8"	105' 10 3/4"	109' 7 3/8"	115' 6 1/2"	126' 6 7/8"
	HM	102' 3 3/8"	104' 5"	107' 4 3/4"	111' 10 1/2"	119' 4"
90' 0"		**120' 0"**	**126' 0"**	**135' 0"**	**150' 0"**	**180' 0"**
	AM	105' 0"	108' 0"	112' 6"	120' 0"	135' 0"
	GM	103' 11 1/8"	106' 5 7/8"	110' 2 3/4"	116' 2 1/4"	127' 3 3/8"
	HM	102' 10 1/4"	105' 0"	108' 0"	112' 6"	120' 0"
90' 6"		**120' 8"**	**126' 8 3/8"**	**135' 9"**	**150' 10"**	**181' 0"**
	AM	105' 7"	108' 7 1/4"	113' 1 1/2"	120' 8"	135' 9"
	GM	104' 6"	107' 1"	110' 10 1/8"	116' 10"	127' 11 7/8"
	HM	103' 5 1/8"	105' 7"	108' 7 1/4"	113' 1 1/2"	120' 8"
91' 0"		**121' 4"**	**127' 4 3/4"**	**136' 6"**	**151' 8"**	**182' 0"**
	AM	106' 2"	109' 2 3/8"	113' 9"	121' 4"	136' 6"
	GM	105' 7/8"	107' 8 1/8"	111' 5 3/8"	117' 5 3/4"	128' 8 3/8"
	HM	104' 0"	106' 2"	109' 2 3/8"	113' 9"	121' 4"
91' 6"		**122' 0"**	**128' 1 1/4"**	**137' 3"**	**152' 6"**	**183' 0"**
	AM	106' 9"	109' 9 5/8"	114' 4 1/2"	122' 0"	137' 3"
	GM	105' 7 7/8"	108' 3 1/8"	112' 3/4"	118' 1 1/2"	129' 4 3/4"
	HM	104' 6 7/8"	106' 9"	109' 9 5/8"	114' 4 1/2"	122' 0"
92' 0"		**122' 8"**	**128' 9 5/8"**	**138' 0"**	**153' 4"**	**184' 0"**
	AM	107' 4"	110' 4 3/4"	115' 0"	122' 8"	138' 0"
	GM	106' 2 3/4"	108' 10 1/4"	112' 8 1/8"	118' 9 1/4"	130' 1 1/4"
	HM	105' 1 3/4"	107' 4"	110' 4 3/4"	115' 0"	122' 8"
92' 6"		**123' 4"**	**129' 6"**	**138' 9"**	**154' 2"**	**185' 0"**
	AM	107' 11"	111' 0"	115' 7 1/2"	123' 4"	138' 9"
	GM	106' 9 3/4"	109' 5 3/8"	113' 3 1/2"	119' 5"	130' 9 3/4"
	HM	105' 8 5/8"	107' 11"	111' 0"	115' 7 1/2"	123' 4"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
89		**118.67**	**124.60**	**133.50**	**148.33**	**178.00**
	AM	103.83	106.80	111.25	118.67	133.50
	GM	102.77	105.31	109.00	114.90	125.87
	HM	101.71	103.83	106.80	111.25	118.67
89.5		**119.33**	**125.30**	**134.25**	**149.17**	**179.00**
	AM	104.42	107.40	111.88	119.33	134.25
	GM	103.35	105.90	109.61	115.54	126.57
	HM	102.29	104.42	107.40	111.88	119.33
90		**120.00**	**126.00**	**135.00**	**150.00**	**180.00**
	AM	105.00	108.00	112.50	120.00	135.00
	GM	103.92	106.49	110.23	116.19	127.28
	HM	102.86	105.00	108.00	112.50	120.00
90.5		**120.67**	**126.70**	**135.75**	**150.83**	**181.00**
	AM	105.58	108.60	113.13	120.67	135.75
	GM	104.50	107.08	110.84	116.83	127.99
	HM	103.43	105.58	108.60	113.13	120.67
91		**121.33**	**127.40**	**136.50**	**151.67**	**182.00**
	AM	106.17	109.20	113.75	121.33	136.50
	GM	105.08	107.67	111.45	117.48	128.69
	HM	104.00	106.17	109.20	113.75	121.33
91.5		**122.00**	**128.10**	**137.25**	**152.50**	**183.00**
	AM	106.75	109.80	114.38	122.00	137.25
	GM	105.66	108.26	112.06	118.13	129.40
	HM	104.57	106.75	109.80	114.38	122.00
92		**122.67**	**128.80**	**138.00**	**153.33**	**184.00**
	AM	107.33	110.40	115.00	122.67	138.00
	GM	106.23	108.86	112.68	118.77	130.11
	HM	105.14	107.33	110.40	115.00	122.67
92.5		**123.33**	**129.50**	**138.75**	**154.17**	**185.00**
	AM	107.92	111.00	115.63	123.33	138.75
	GM	106.81	109.45	113.29	119.42	130.81
	HM	105.71	107.92	111.00	115.63	123.33

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
89' 0"		**66' 9"**	**63' 6 7/8"**	**59' 4"**	**53' 4 3/4"**	**44' 6"**
	AM	77' 10 1/2"	76' 3 3/8"	74' 2"	71' 2 3/8"	66' 9"
	GM	77' 7/8"	75' 2 5/8"	72' 8"	68' 11 1/4"	62' 11 1/4"
	HM	76' 3 3/8"	74' 2"	71' 2 3/8"	66' 9"	59' 4"
89' 6"		**67' 1 1/2"**	**63' 11 1/8"**	**59' 8"**	**53' 8 3/8"**	**44' 9"**
	AM	78' 3 3/4"	76' 8 5/8"	74' 7"	71' 7 1/4"	67' 1 1/2"
	GM	77' 6 1/8"	75' 7 3/4"	73' 7/8"	69' 3 7/8"	63' 3 3/8"
	HM	76' 8 5/8"	74' 7"	71' 7 1/4"	67' 1 1/2"	59' 8"
90' 0"		**67' 6"**	**64' 3 3/8"**	**60' 0"**	**54' 0"**	**45' 0"**
	AM	78' 9"	77' 1 3/4"	75' 0"	72' 0"	67' 6"
	GM	77' 11 1/4"	76' 3/4"	73' 5 7/8"	69' 8 5/8"	63' 7 5/8"
	HM	77' 1 3/4"	75' 0"	72' 0"	67' 6"	60' 0"
90' 6"		**67' 10 1/2"**	**64' 7 3/4"**	**60' 4"**	**54' 3 5/8"**	**45' 3"**
	AM	79' 2 1/4"	77' 6 7/8"	75' 5"	72' 4 3/4"	67' 10 1/2"
	GM	78' 4 1/2"	76' 5 7/8"	73' 10 3/4"	70' 1 1/4"	63' 11 7/8"
	HM	77' 6 7/8"	75' 5"	72' 4 3/4"	67' 10 1/2"	60' 4"
91' 0"		**68' 3"**	**65' 0"**	**60' 8"**	**54' 7 1/4"**	**45' 6"**
	AM	79' 7 1/2"	78' 0"	75' 10"	72' 9 5/8"	68' 3"
	GM	78' 9 3/4"	76' 10 7/8"	74' 3 5/8"	70' 5 7/8"	64' 4 1/8"
	HM	78' 0"	75' 10"	72' 9 5/8"	68' 3"	60' 8"
91' 6"		**68' 7 1/2"**	**65' 4 1/4"**	**61' 0"**	**54' 10 3/4"**	**45' 9"**
	AM	80' 3/4"	78' 5 1/8"	76' 3"	73' 2 3/8"	68' 7 1/2"
	GM	79' 2 7/8"	77' 4"	74' 8 1/2"	70' 10 1/2"	64' 8 3/8"
	HM	78' 5 1/8"	76' 3"	73' 2 3/8"	68' 7 1/2"	61' 0"
92' 0"		**69' 0"**	**65' 8 5/8"**	**61' 4"**	**55' 2 3/8"**	**46' 0"**
	AM	80' 6"	78' 10 1/4"	76' 8"	73' 7 1/4"	69' 0"
	GM	79' 8 1/8"	77' 9"	75' 1 3/8"	71' 3 1/8"	65' 5/8"
	HM	78' 10 1/4"	76' 8"	73' 7 1/4"	69' 0"	61' 4"
92' 6"		**69' 4 1/2"**	**66' 7/8"**	**61' 8"**	**55' 6"**	**46' 3"**
	AM	80' 11 1/4"	79' 3 3/8"	77' 1"	74' 0"	69' 4 1/2"
	GM	80' 1 1/4"	78' 2 1/8"	75' 6 1/4"	71' 7 3/4"	65' 4 7/8"
	HM	79' 3 3/8"	77' 1"	74' 0"	69' 4 1/2"	61' 8"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
89		**66.75**	**63.57**	**59.33**	**53.40**	**44.50**
	AM	77.88	76.29	74.17	71.20	66.75
	GM	77.08	75.22	72.67	68.94	62.93
	HM	76.29	74.17	71.20	66.75	59.33
89.5		**67.13**	**63.93**	**59.67**	**53.70**	**44.75**
	AM	78.31	76.71	74.58	71.60	67.13
	GM	77.51	75.64	73.08	69.33	63.29
	HM	76.71	74.58	71.60	67.13	59.67
90		**67.50**	**64.29**	**60.00**	**54.00**	**45.00**
	AM	78.75	77.14	75.00	72.00	67.50
	GM	77.94	76.06	73.48	69.71	63.64
	HM	77.14	75.00	72.00	67.50	60.00
90.5		**67.88**	**64.64**	**60.33**	**54.30**	**45.25**
	AM	79.19	77.57	75.42	72.40	67.88
	GM	78.38	76.49	73.89	70.10	63.99
	HM	77.57	75.42	72.40	67.88	60.33
91		**68.25**	**65.00**	**60.67**	**54.60**	**45.50**
	AM	79.63	78.00	75.83	72.80	68.25
	GM	78.81	76.91	74.30	70.49	64.35
	HM	78.00	75.83	72.80	68.25	60.67
91.5		**68.63**	**65.36**	**61.00**	**54.90**	**45.75**
	AM	80.06	78.43	76.25	73.20	68.63
	GM	79.24	77.33	74.71	70.88	64.70
	HM	78.43	76.25	73.20	68.63	61.00
92		**69.00**	**65.71**	**61.33**	**55.20**	**46.00**
	AM	80.50	78.86	76.67	73.60	69.00
	GM	79.67	77.75	75.12	71.26	65.05
	HM	78.86	76.67	73.60	69.00	61.33
92.5		**69.38**	**66.07**	**61.67**	**55.50**	**46.25**
	AM	80.94	79.29	77.08	74.00	69.38
	GM	80.11	78.18	75.53	71.65	65.41
	HM	79.29	77.08	74.00	69.38	61.67

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2 .
93' 0"		**124' 0"**	**130' 2 3/8"**	**139' 6"**	**155' 0"**	**186' 0"**
	AM	108' 6"	111' 7 1/4"	116' 3"	124' 0"	139' 6"
	GM	107' 4 5/8"	110' 1/2"	113' 10 7/8"	120' 3/4"	131' 6 1/4"
	HM	106' 3 3/8"	108' 6"	111' 7 1/4"	116' 3"	124' 0"
93' 6"		**124' 8"**	**130' 10 3/4"**	**140' 3"**	**155' 10"**	**187' 0"**
	AM	109' 1"	112' 2 3/8"	116' 10 1/2"	124' 8"	140' 3"
	GM	107' 11 5/8"	110' 7 5/8"	114' 6 1/8"	120' 8 1/2"	132' 2 3/4"
	HM	106' 10 1/4"	109' 1"	112' 2 3/8"	116' 10 1/2"	124' 8"
94' 0"		**125' 4"**	**131' 7 1/4"**	**141' 0"**	**156' 8"**	**188' 0"**
	AM	109' 8"	112' 9 5/8"	117' 6"	125' 4"	141' 0"
	GM	108' 6 1/2"	111' 2 5/8"	115' 1 1/2"	121' 4 1/4"	132' 11 1/4"
	HM	107' 5 1/8"	109' 8"	112' 9 5/8"	117' 6"	125' 4"
94' 6"		**126' 0"**	**132' 3 5/8"**	**141' 9"**	**157' 6"**	**189' 0"**
	AM	110' 3"	113' 4 3/4"	118' 1 1/2"	126' 0"	141' 9"
	GM	109' 1 3/8"	111' 9 3/4"	115' 8 7/8"	122' 0"	133' 7 3/4"
	HM	108' 0"	110' 3"	113' 4 3/4"	118' 1 1/2"	126' 0"
95' 0"		**126' 8"**	**133' 0"**	**142' 6"**	**158' 4"**	**190' 0"**
	AM	110' 10"	114' 0"	118' 9"	126' 8"	142' 6"
	GM	109' 8 3/8"	112' 4 7/8"	116' 4 1/4"	122' 7 3/4"	134' 4 1/4"
	HM	108' 6 7/8"	110' 10"	114' 0"	118' 9"	126' 8"
95' 6"		**127' 4"**	**133' 8 3/8"**	**143' 3"**	**159' 2"**	**191' 0"**
	AM	111' 5"	114' 7 1/4"	119' 4 1/2"	127' 4"	143' 3"
	GM	110' 3 1/4"	113' 0"	116' 11 1/2"	123' 3 1/2"	135' 3/4"
	HM	109' 1 3/4"	111' 5"	114' 7 1/4"	119' 4 1/2"	127' 4"
96' 0"		**128' 0"**	**134' 4 3/4"**	**144' 0"**	**160' 0"**	**192' 0"**
	AM	112' 0"	115' 2 3/8"	120' 0"	128' 0"	144' 0"
	GM	110' 10 1/4"	113' 7 1/8"	117' 6 7/8"	123' 11 1/4"	135' 9 1/8"
	HM	109' 8 5/8"	112' 0"	115' 2 3/8"	120' 0"	128' 0"
96' 6"		**128' 8"**	**135' 1 1/4"**	**144' 9"**	**160' 10"**	**193' 0"**
	AM	112' 7"	115' 9 5/8"	120' 7 1/2"	128' 8"	144' 9"
	GM	111' 5 1/8"	114' 2 1/8"	118' 2 1/4"	124' 7"	136' 5 5/8"
	HM	110' 3 3/8"	112' 7"	115' 9 5/8"	120' 7 1/2"	128' 8"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
93		**124.00**	**130.20**	**139.50**	**155.00**	**186.00**
	AM	108.50	111.60	116.25	124.00	139.50
	GM	107.39	110.04	113.90	120.06	131.52
	HM	106.29	108.50	111.60	116.25	124.00
93.5		**124.67**	**130.90**	**140.25**	**155.83**	**187.00**
	AM	109.08	112.20	116.88	124.67	140.25
	GM	107.96	110.63	114.51	120.71	132.23
	HM	106.86	109.08	112.20	116.88	124.67
94		**125.33**	**131.60**	**141.00**	**156.67**	**188.00**
	AM	109.67	112.80	117.50	125.33	141.00
	GM	108.54	111.22	115.13	121.35	132.94
	HM	107.43	109.67	112.80	117.50	125.33
94.5		**126.00**	**132.30**	**141.75**	**157.50**	**189.00**
	AM	110.25	113.40	118.13	126.00	141.75
	GM	109.12	111.81	115.74	122.00	133.64
	HM	108.00	110.25	113.40	118.13	126.00
95		**126.67**	**133.00**	**142.50**	**158.33**	**190.00**
	AM	110.83	114.00	118.75	126.67	142.50
	GM	109.70	112.41	116.35	122.64	134.35
	HM	108.57	110.83	114.00	118.75	126.67
95.5		**127.33**	**133.70**	**143.25**	**159.17**	**191.00**
	AM	111.42	114.60	119.38	127.33	143.25
	GM	110.27	113.00	116.96	123.29	135.06
	HM	109.14	111.42	114.60	119.38	127.33
96		**128.00**	**134.40**	**144.00**	**160.00**	**192.00**
	AM	112.00	115.20	120.00	128.00	144.00
	GM	110.85	113.59	117.58	123.94	135.76
	HM	109.71	112.00	115.20	120.00	128.00
96.5		**128.67**	**135.10**	**144.75**	**160.83**	**193.00**
	AM	112.58	115.80	120.63	128.67	144.75
	GM	111.43	114.18	118.19	124.58	136.47
	HM	110.29	112.58	115.80	120.63	128.67

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
93' 0"		69' 9"	66' 5 1/8"	62' 0"	55' 9 5/8"	46' 6"
	AM	81' 4 1/2"	79' 8 5/8"	77' 6"	74' 4 3/4"	69' 9"
	GM	80' 6 1/2"	78' 7 1/4"	75' 11 1/4"	72' 1/2"	65' 9 1/8"
	HM	79' 8 5/8"	77' 6"	74' 4 3/4"	69' 9"	62' 0"
93' 6"		70' 1 1/2"	66' 9 3/8"	62' 4"	56' 1 1/4"	46' 9"
	AM	81' 9 3/4"	80' 1 3/4"	77' 11"	74' 9 5/8"	70' 1 1/2"
	GM	80' 11 5/8"	79' 1/4"	76' 4 1/8"	72' 5 1/8"	66' 1 3/8"
	HM	80' 1 3/4"	77' 11"	74' 9 5/8"	70' 1 1/2"	62' 4"
94' 0"		70' 6"	67' 1 3/4"	62' 8"	56' 4 3/4"	47' 0"
	AM	82' 3"	80' 6 7/8"	78' 4"	75' 2 3/8"	70' 6"
	GM	81' 4 7/8"	79' 5 3/8"	76' 9"	72' 9 3/4"	66' 5 5/8"
	HM	80' 6 7/8"	78' 4"	75' 2 3/8"	70' 6"	62' 8"
94' 6"		70' 10 1/2"	67' 6"	63' 0"	56' 8 3/8"	47' 3"
	AM	82' 8 1/4"	81' 0"	78' 9"	75' 7 1/4"	70' 10 1/2"
	GM	81' 10 1/8"	79' 10 3/8"	77' 1 7/8"	73' 2 3/8"	66' 9 7/8"
	HM	81' 0"	78' 9"	75' 7 1/4"	70' 10 1/2"	63' 0"
95' 0"		71' 3"	67' 10 1/4"	63' 4"	57' 0"	47' 6"
	AM	83' 1 1/2"	81' 5 1/8"	79' 2"	76' 0"	71' 3"
	GM	82' 3 1/4"	80' 3 1/2"	77' 6 3/4"	73' 7"	67' 2 1/8"
	HM	81' 5 1/8"	79' 2"	76' 0"	71' 3"	63' 4"
95' 6"		71' 7 1/2"	68' 2 5/8"	63' 8"	57' 3 5/8"	47' 9"
	AM	83' 6 3/4"	81' 10 1/4"	79' 7"	76' 4 3/4"	71' 7 1/2"
	GM	82' 8 1/2"	80' 8 1/2"	77' 11 3/4"	73' 11 3/4"	67' 6 3/8"
	HM	81' 10 1/4"	79' 7"	76' 4 3/4"	71' 7 1/2"	63' 8"
96' 0"		72' 0"	68' 6 7/8"	64' 0"	57' 7 1/4"	48' 0"
	AM	84' 0"	82' 3 3/8"	80' 0"	76' 9 5/8"	72' 0"
	GM	83' 1 5/8"	81' 1 5/8"	78' 4 5/8"	74' 4 3/8"	67' 10 5/8"
	HM	82' 3 3/8"	80' 0"	76' 9 5/8"	72' 0"	64' 0"
96' 6"		72' 4 1/2"	68' 11 1/8"	64' 4"	57' 10 3/4"	48' 3"
	AM	84' 5 1/4"	82' 8 5/8"	80' 5"	77' 2 3/8"	72' 4 1/2"
	GM	83' 6 7/8"	81' 6 3/4"	78' 9 1/2"	74' 9"	68' 2 7/8"
	HM	82' 8 5/8"	80' 5"	77' 2 3/8"	72' 4 1/2"	64' 4"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
93		69.75	66.43	62.00	55.80	46.50
	AM	81.38	79.71	77.50	74.40	69.75
	GM	80.54	78.60	75.93	72.04	65.76
	HM	79.71	77.50	74.40	69.75	62.00
93.5		70.13	66.79	62.33	56.10	46.75
	AM	81.81	80.14	77.92	74.80	70.13
	GM	80.97	79.02	76.34	72.42	66.11
	HM	80.14	77.92	74.80	70.13	62.33
94		70.50	67.14	62.67	56.40	47.00
	AM	82.25	80.57	78.33	75.20	70.50
	GM	81.41	79.44	76.75	72.81	66.47
	HM	80.57	78.33	75.20	70.50	62.67
94.5		70.88	67.50	63.00	56.70	47.25
	AM	82.69	81.00	78.75	75.60	70.88
	GM	81.84	79.87	77.16	73.20	66.82
	HM	81.00	78.75	75.60	70.88	63.00
95		71.25	67.86	63.33	57.00	47.50
	AM	83.13	81.43	79.17	76.00	71.25
	GM	82.27	80.29	77.57	73.59	67.18
	HM	81.43	79.17	76.00	71.25	63.33
95.5		71.63	68.21	63.67	57.30	47.75
	AM	83.56	81.86	79.58	76.40	71.63
	GM	82.71	80.71	77.98	73.97	67.53
	HM	81.86	79.58	76.40	71.63	63.67
96		72.00	68.57	64.00	57.60	48.00
	AM	84.00	82.29	80.00	76.80	72.00
	GM	83.14	81.13	78.38	74.36	67.88
	HM	82.29	80.00	76.80	72.00	64.00
96.5		72.38	68.93	64.33	57.90	48.25
	AM	84.44	82.71	80.42	77.20	72.38
	GM	83.57	81.56	78.79	74.75	68.24
	HM	82.71	80.42	77.20	72.38	64.33

primary room length		secondary room length & different room heights				
		3:4	5:7	2:3	3:5	1:2
97' 0"		**129' 4"**	**135' 9 5/8"**	**145' 6"**	**161' 8"**	**194' 0"**
	AM	113' 2"	116' 4 3/4"	121' 3"	129' 4"	145' 6"
	GM	112' 1/8"	114' 9 1/4"	118' 9 5/8"	125' 2 3/4"	137' 2 1/8"
	HM	110' 10 1/4"	113' 2"	116' 4 3/4"	121' 3"	129' 4"
97' 6"		**130' 0"**	**136' 6"**	**146' 3"**	**162' 6"**	**195' 0"**
	AM	113' 9"	117' 0"	121' 10 1/2"	130' 0"	146' 3"
	GM	112' 7"	115' 4 3/8"	119' 5"	125' 10 1/2"	137' 10 5/8"
	HM	111' 5 1/8"	113' 9"	117' 0"	121' 10 1/2"	130' 0"
98' 0"		**130' 8"**	**137' 2 3/8"**	**147' 0"**	**163' 4"**	**196' 0"**
	AM	114' 4"	117' 7 1/4"	122' 6"	130' 8"	147' 0"
	GM	113' 1 7/8"	115' 11 1/2"	120' 1/4"	126' 6 1/4"	138' 7 1/8"
	HM	112' 0"	114' 4"	117' 7 1/4"	122' 6"	130' 8"
98' 6"		**131' 4"**	**137' 10 3/4"**	**147' 9"**	**164' 2"**	**197' 0"**
	AM	114' 11"	118' 2 3/8"	123' 1 1/2"	131' 4"	147' 9"
	GM	113' 8 7/8"	116' 6 1/2"	120' 7 5/8"	127' 2"	139' 3 5/8"
	HM	112' 6 7/8"	114' 11"	118' 2 3/8"	123' 1 1/2"	131' 4"
99' 0"		**132' 0"**	**138' 7 1/4"**	**148' 6"**	**165' 0"**	**198' 0"**
	AM	115' 6"	118' 9 5/8"	123' 9"	132' 0"	148' 6"
	GM	114' 3 3/4"	117' 1 5/8"	121' 3"	127' 9 3/4"	140' 1/8"
	HM	113' 1 3/4"	115' 6"	118' 9 5/8"	123' 9"	132' 0"
99' 6"		**132' 8"**	**139' 3 5/8"**	**149' 3"**	**165' 10"**	**199' 0"**
	AM	116' 1"	119' 4 3/4"	124' 4 1/2"	132' 8"	149' 3"
	GM	114' 10 3/4"	117' 8 3/4"	121' 10 3/8"	128' 5 1/2"	140' 8 5/8"
	HM	113' 8 5/8"	116' 1"	119' 4 3/4"	124' 4 1/2"	132' 8"
100' 0"		**133' 4"**	**140' 0"**	**150' 0"**	**166' 8"**	**200' 0"**
	AM	116' 8"	120' 0"	125' 0"	133' 4"	150' 0"
	GM	115' 5 5/8"	118' 3 7/8"	122' 5 3/4"	129' 1 1/4"	141' 5"
	HM	114' 3 3/8"	116' 8"	120' 0"	125' 0"	133' 4"
100' 6"		**134' 0"**	**140' 8 3/8"**	**150' 9"**	**167' 6"**	**201' 0"**
	AM	117' 3"	120' 7 1/4"	125' 7 1/2"	134' 0"	150' 9"
	GM	116' 5/8"	118' 11"	123' 1"	129' 9"	142' 1 1/2"
	HM	114' 10 1/4"	117' 3"	120' 7 1/4"	125' 7 1/2"	134' 0"

primary room length		decimal equivalent values				
		3:4	5:7	2:3	3:5	1:2
97		**129.33**	**135.80**	**145.50**	**161.67**	**194.00**
	AM	113.17	116.40	121.25	129.33	145.50
	GM	112.01	114.77	118.80	125.23	137.18
	HM	110.86	113.17	116.40	121.25	129.33
97.5		**130.00**	**136.50**	**146.25**	**162.50**	**195.00**
	AM	113.75	117.00	121.88	130.00	146.25
	GM	112.58	115.36	119.41	125.87	137.89
	HM	111.43	113.75	117.00	121.88	130.00
98		**130.67**	**137.20**	**147.00**	**163.33**	**196.00**
	AM	114.33	117.60	122.50	130.67	147.00
	GM	113.16	115.96	120.02	126.52	138.59
	HM	112.00	114.33	117.60	122.50	130.67
98.5		**131.33**	**137.90**	**147.75**	**164.17**	**197.00**
	AM	114.92	118.20	123.13	131.33	147.75
	GM	113.74	116.55	120.64	127.16	139.30
	HM	112.57	114.92	118.20	123.13	131.33
99		**132.00**	**138.60**	**148.50**	**165.00**	**198.00**
	AM	115.50	118.80	123.75	132.00	148.50
	GM	114.32	117.14	121.25	127.81	140.01
	HM	113.14	115.50	118.80	123.75	132.00
99.5		**132.67**	**139.30**	**149.25**	**165.83**	**199.00**
	AM	116.08	119.40	124.38	132.67	149.25
	GM	114.89	117.73	121.86	128.45	140.71
	HM	113.71	116.08	119.40	124.38	132.67
100		**133.33**	**140.00**	**150.00**	**166.67**	200.00
	AM	116.67	120.00	125.00	133.33	150.00
	GM	115.47	118.32	122.47	129.10	141.42
	HM	114.29	116.67	120.00	125.00	133.33
100.5		**134.00**	**140.70**	**150.75**	**167.50**	**201.00**
	AM	117.25	120.60	125.63	134.00	150.75
	GM	116.05	118.91	123.09	129.74	142.13
	HM	114.86	117.25	120.60	125.63	134.00

primary room length		secondary room length & different room heights				
		4:3	7:5	3:2	5:3	2:1
97' 0"		**72' 9"**	**69' 3 3/8"**	**64' 8"**	**58' 2 3/8"**	**48' 6"**
	AM	84' 10 1/2"	83' 1 3/4"	80' 10"	77' 7 1/4"	72' 9"
	GM	84' 0"	81' 11 3/4"	79' 2 3/8"	75' 1 5/8"	68' 7 1/8"
	HM	83' 1 3/4"	80' 10"	77' 7 1/4"	72' 9"	64' 8"
97' 6"		**73' 1 1/2"**	**69' 7 3/4"**	**65' 0"**	**58' 6"**	**48' 9"**
	AM	85' 3 3/4"	83' 6 7/8"	81' 3"	78' 0"	73' 1 1/2"
	GM	84' 5 1/4"	82' 4 7/8"	79' 7 1/4"	75' 6 1/4"	68' 11 3/8"
	HM	83' 6 7/8"	81' 3"	78' 0"	73' 1 1/2"	65' 0"
98' 0"		**73' 6"**	**70' 0"**	**65' 4"**	**58' 9 5/8"**	**49' 0"**
	AM	85' 9"	84' 0"	81' 8"	78' 4 3/4"	73' 6"
	GM	84' 10 1/2"	82' 9 7/8"	80' 1/4"	75' 10 7/8"	69' 3 1/2"
	HM	84' 0"	81' 8"	78' 4 3/4"	73' 6"	65' 4"
98' 6"		**73' 10 1/2"**	**70' 4 1/4"**	**65' 8"**	**59' 1 1/4"**	**49' 3"**
	AM	86' 2 1/4"	84' 5 1/8"	82' 1"	78' 9 5/8"	73' 10 1/2"
	GM	85' 3 5/8"	83' 3"	80' 5 1/8"	76' 3 5/8"	69' 7 3/4"
	HM	84' 5 1/8"	82' 1"	78' 9 5/8"	73' 10 1/2"	65' 8"
99' 0"		**74' 3"**	**70' 8 5/8"**	**66' 0"**	**59' 4 3/4"**	**49' 6"**
	AM	86' 7 1/2"	84' 10 1/4"	82' 6"	79' 2 3/8"	74' 3"
	GM	85' 8 7/8"	83' 8"	80' 10"	76' 8 1/4"	70' 0"
	HM	84' 10 1/4"	82' 6"	79' 2 3/8"	74' 3"	66' 0"
99' 6"		**74' 7 1/2"**	**71' 7/8"**	**66' 4"**	**59' 8 3/8"**	**49' 9"**
	AM	87' 3/4"	85' 3 3/8"	82' 11"	79' 7 1/4"	74' 7 1/2"
	GM	86' 2"	84' 1 1/8"	81' 2 7/8"	77' 7/8"	70' 4 1/4"
	HM	85' 3 3/8"	82' 11"	79' 7 1/4"	74' 7 1/2"	66' 4"
100' 0"		**75' 0"**	**71' 5 1/8"**	**66' 8"**	**60' 0"**	**50' 0"**
	AM	87' 6"	85' 8 5/8"	83' 4"	80' 0"	75' 0"
	GM	86' 7 1/4"	84' 6 1/8"	81' 7 3/4"	77' 5 1/2"	70' 8 1/2"
	HM	85' 8 5/8"	83' 4"	80' 0"	75' 0"	66' 8"
100' 6"		**75' 4 1/2"**	**71' 9 3/8"**	**67' 0"**	**60' 3 5/8"**	**50' 3"**
	AM	87' 11 1/4"	86' 1 3/4"	83' 9"	80' 4 3/4"	75' 4 1/2"
	GM	87' 3/8"	84' 11 1/4"	82' 3/4"	77' 10 1/8"	71' 3/4"
	HM	86' 1 3/4"	83' 9"	80' 4 3/4"	75' 4 1/2"	67' 0"

primary room length		decimal equivalent values				
		4:3	7:5	3:2	5:3	2:1
97		**72.75**	**69.29**	**64.67**	**58.20**	**48.50**
	AM	84.88	83.14	80.83	77.60	72.75
	GM	84.00	81.98	79.20	75.14	68.59
	HM	83.14	80.83	77.60	72.75	64.67
97.5		**73.13**	**69.64**	**65.00**	**58.50**	**48.75**
	AM	85.31	83.57	81.25	78.00	73.13
	GM	84.44	82.40	79.61	75.52	68.94
	HM	83.57	81.25	78.00	73.13	65.00
98		**73.50**	**70.00**	**65.33**	**58.80**	**49.00**
	AM	85.75	84.00	81.67	78.40	73.50
	GM	84.87	82.83	80.02	75.91	69.30
	HM	84.00	81.67	78.40	73.50	65.33
98.5		**73.88**	**70.36**	**65.67**	**59.10**	**49.25**
	AM	86.19	84.43	82.08	78.80	73.88
	GM	85.30	83.25	80.42	76.30	69.65
	HM	84.43	82.08	78.80	73.88	65.67
99		**74.25**	**70.71**	**66.00**	**59.40**	**49.50**
	AM	86.63	84.86	82.50	79.20	74.25
	GM	85.74	83.67	80.83	76.69	70.00
	HM	84.86	82.50	79.20	74.25	66.00
99.5		**74.63**	**71.07**	**66.33**	**59.70**	**49.75**
	AM	87.06	85.29	82.92	79.60	74.63
	GM	86.17	84.09	81.24	77.07	70.36
	HM	85.29	82.92	79.60	74.63	66.33
100		**75.00**	**71.43**	**66.67**	**60.00**	**50.00**
	AM	87.50	85.71	83.33	80.00	75.00
	GM	86.60	84.52	81.65	77.46	70.71
	HM	85.71	83.33	80.00	75.00	66.67
100.5		**75.38**	**71.79**	**67.00**	**60.30**	**50.25**
	AM	87.94	86.14	83.75	80.40	75.38
	GM	87.04	84.94	82.06	77.85	71.06
	HM	86.14	83.75	80.40	75.38	67.00

APPENDIX 4: PLATES OF BOOK TWO, *'I QUATTRO LIBRI DELL' ARCHITETTURA'*

4.1 Notes on documentation of Palladian plates:

This part documents the plates of *' I Quattro Libri Dell' Architettura' book two* in their entirety in original form from Adolf K. Placzek's (Dover Publication) translation with addition of foot notes for clarity of drawings in the format described earlier. As observed it has to be noted here that plates in both the publications {Robert Tavernor and Richard Schofield (The MIT Press Edition) and Adolf K. Placzek's (Dover Publication)} are mirror images along vertical axis. Refraining from ideological, theoretical and analytical debate of its authenticity, presented here are the plates from Dover publication for its print clarity.

For ease in referring; each plate from book two is numbered and titled (which is missing in Palladio's presentation of plates) on the basis of references available from Palladio's commentary on the same in book two.

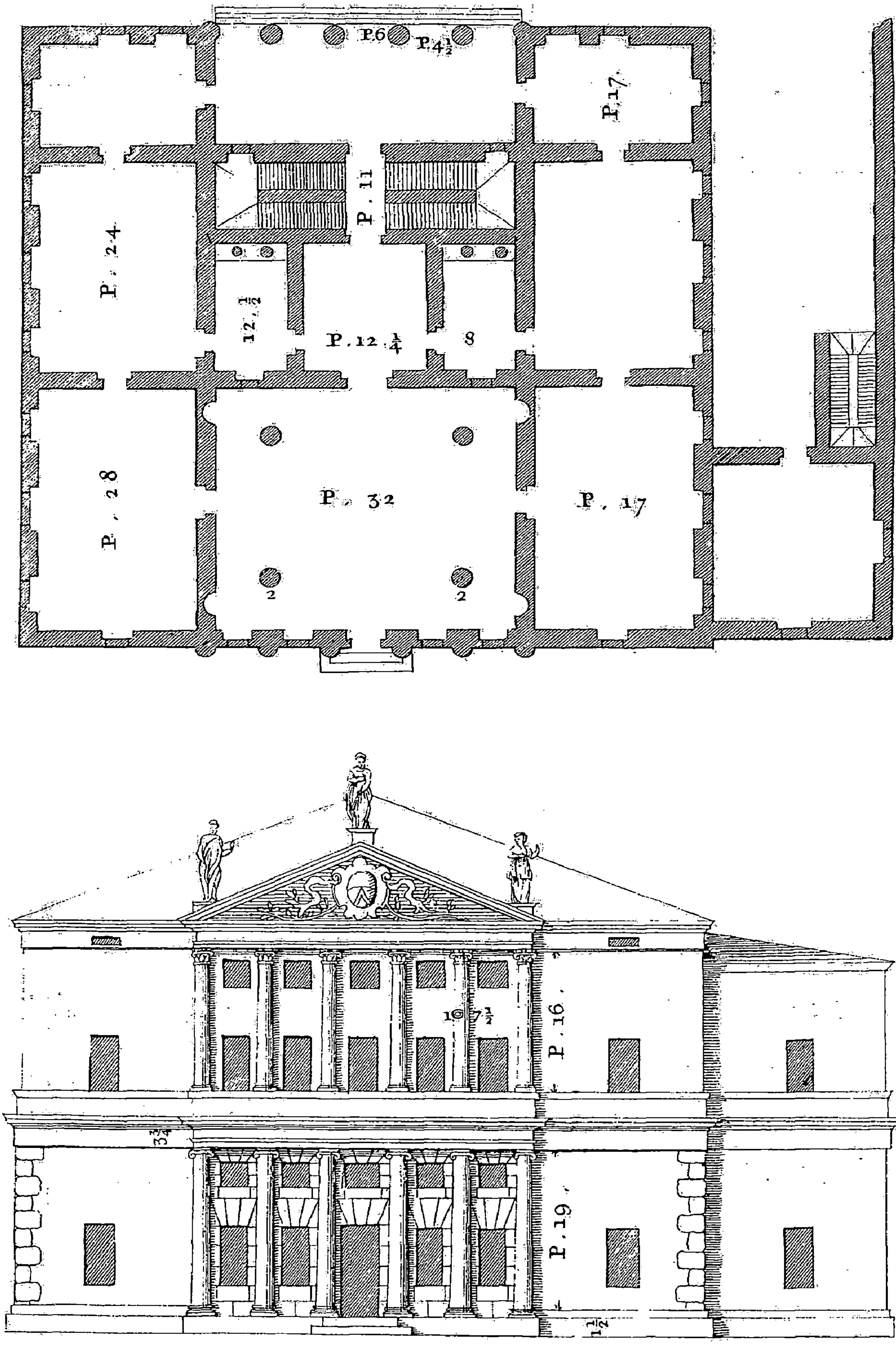
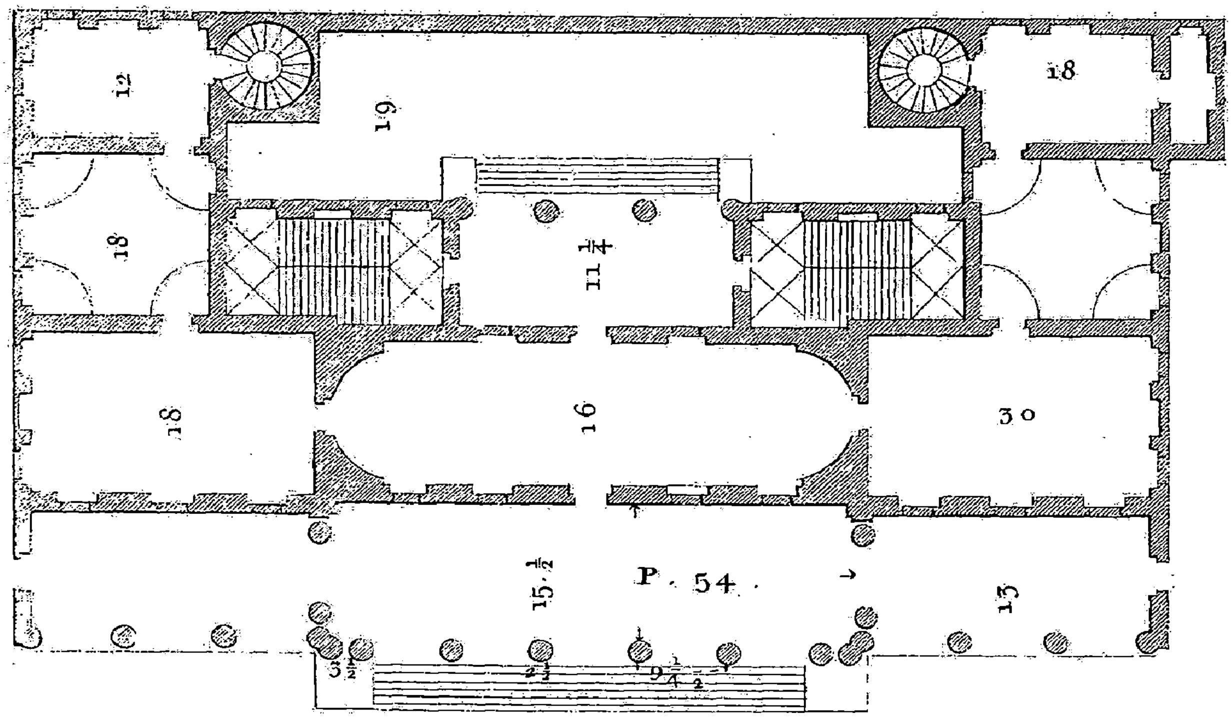


Plate 01 Palazzo Florino Antonini in Udine Ground plan and elevation



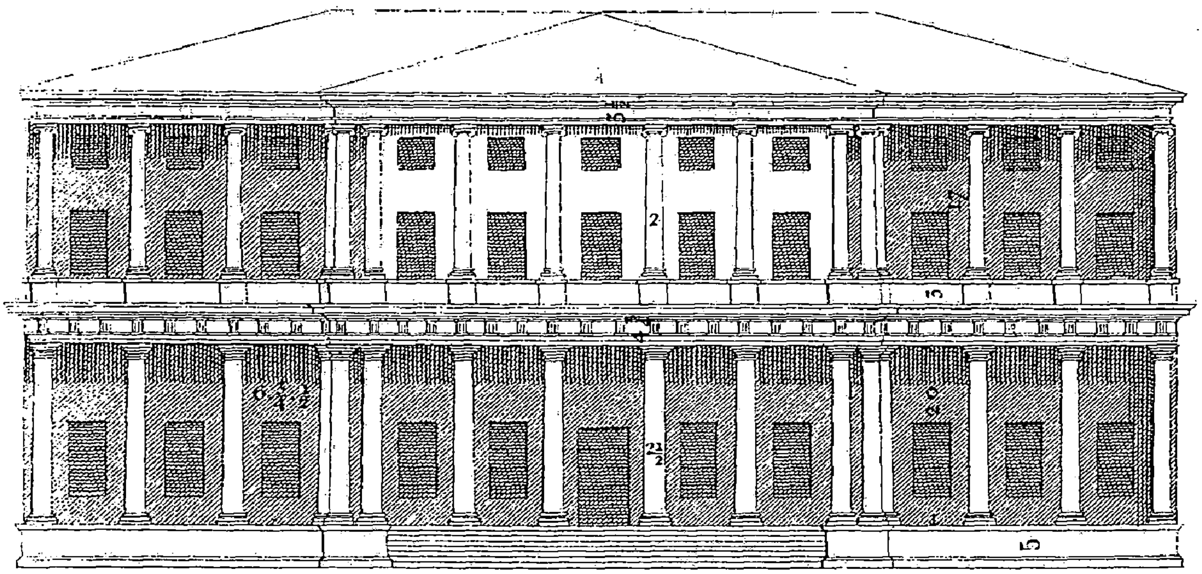


Plate 02 Palazzo Chierirati at Vincenza Ground plan and elevation

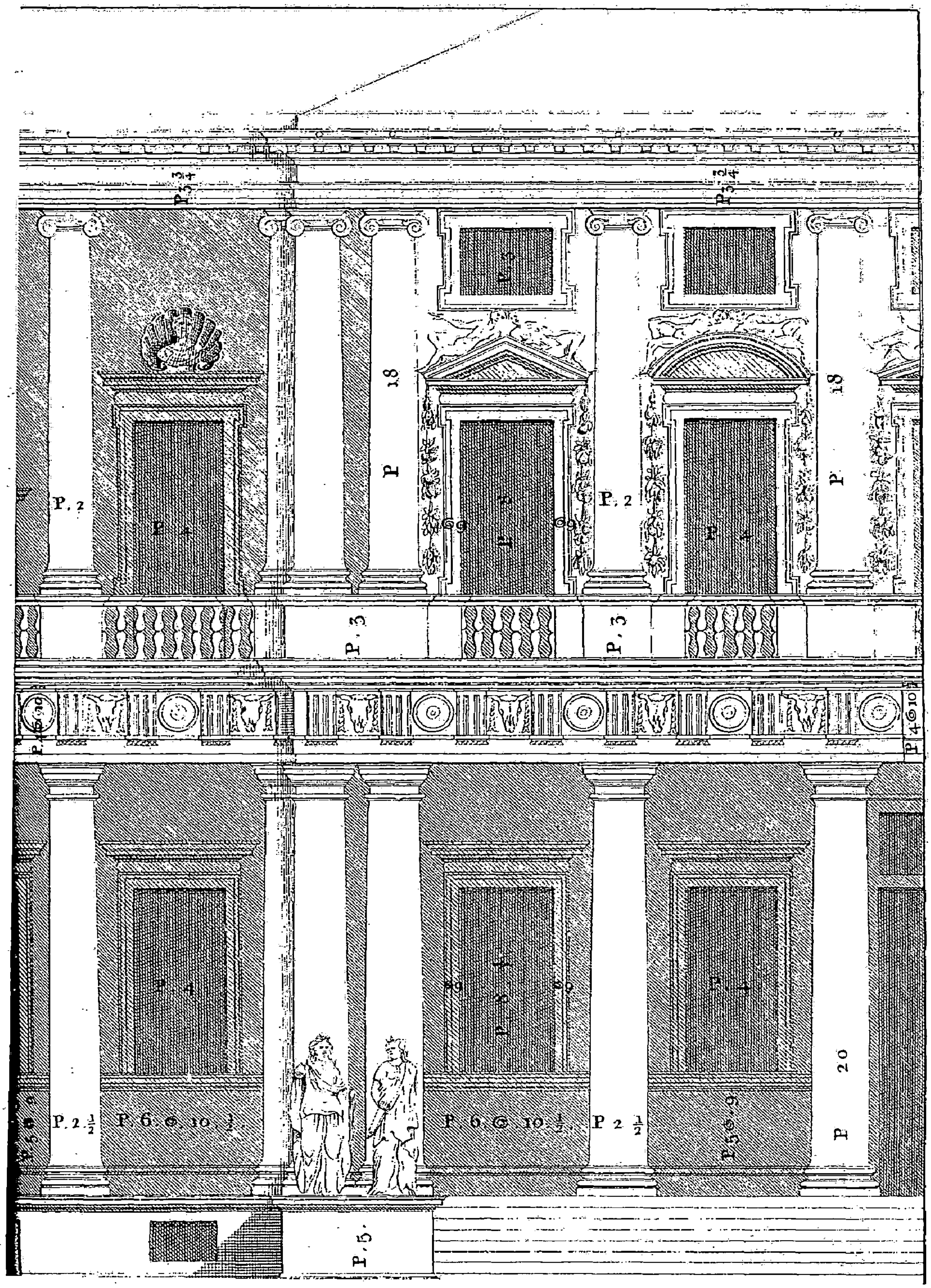
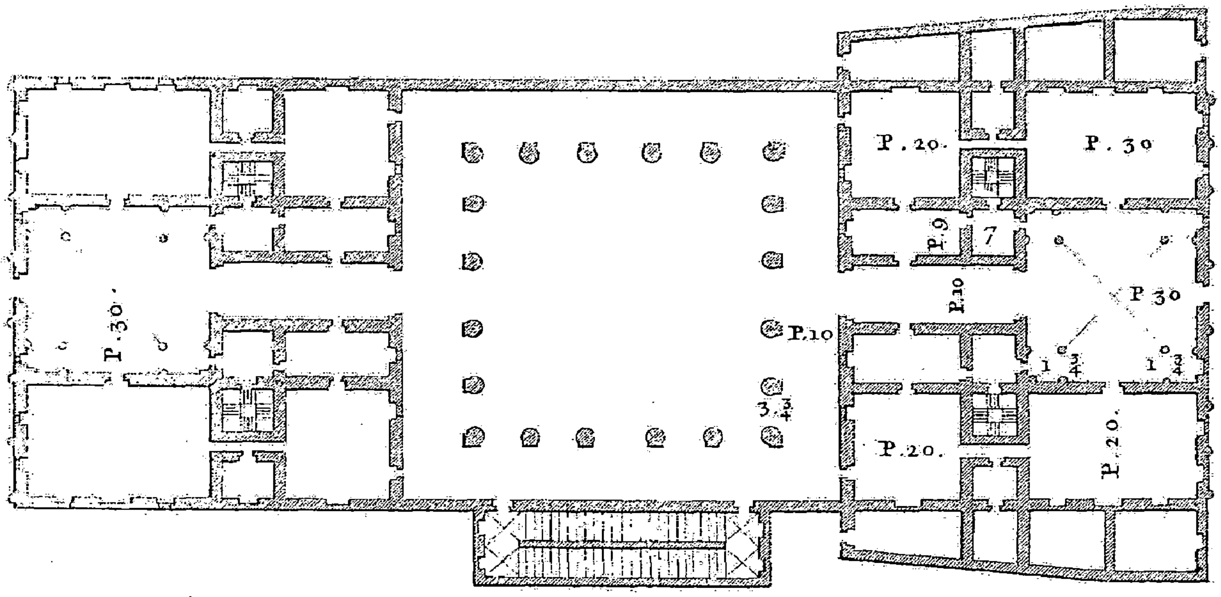


Plate 03 Palazzo Chierirati at Vincenza Part elevation of the facade

IV.



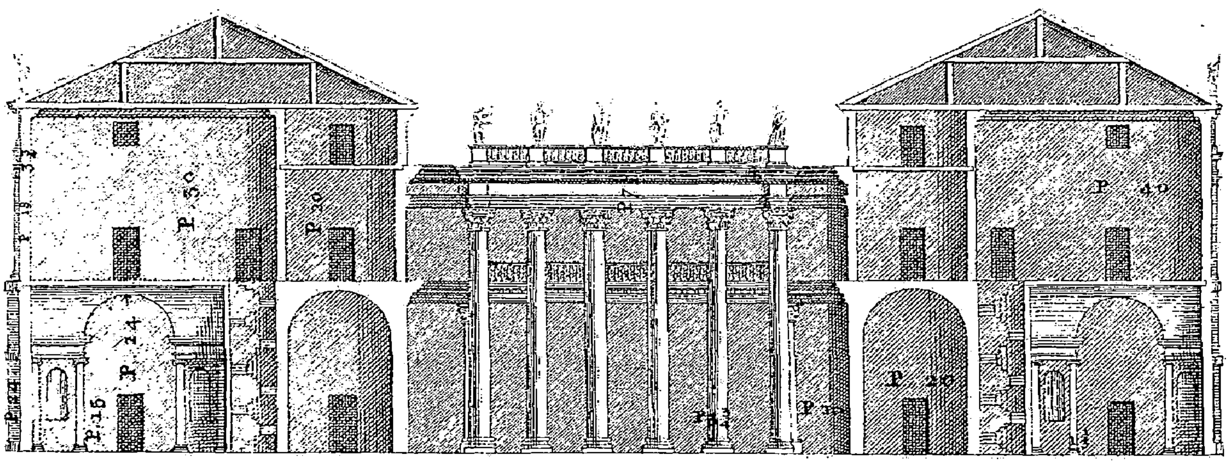


Plate 04 Palazzo Iseppo de' Porti at Vicenza ground plan and long section

V.

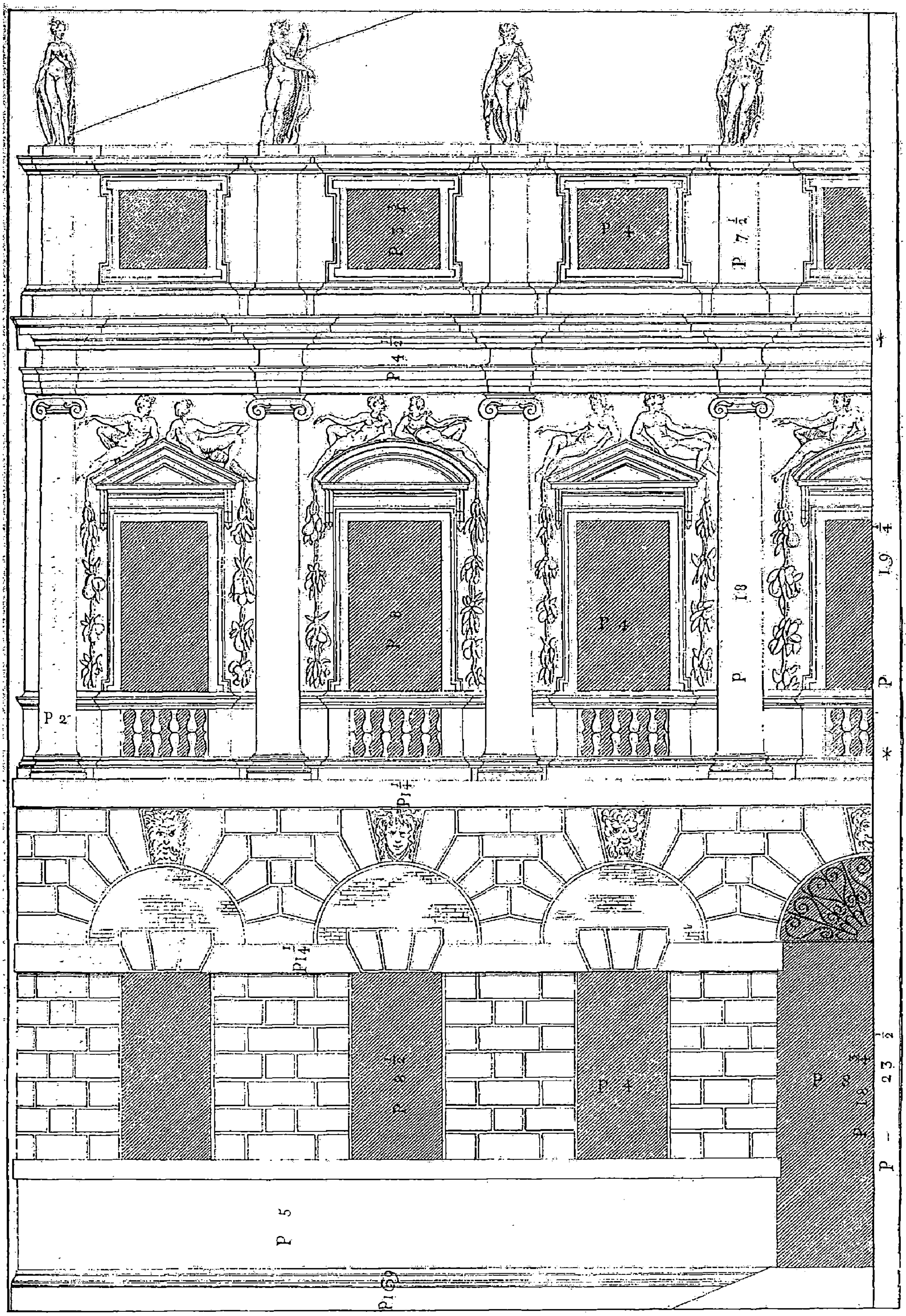


Plate 05 Palazzo Iseppo de' Porti at Vicenza Half of the main elevation

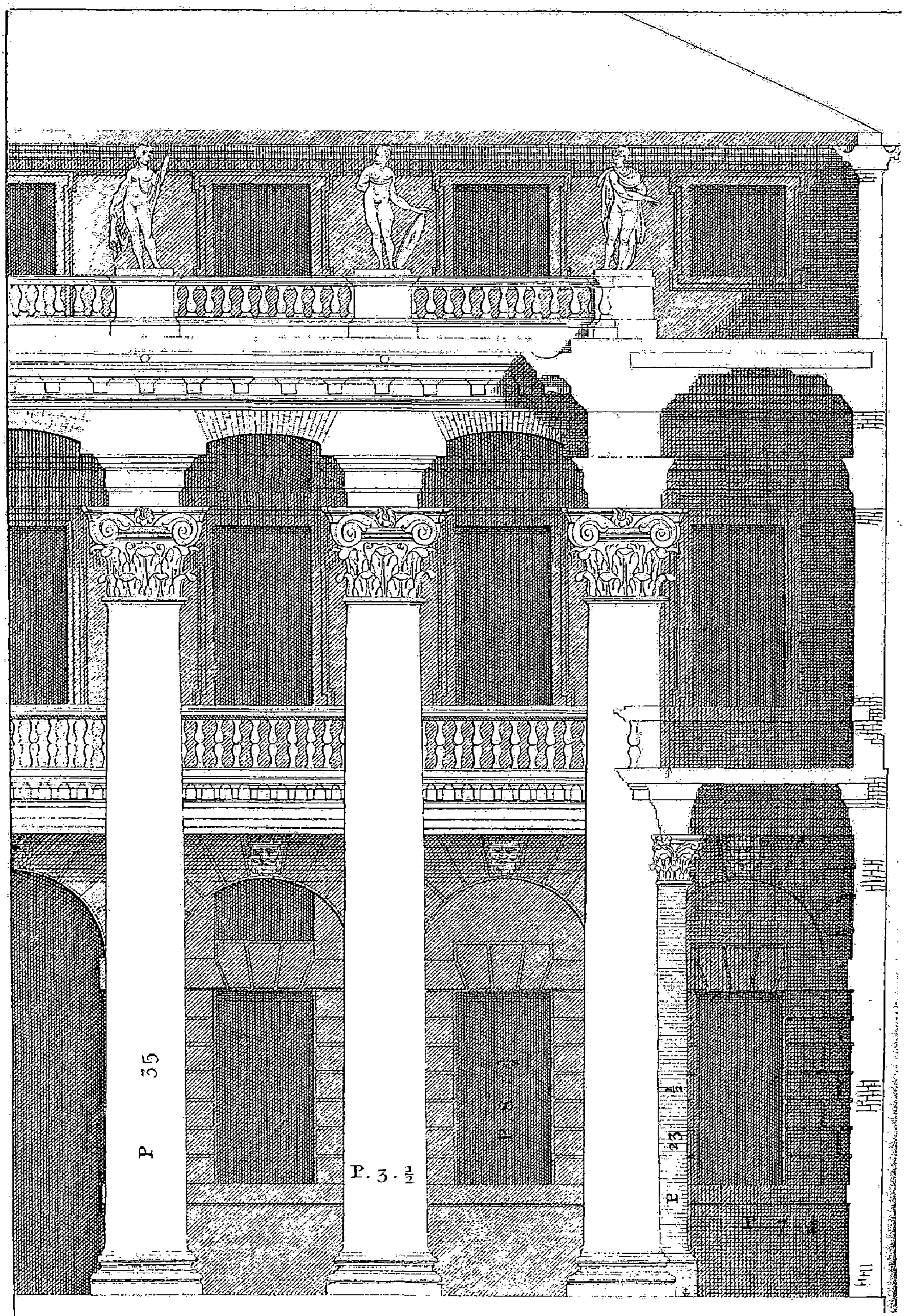


Plate 06 Palazzo Iseppo de' Porti at Vicenza

VII.

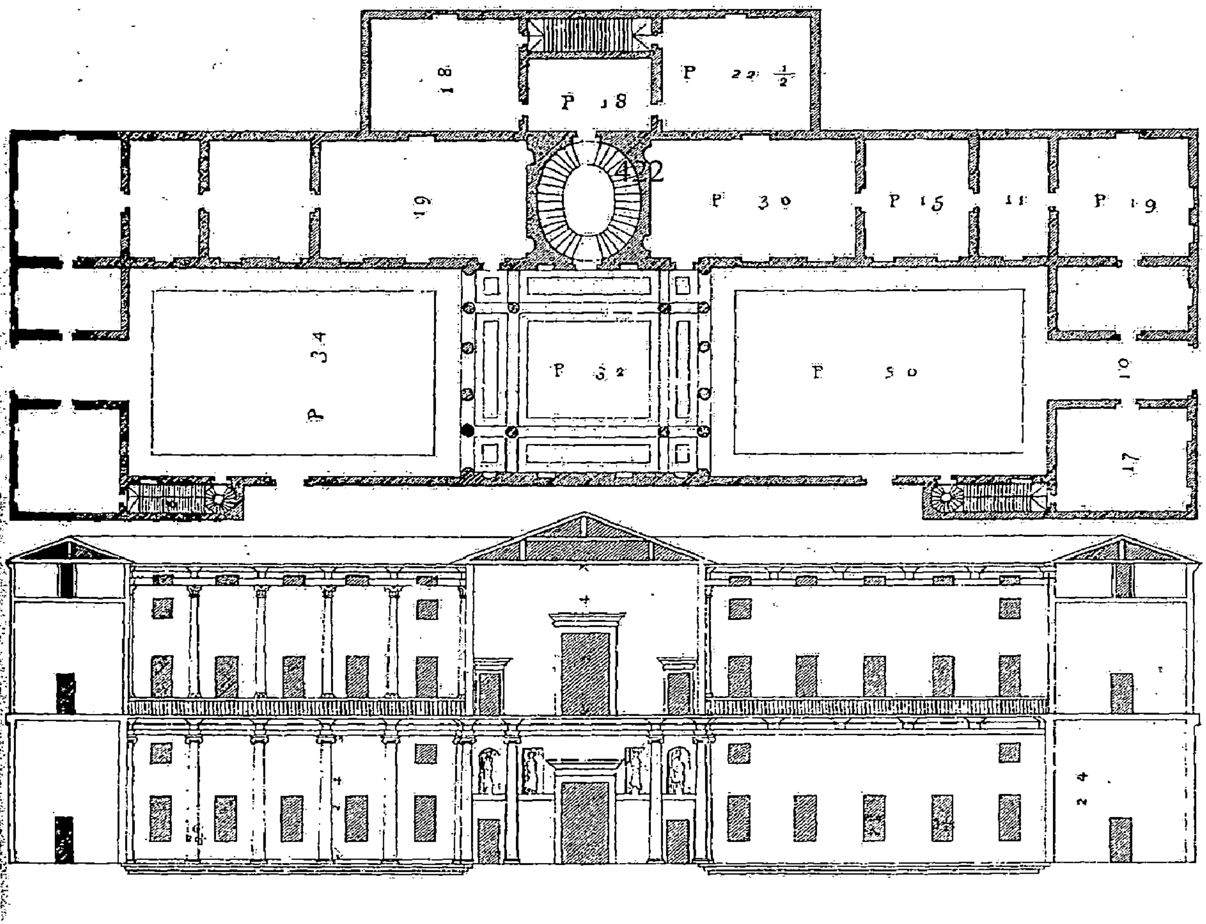


Plate 07 Palazzo Giovanni Battista Della Torre at Verona in plan and cross section

VIII.

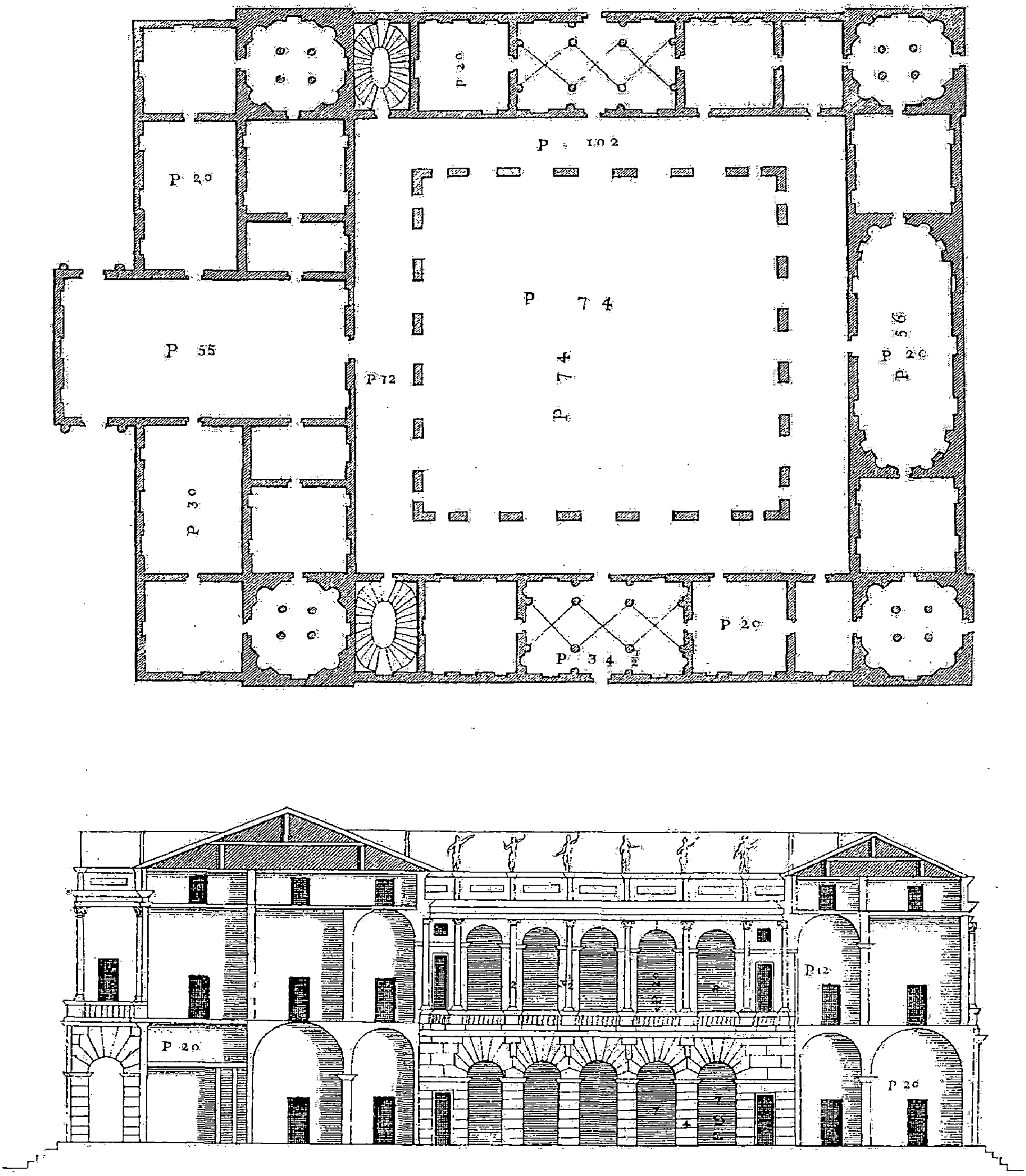


Plate 08 Palazzo Ottavio de' Thiene at Vicenza ground plan and sectional elevation

IX

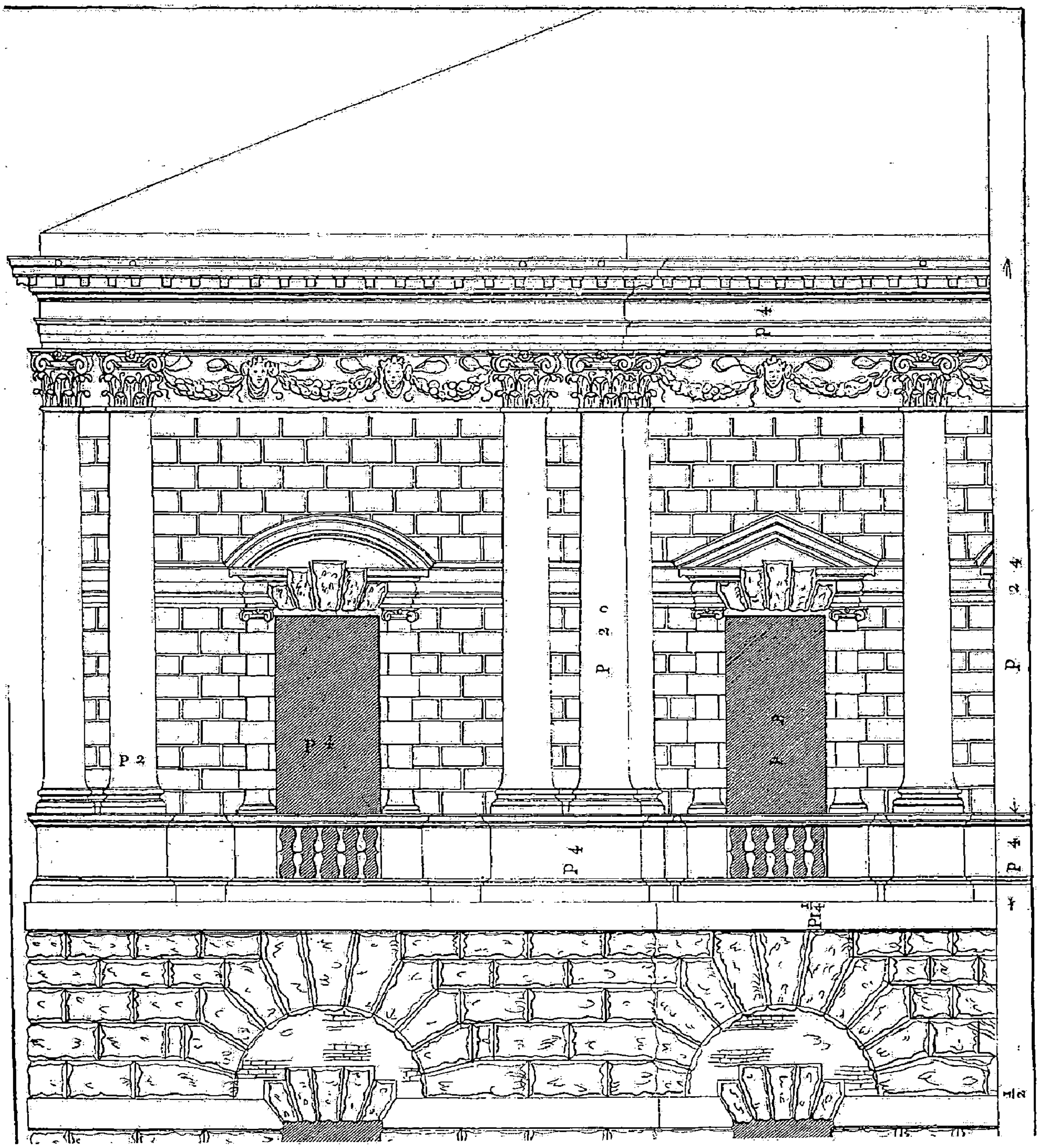


Plate 09 Palazzo Ottavio de' Thiene at Vicenza Part elevation of the end bays

X.

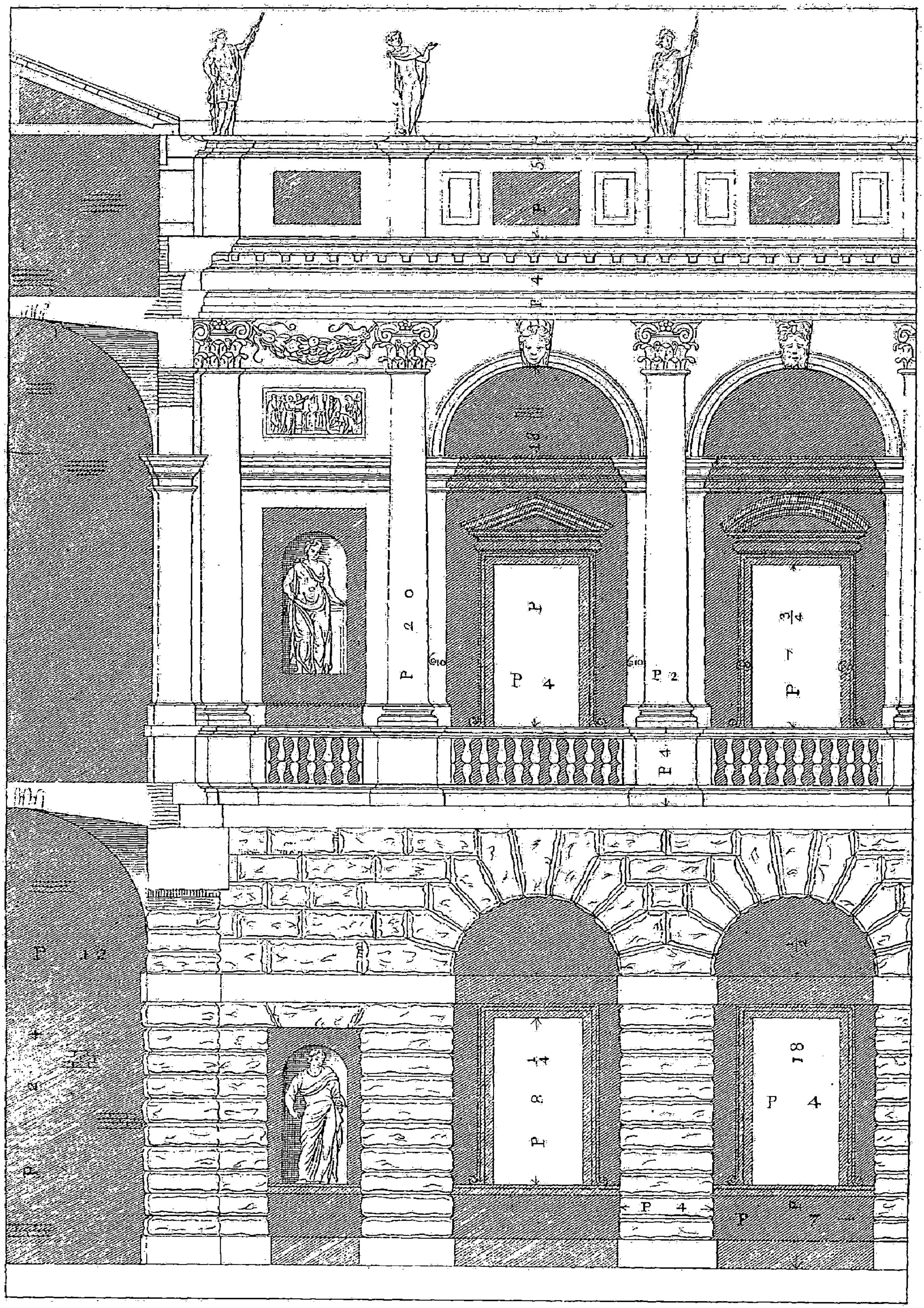


Plate 10 Palazzo Ottavio de' Thiene at Vicenza Part sectional elevation of the courtyard

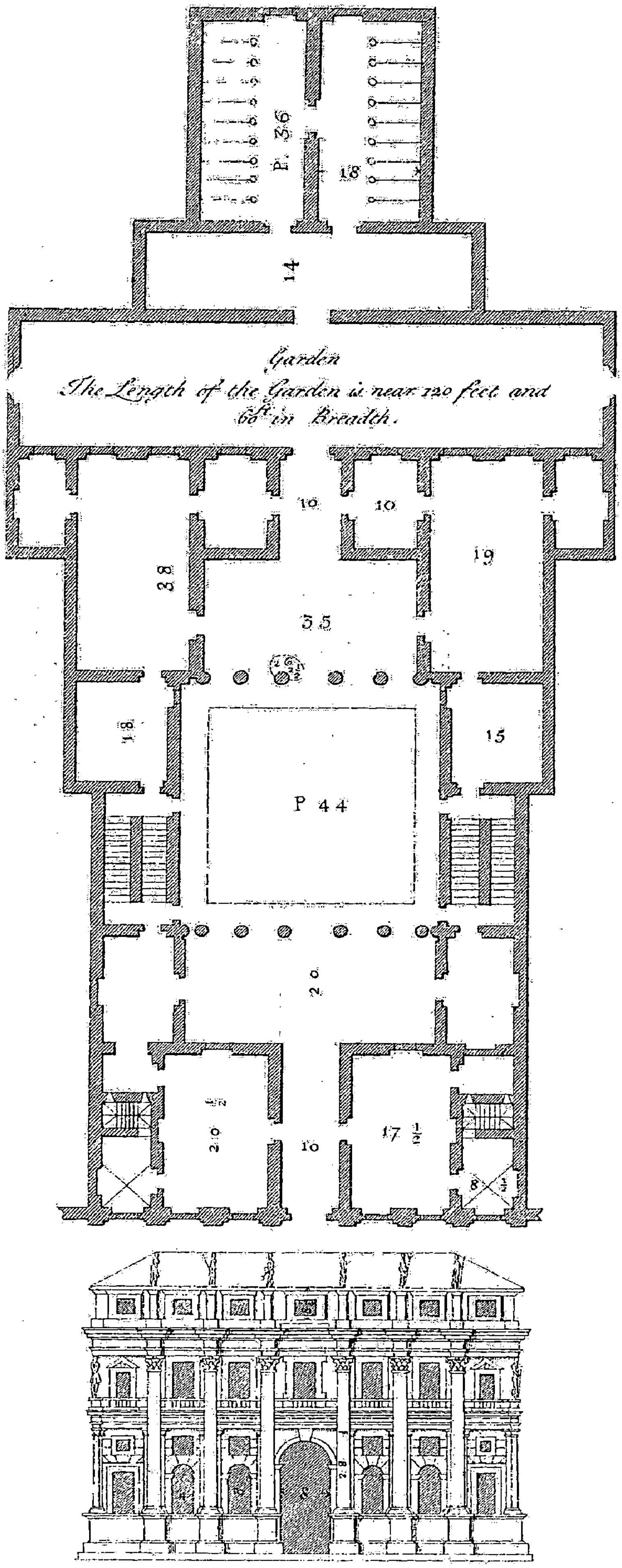


Plate 11 Palazzo Valmarana at Vicenza in plan and elevation

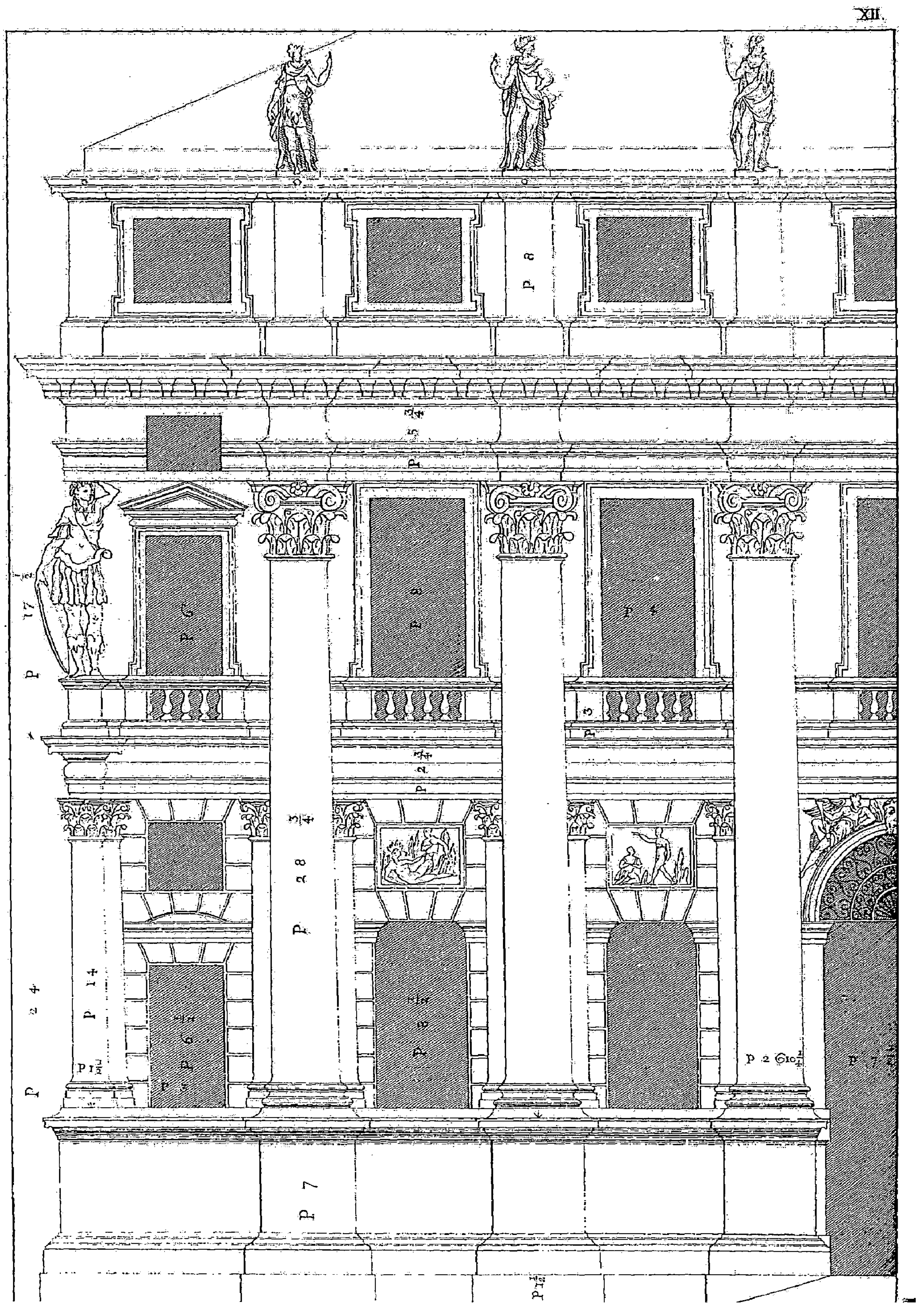


Plate 12 Palazzo Valmarana at Vicenza Half of the main elevation

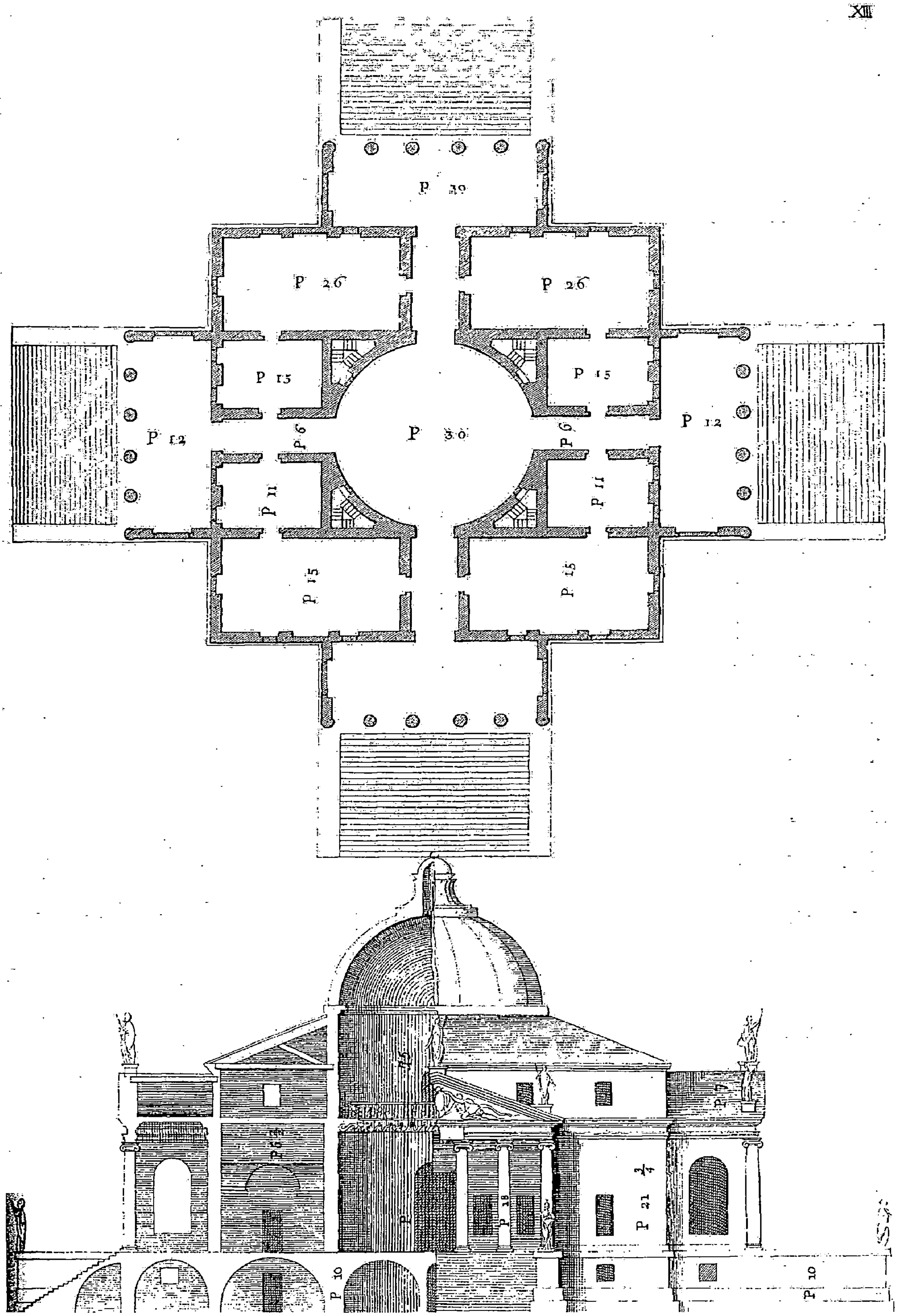


Plate 13 Villa Paolo Almerico near Vicenza in plan and half-elevation half-section

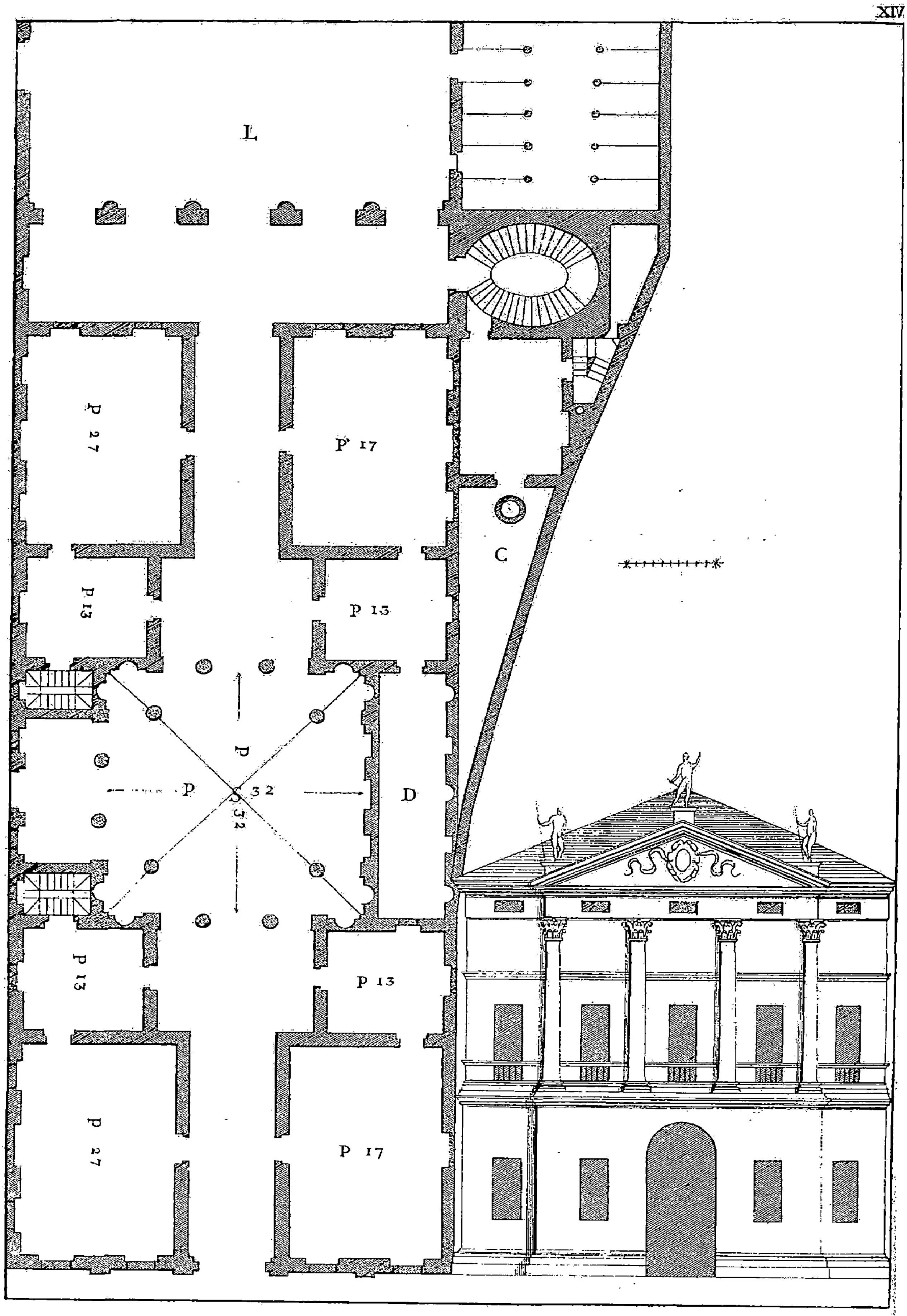


Plate 14 Palazzo Giulio Capra at Vicenza in plan and elevation

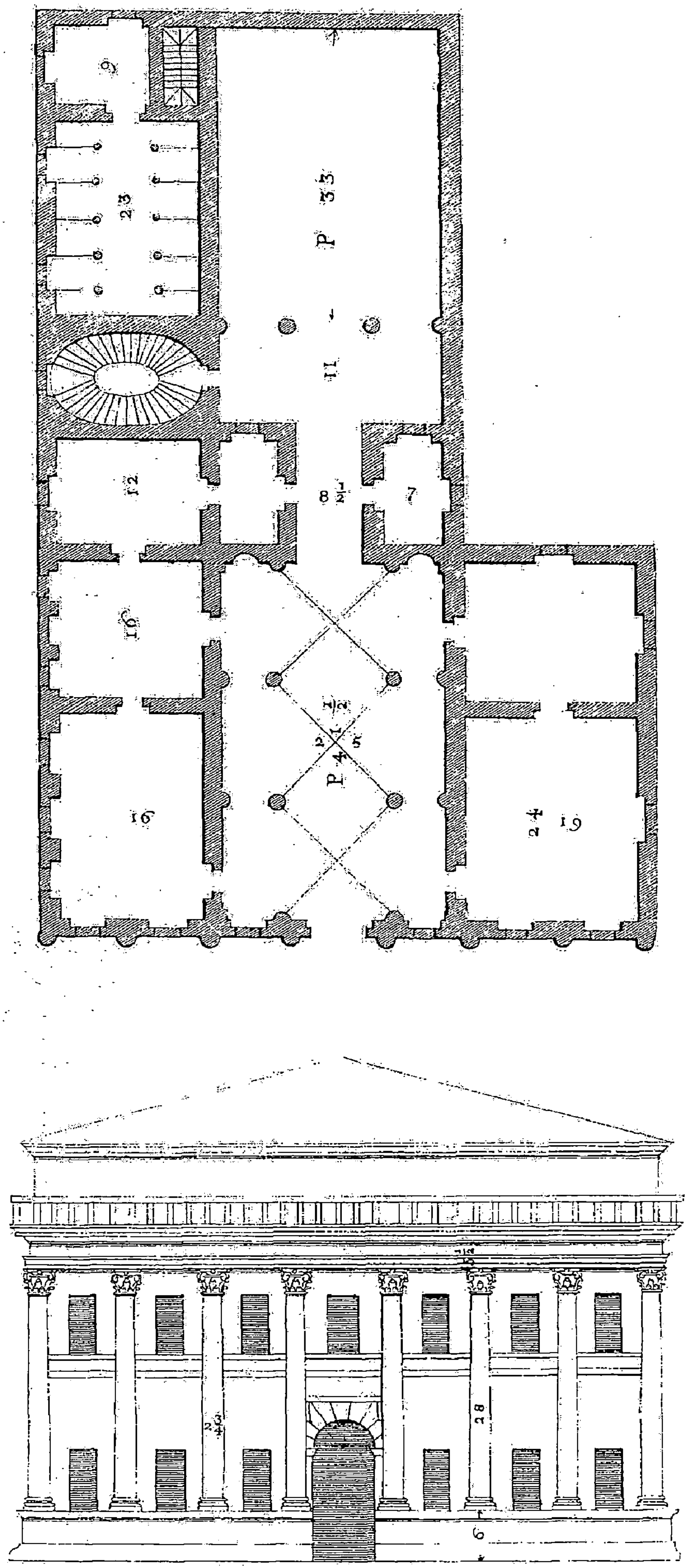


Plate 15 Palazzo Montano Barbarano at Vicenza in plan and elevation

XVI.

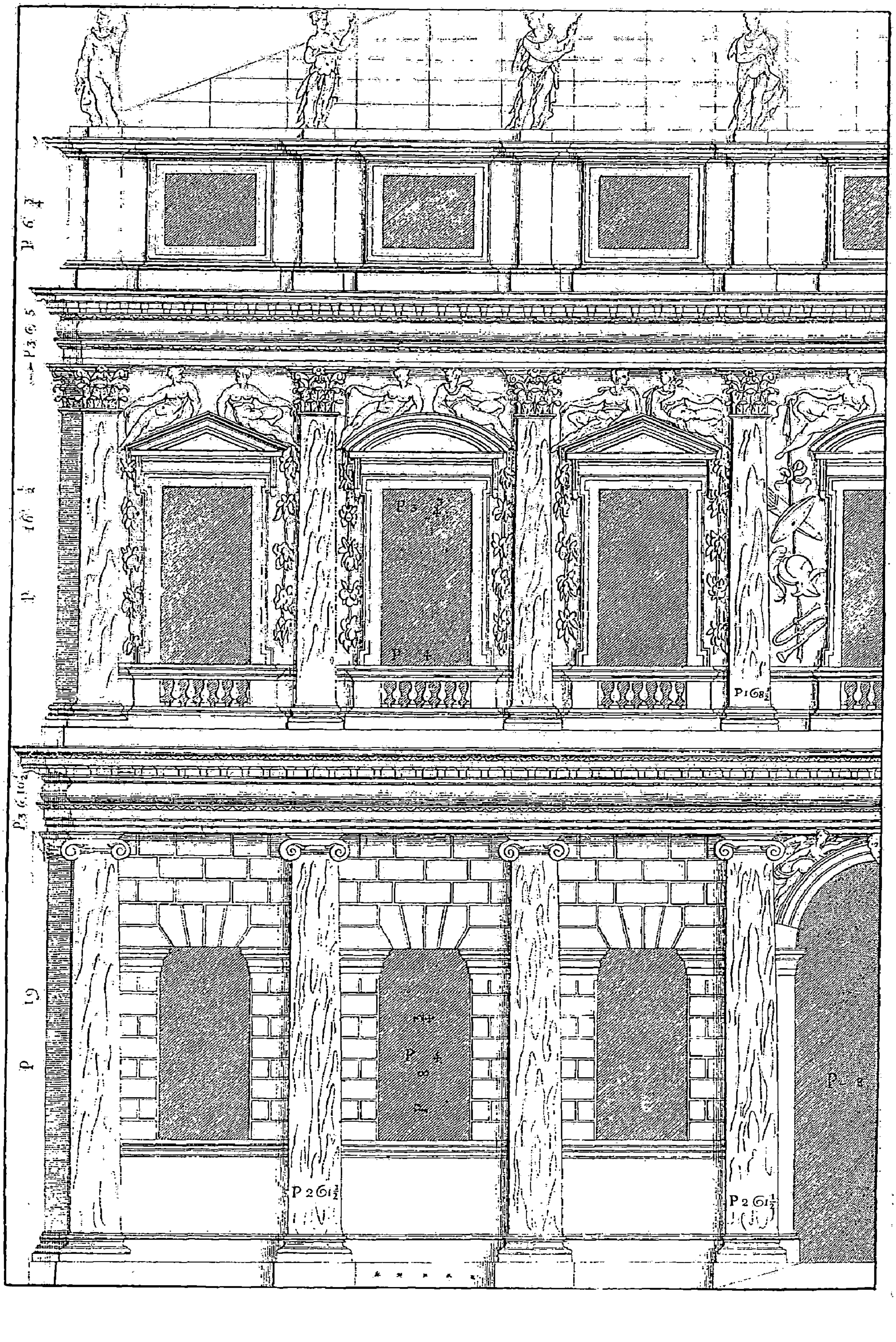


Plate 16 Palazzo Montano Barbarano at Vicenza Half of the main elevation

XVII.

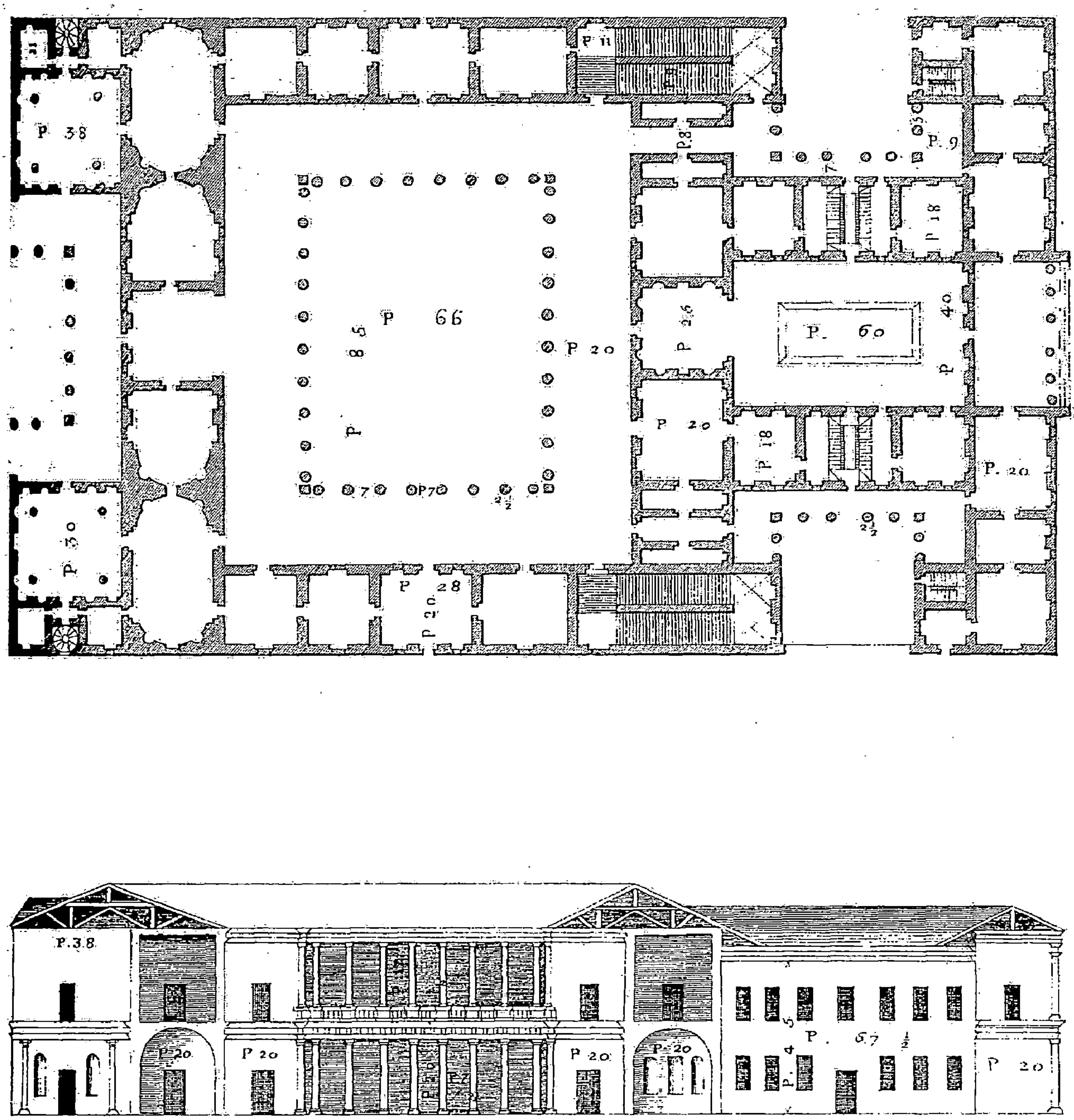


Plate 17 The Tuscan atrium House of the ancients in plan and long section

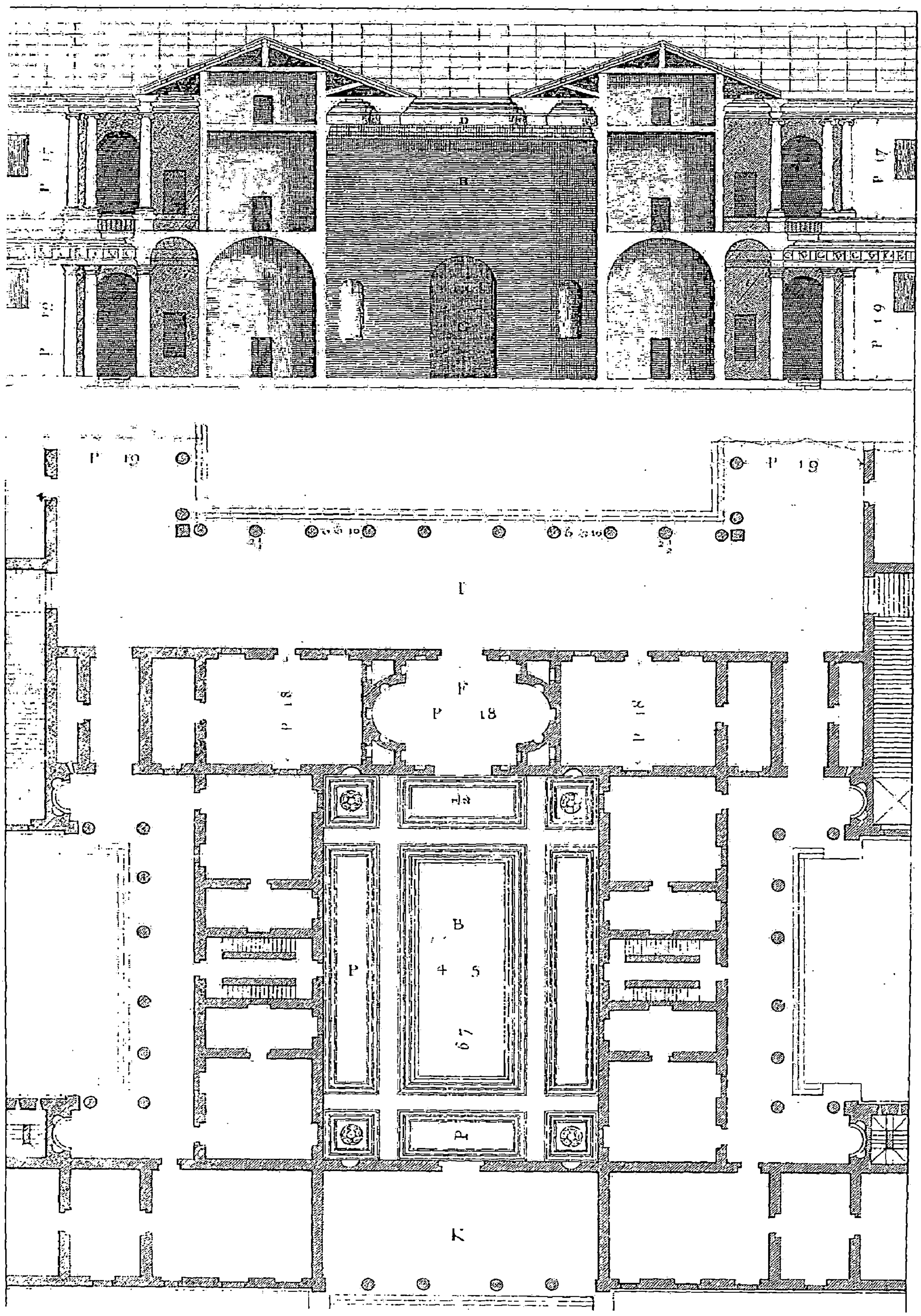


Plate 18 The Tuscan atrium in plan and elevation section

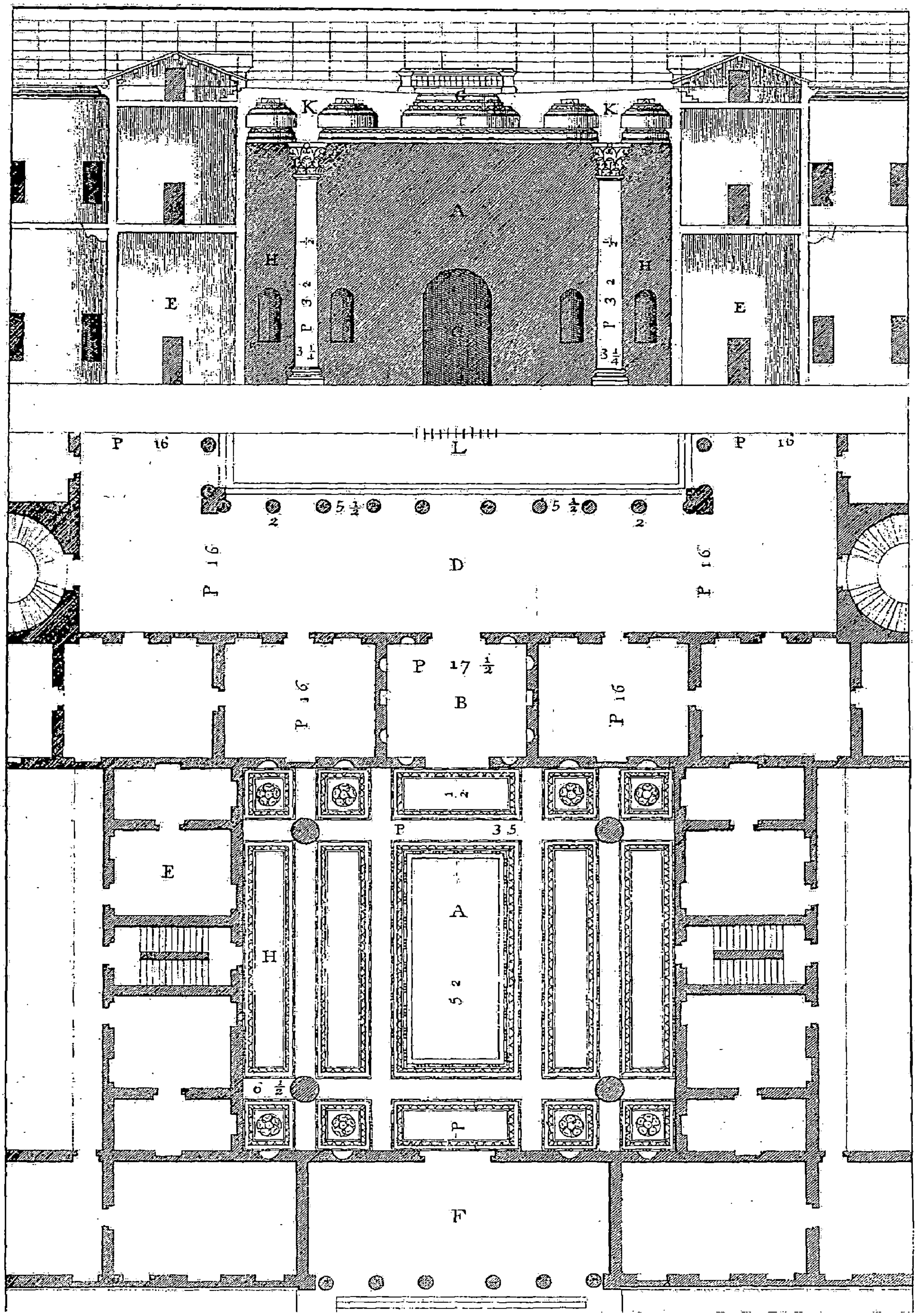


Plate 19 The atrium with four columns in plan and elevation

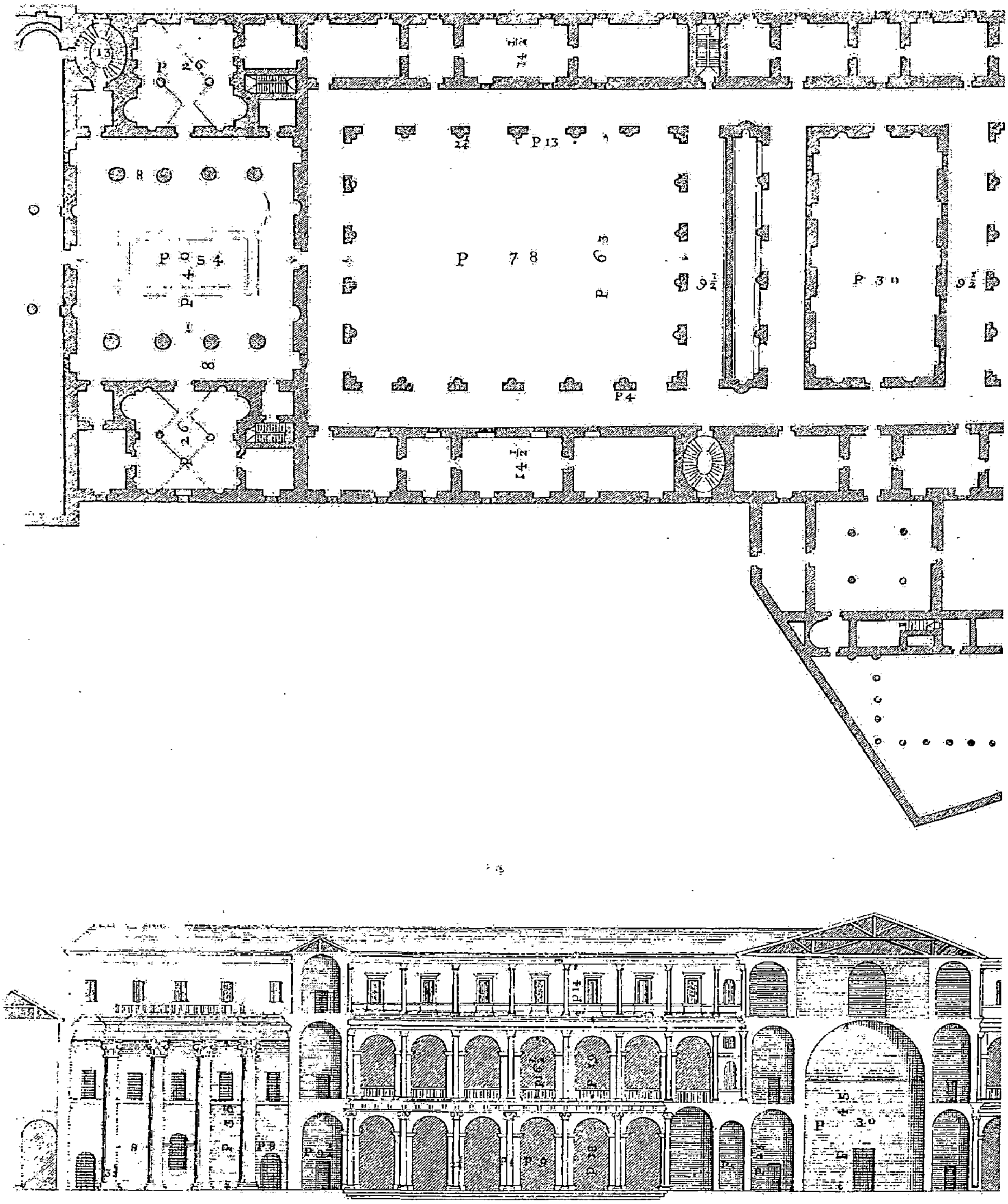


Plate 20 The Corinthian Atrium The Convent of the Carita at Venice in plan and long section

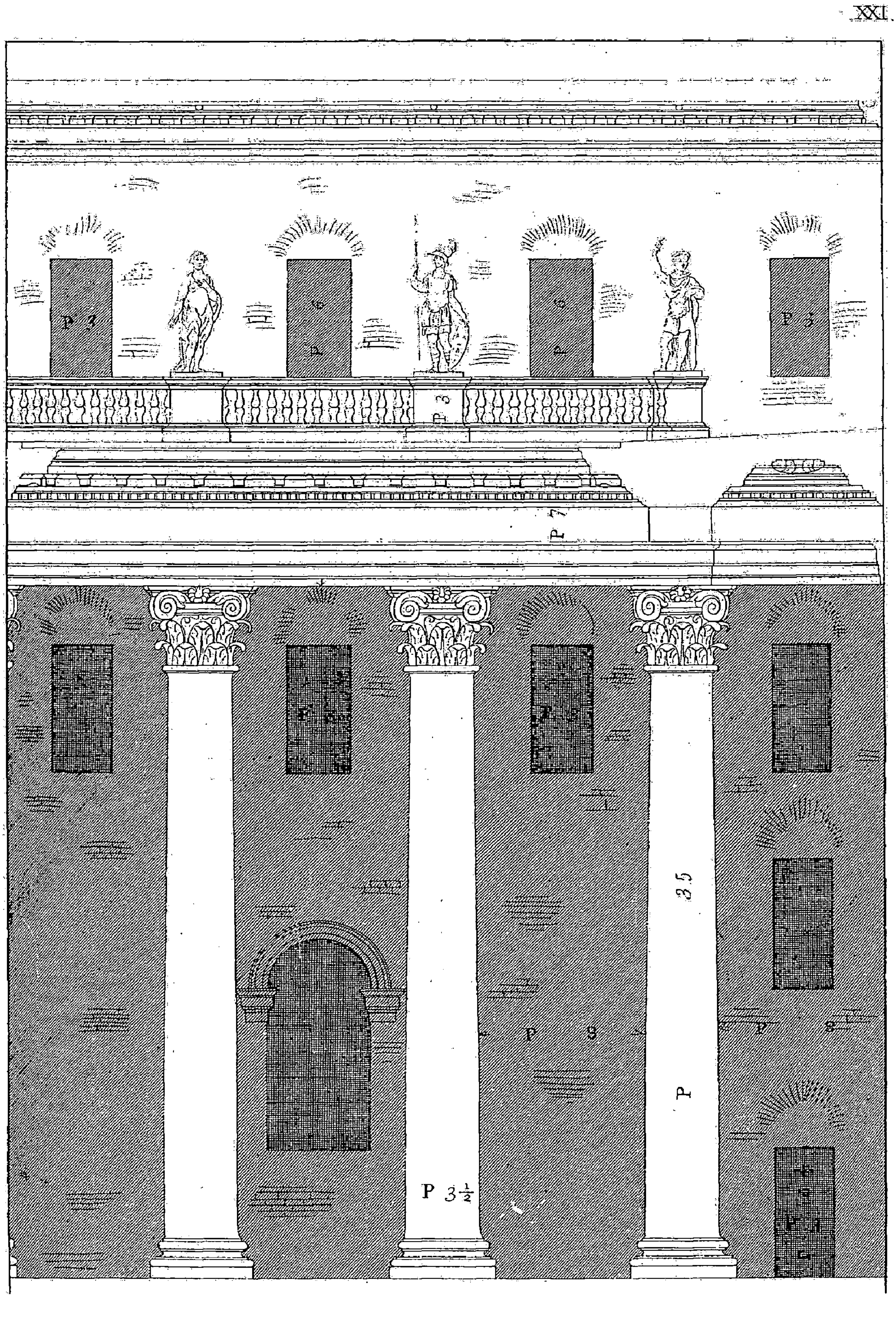


Plate 21 The Corinthian Atrium The Convent of the Carita at Venice Part sectional elevation

XXII

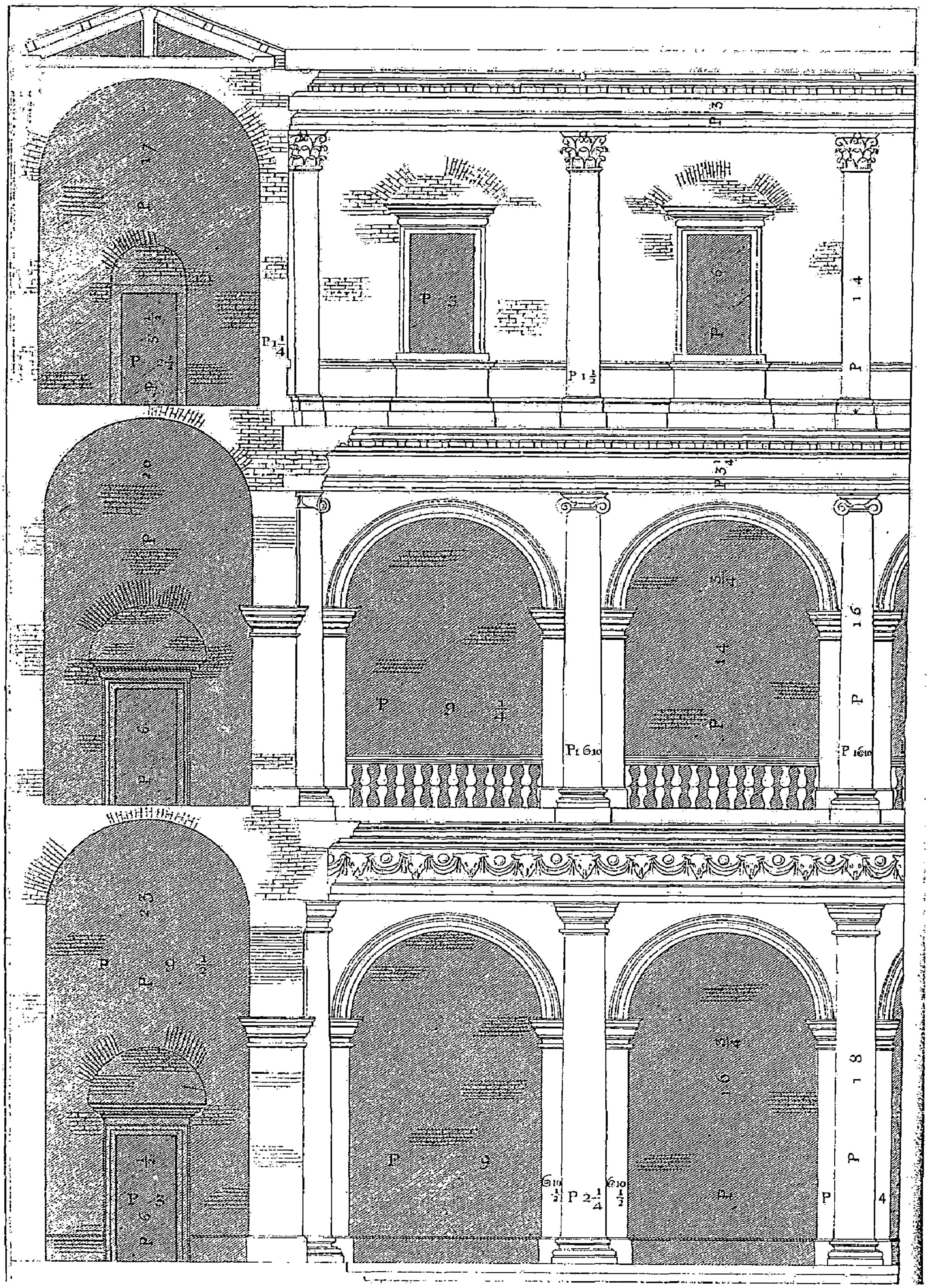


Plate 22 The Corinthian Atrium The Convent of the Carita at Venice
Part sectional elevation

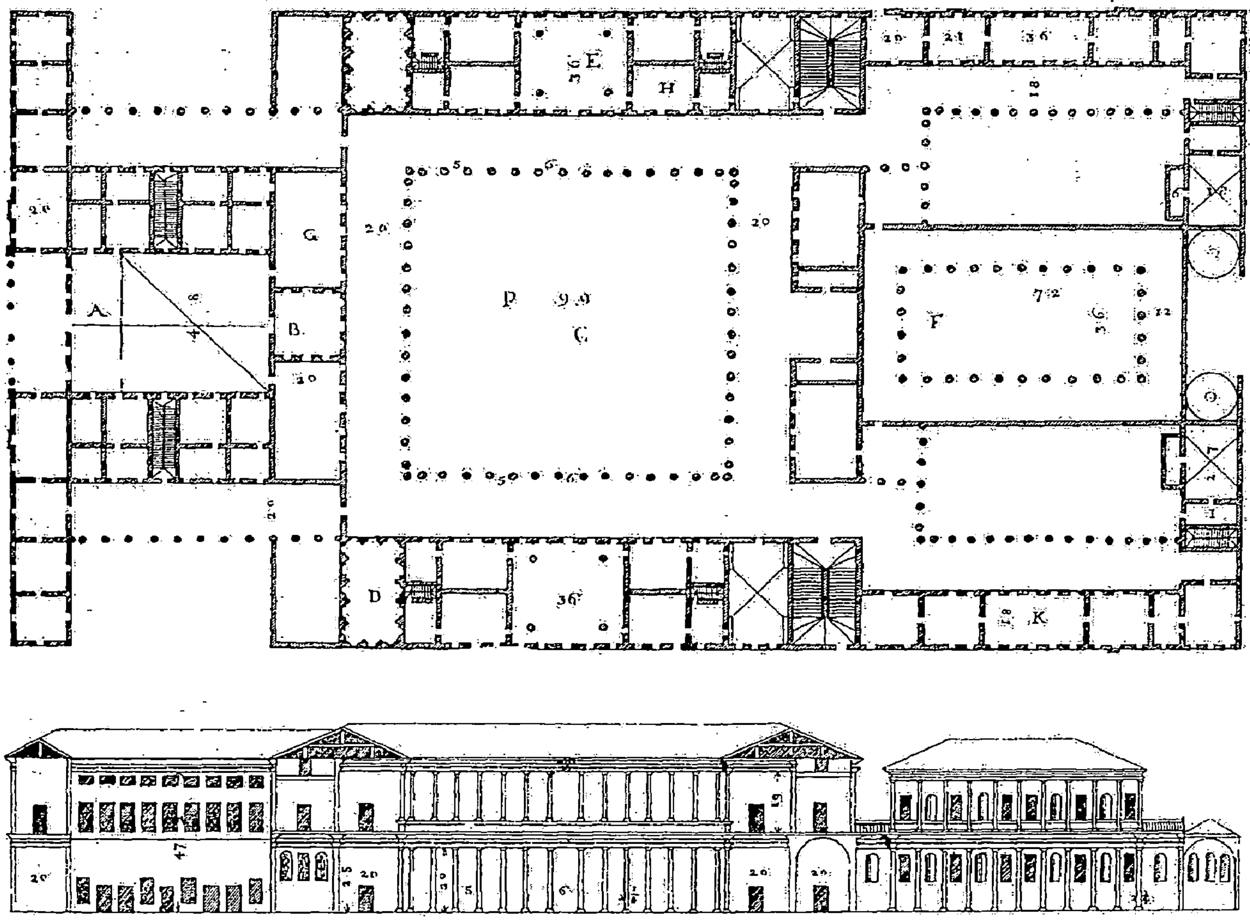


Plate 23 Testugginato Atrium A private house of the ancient Romans in plan and long section

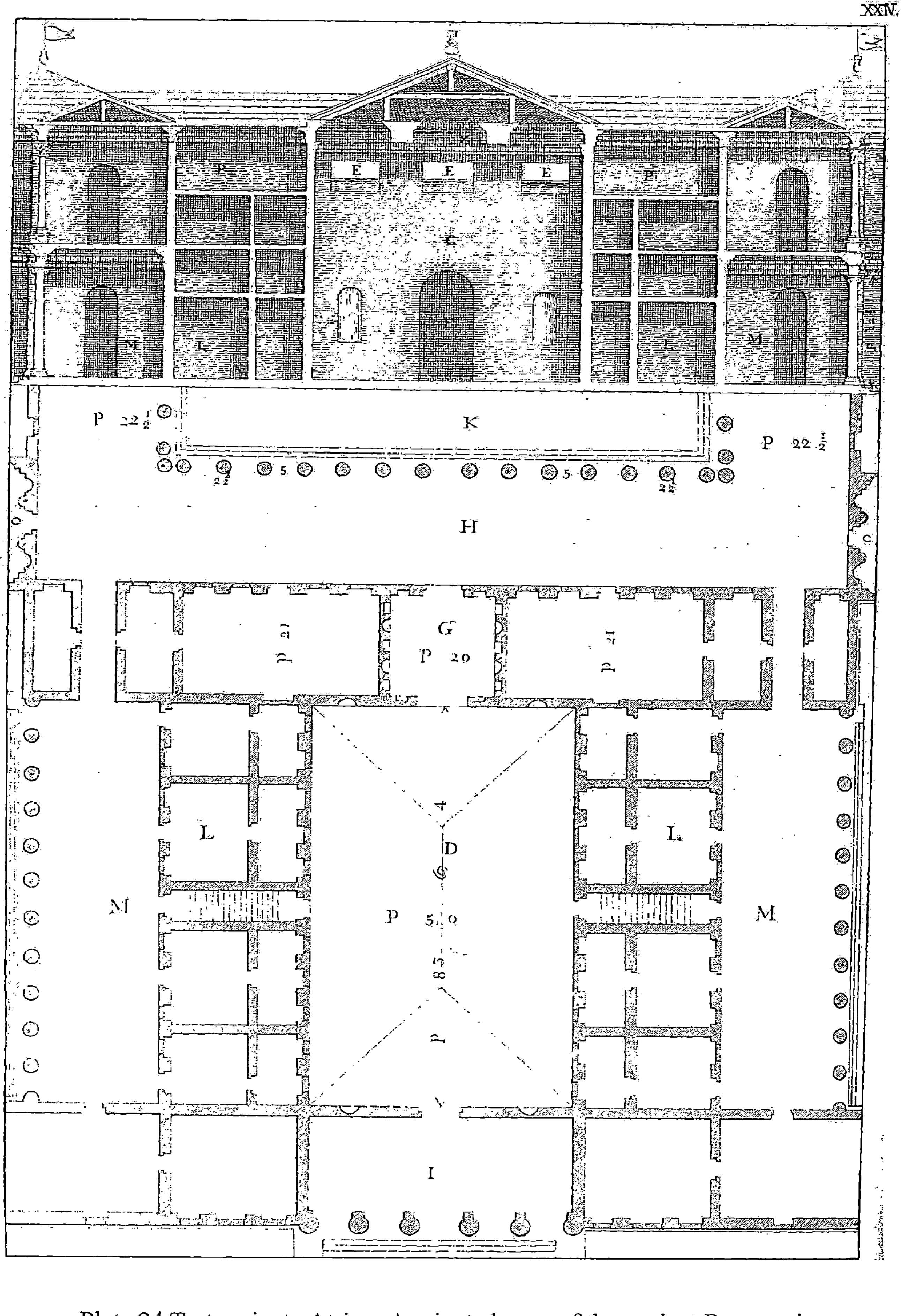


Plate 24 Testugginato Atrium A private house of the ancient Romans in plan and section

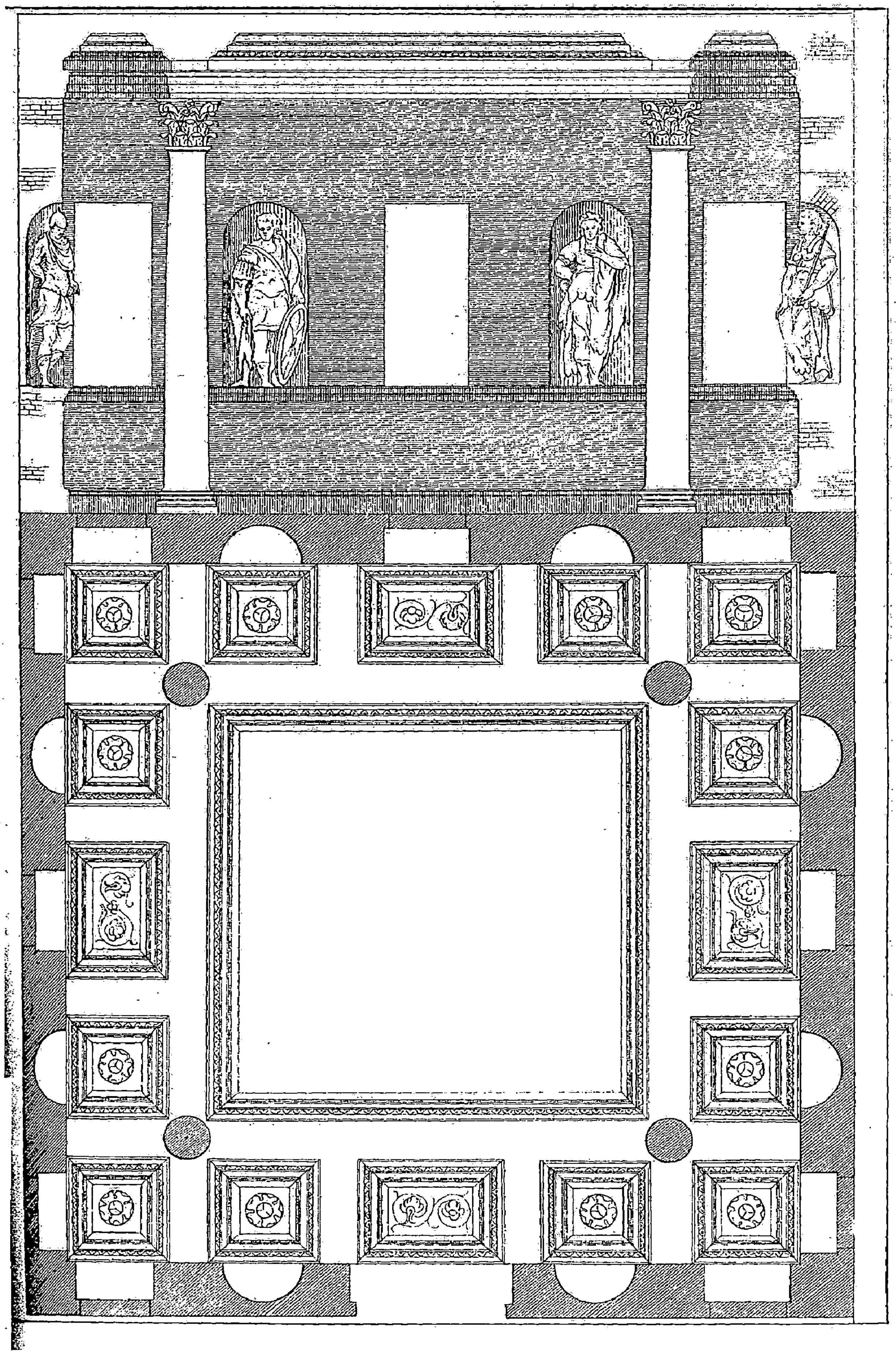


Plate 25 A tetrastyle hall Halls with four columns in plan and sectional elevation

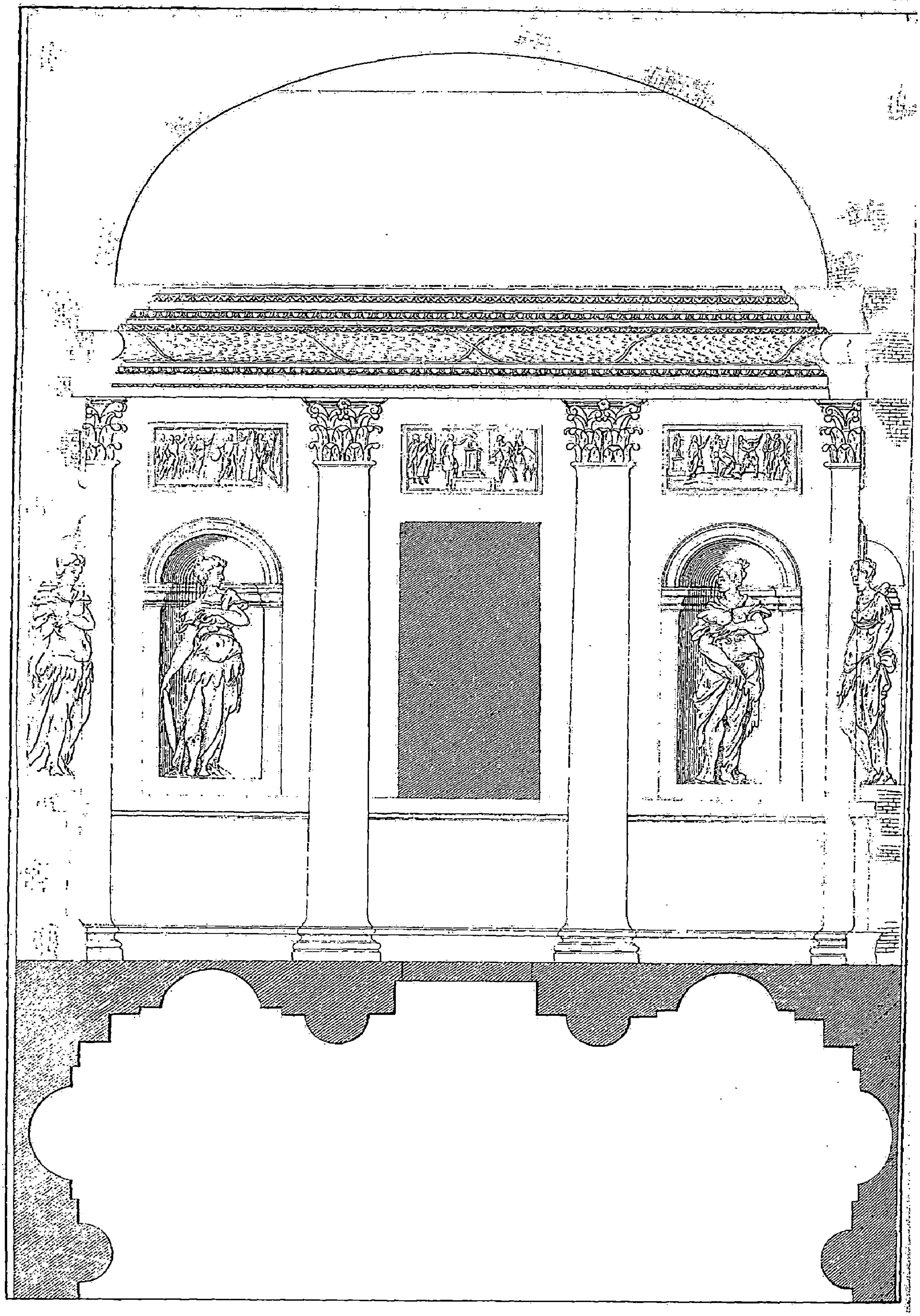


Plate 26 A Corinthian hall with half-columns in partial plan and sectional elevation

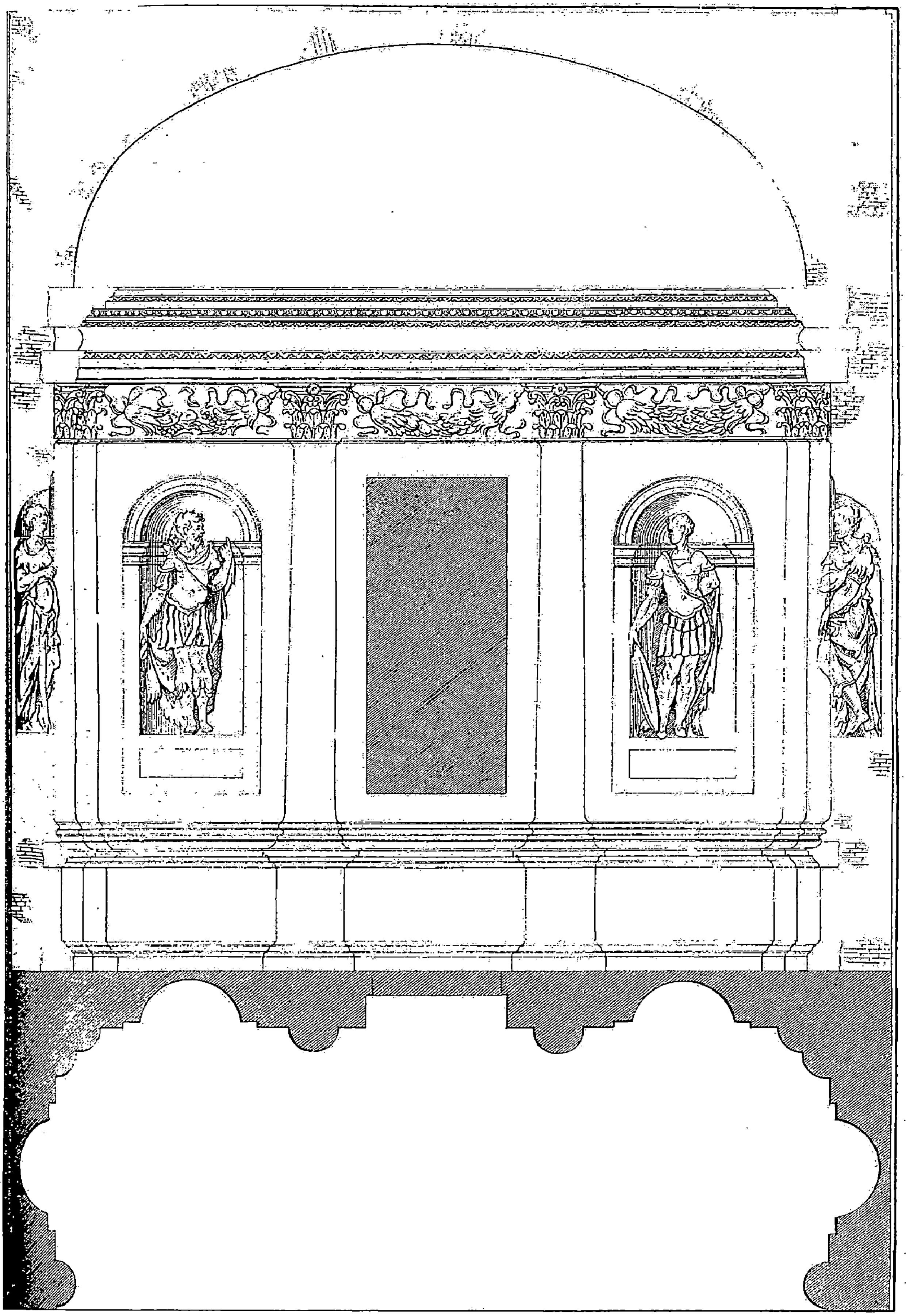


Plate 27 A Corinthian hall with half-columns and pedestals in partial plan and sectional elevation

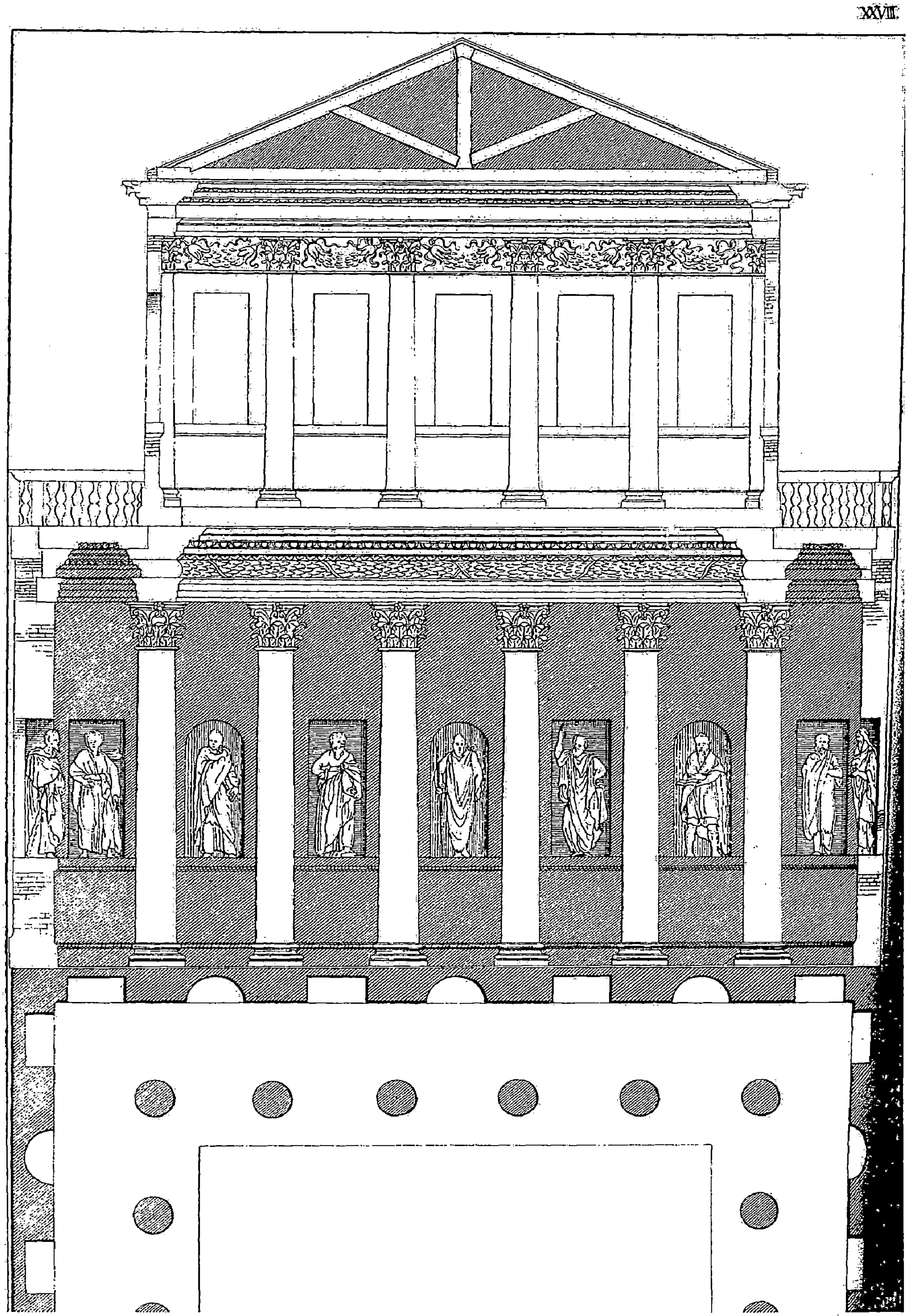


Plate 28 An Egyptian hall in partial plan and cross section

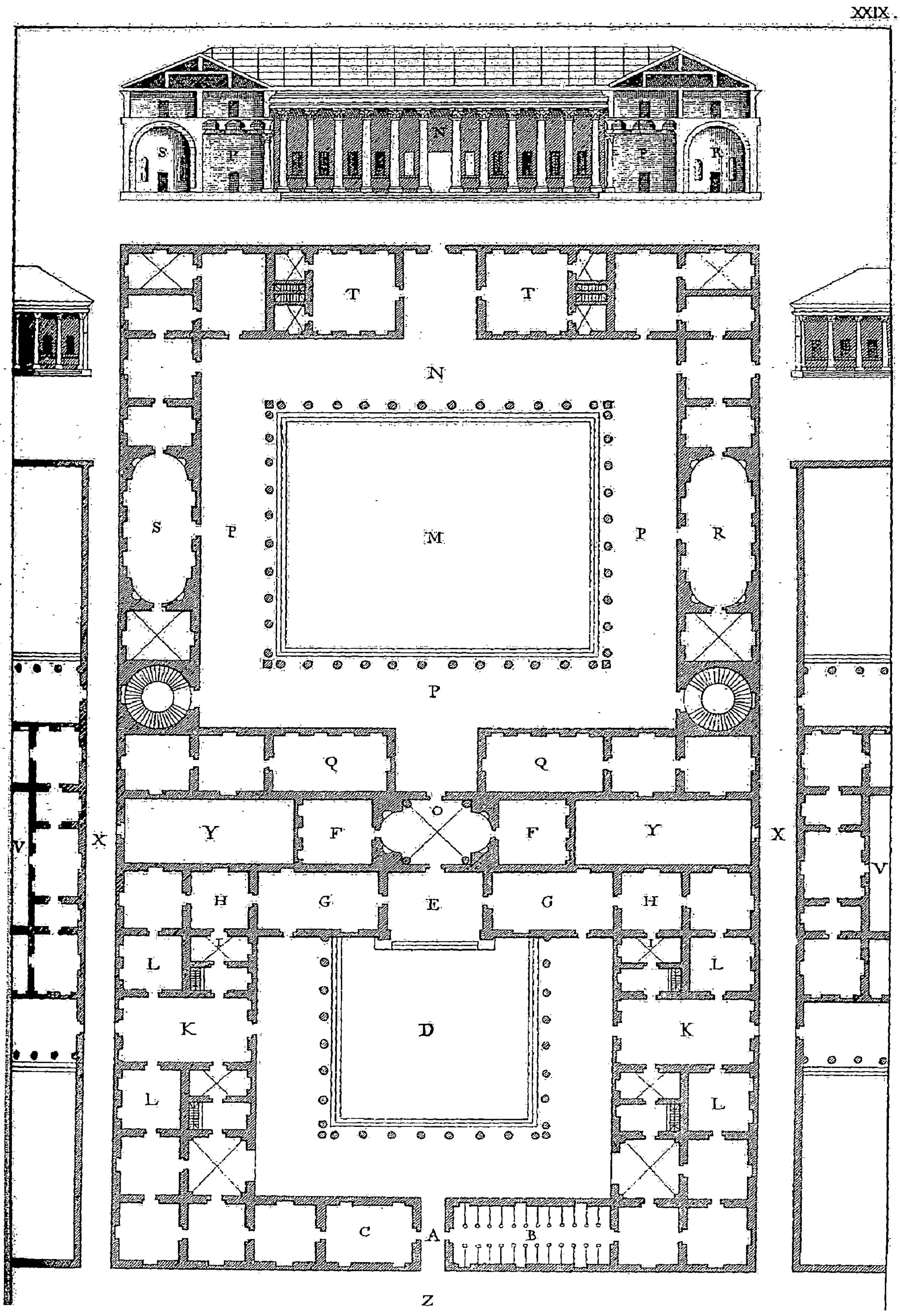


Plate 29 A private house of the ancient Greeks in plan and cross section with adjacent buildings

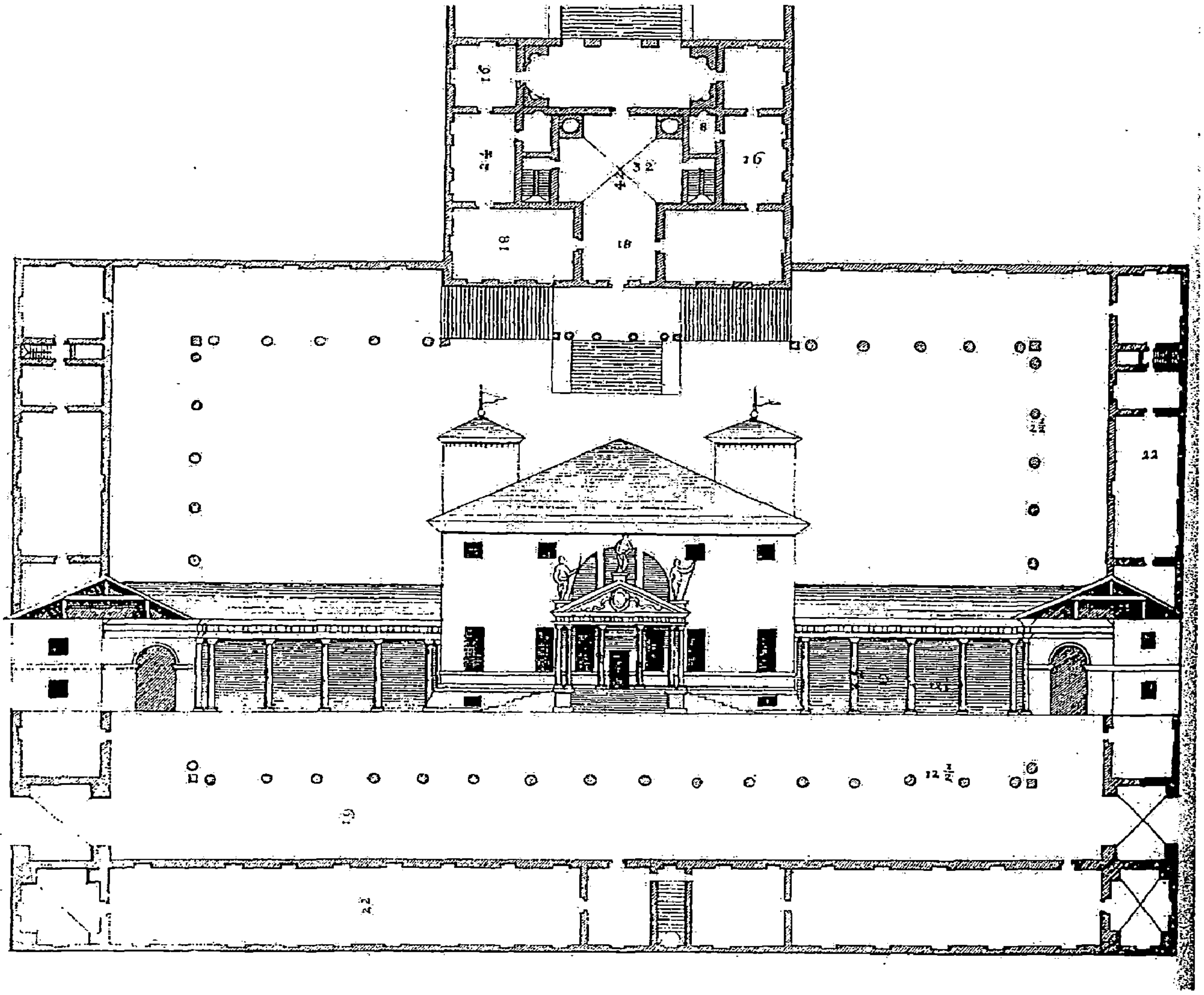


Plate 30 Villa Vittore Marco and Daniele Pisani at Bagnolo near Lonigo in plan and elevation

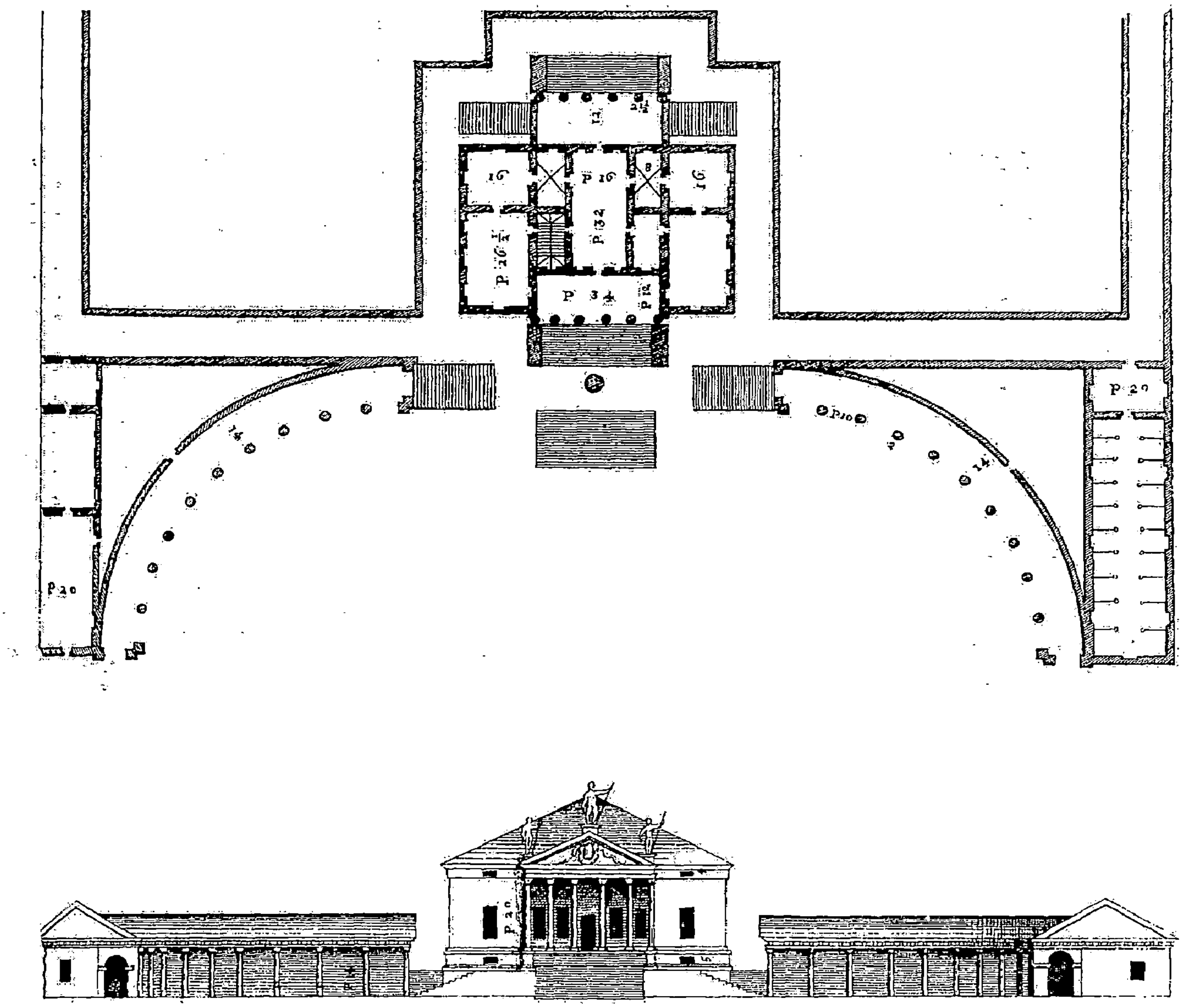


Plate 31 Villa Francesco Badoero at Polesine in plan and elevation

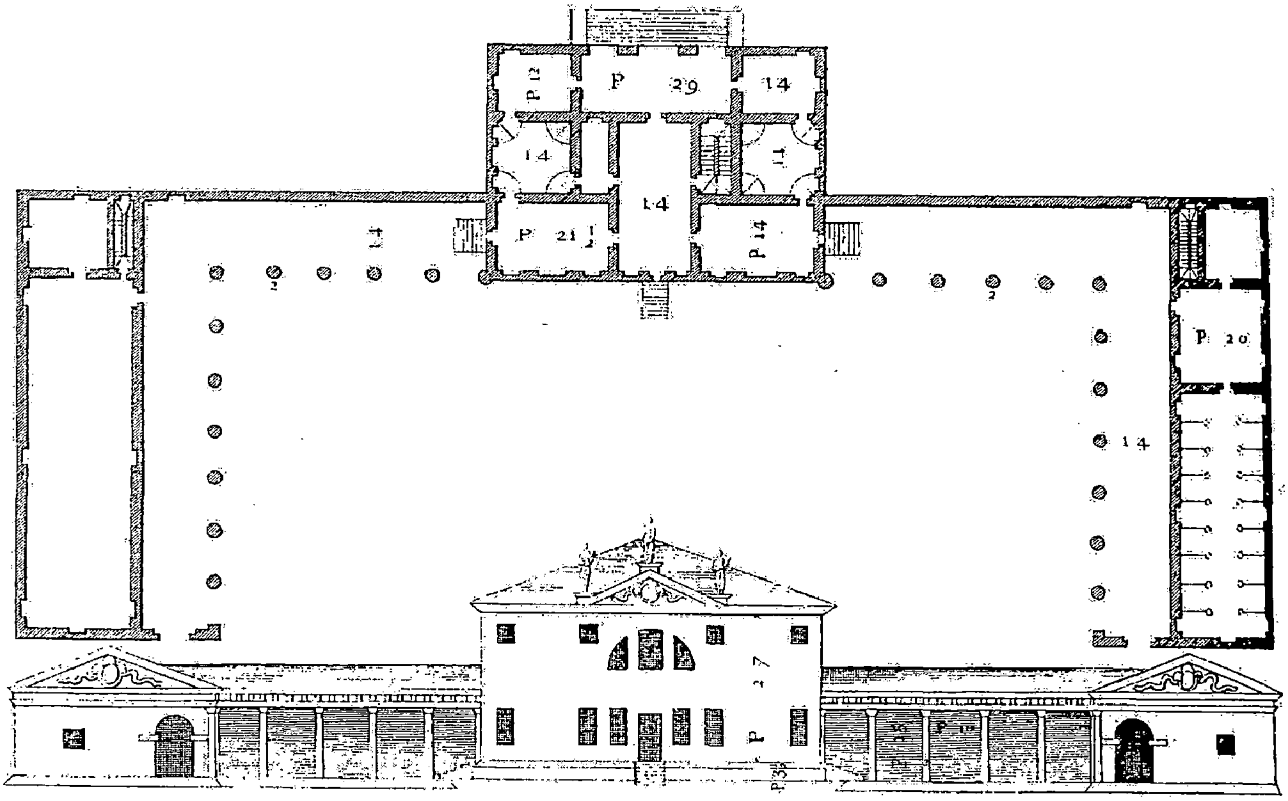


Plate 32 Villa Marco Zeno at Cesalto in plan and elevation

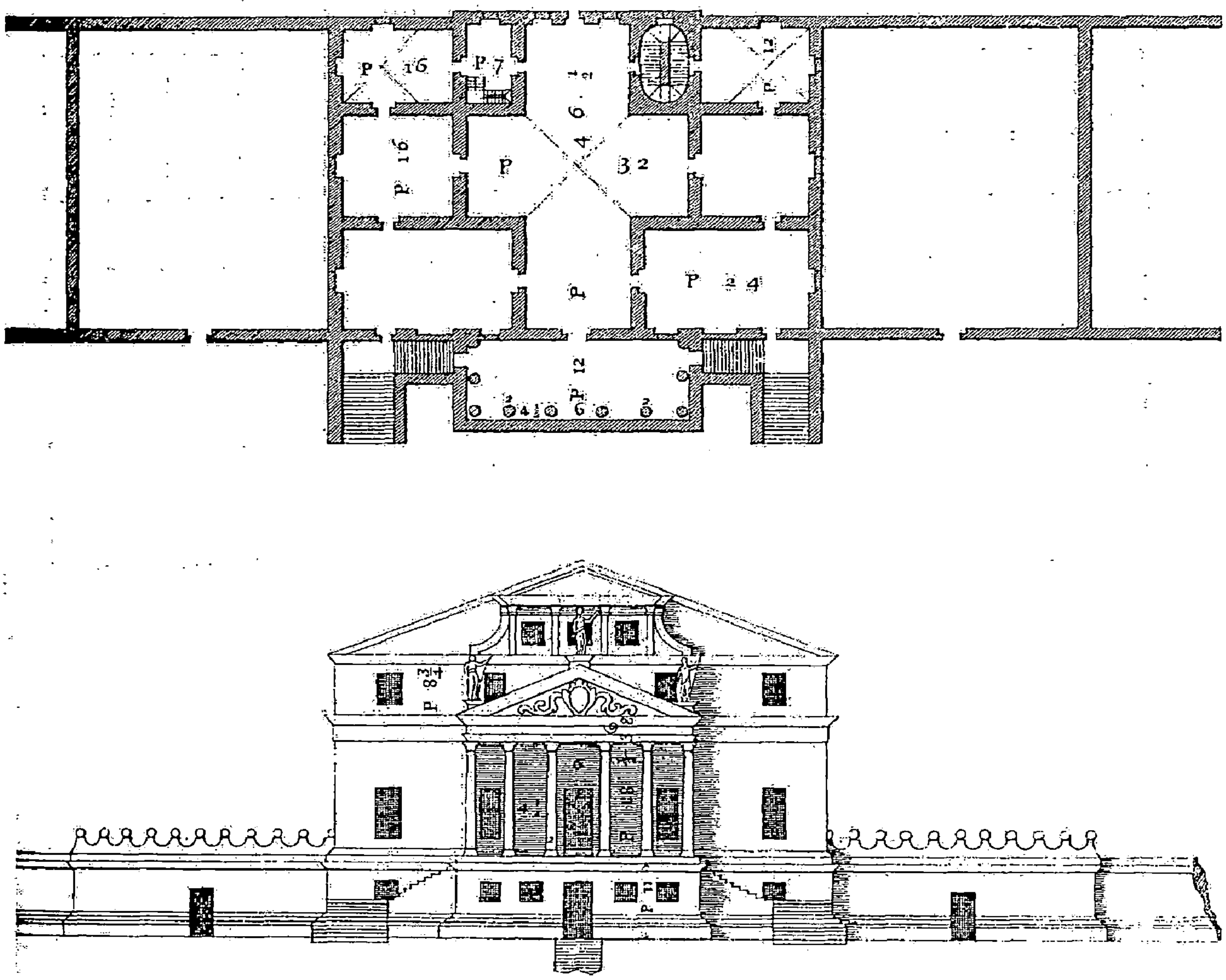


Plate 33 Villa Nicolo and Luigi Foscari at Brenta in plan and elevation

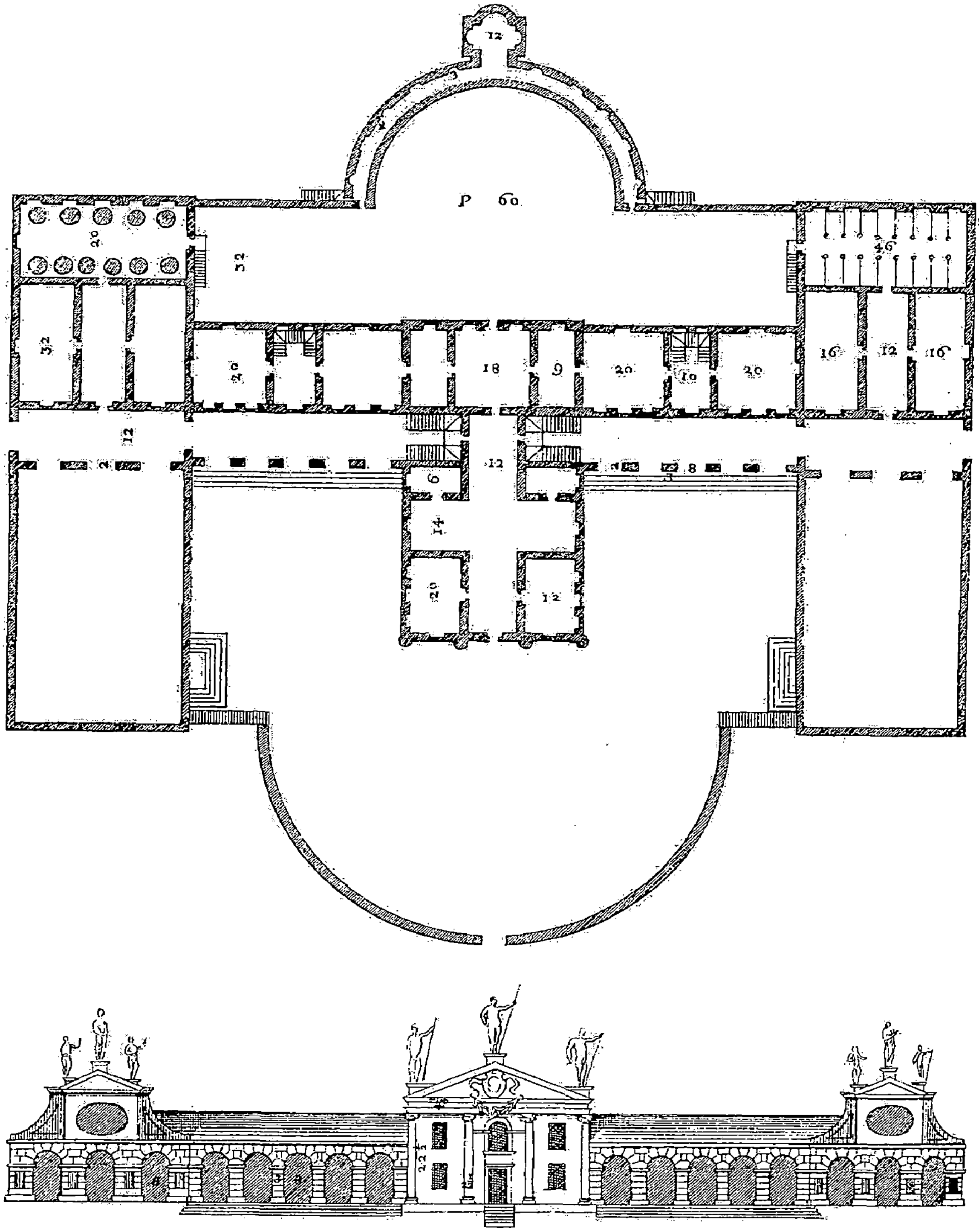


Plate 34 Villa Elettlo De Aquileia and Marc' Antonio De Barbari at Maser in plan and elevation

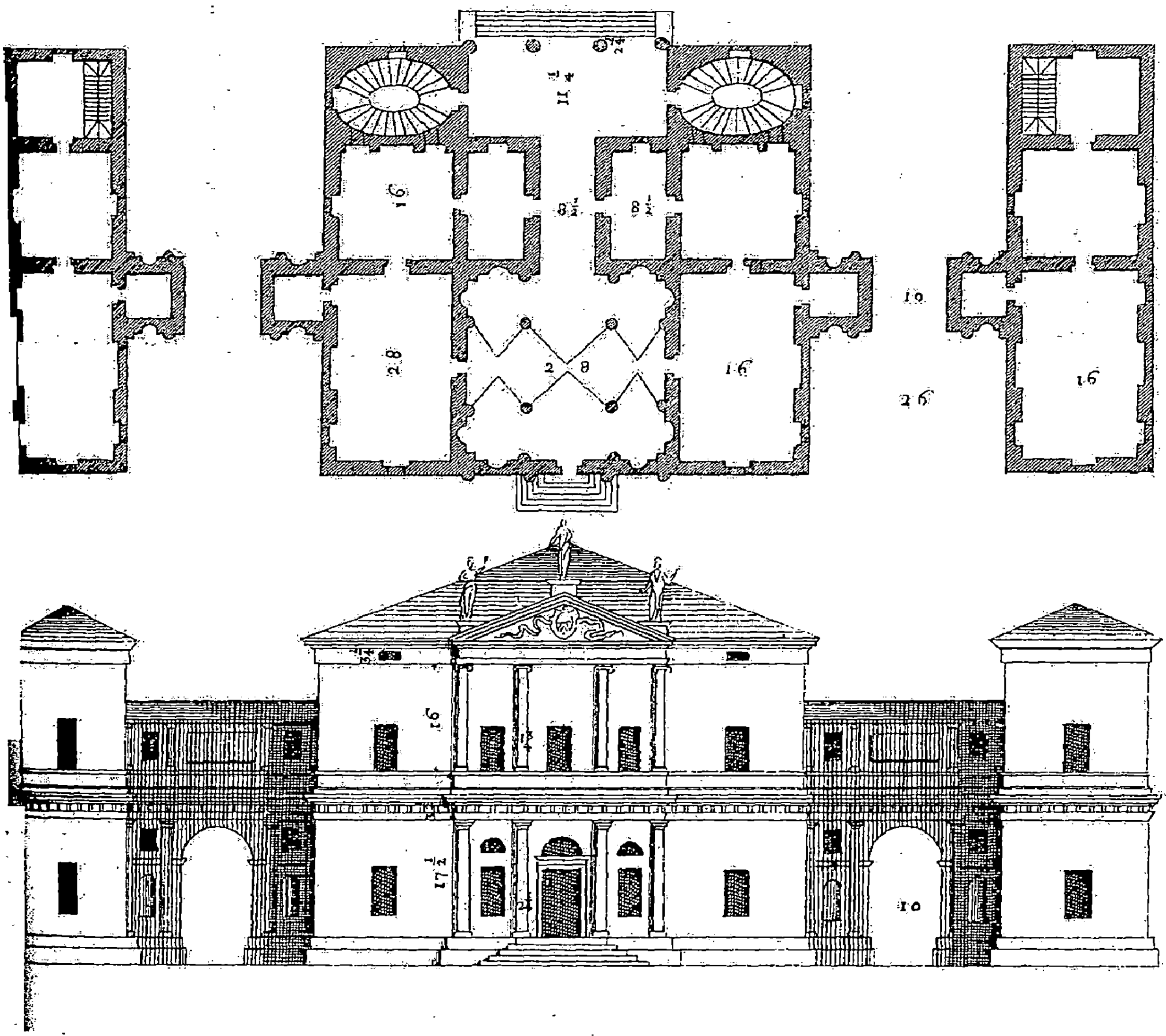


Plate 35 Villa Francesco Pisani at Montagnana in plan and elevation

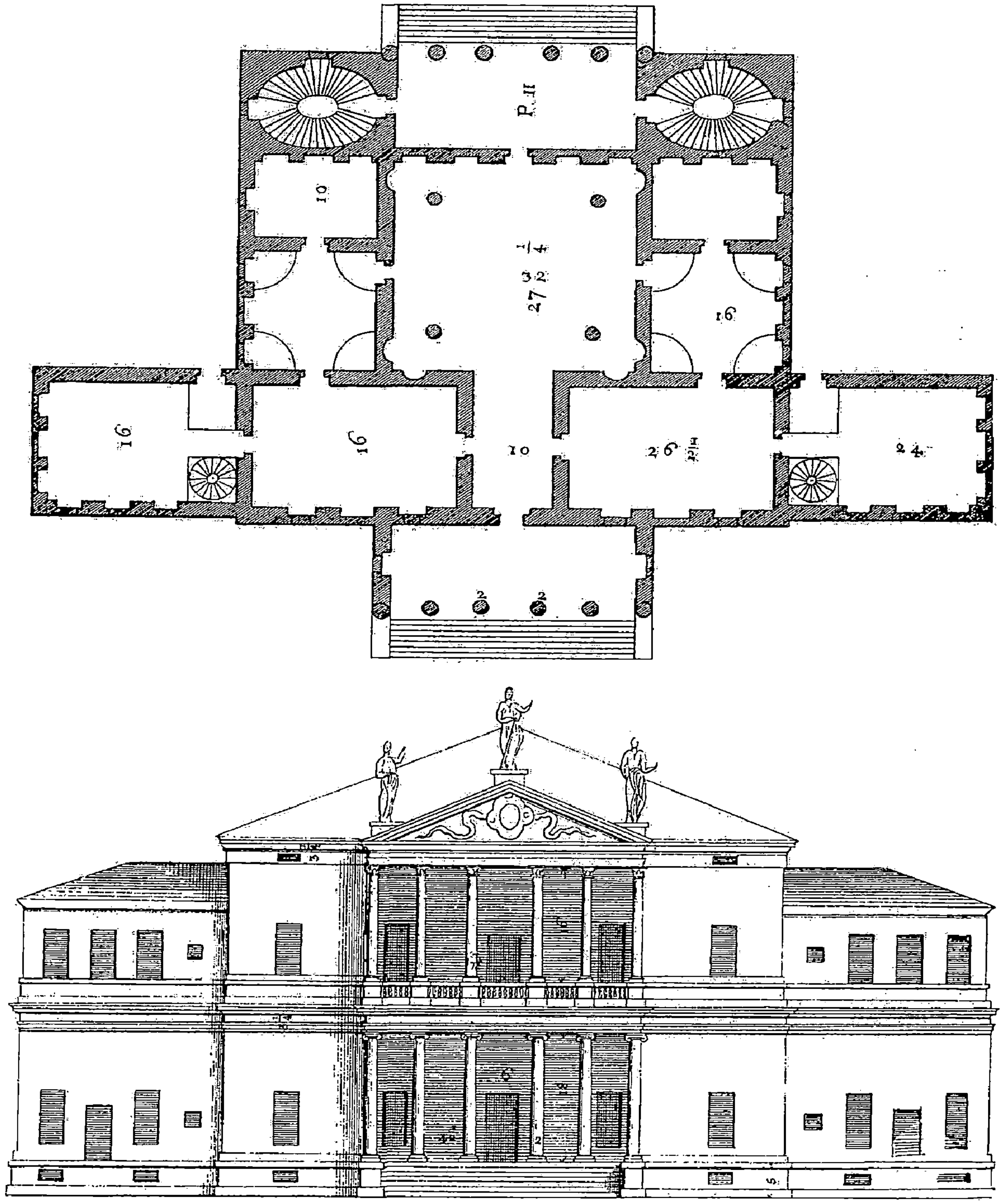


Plate 36 Villa Giorgio Cornaro at Piombino in plan and elevation

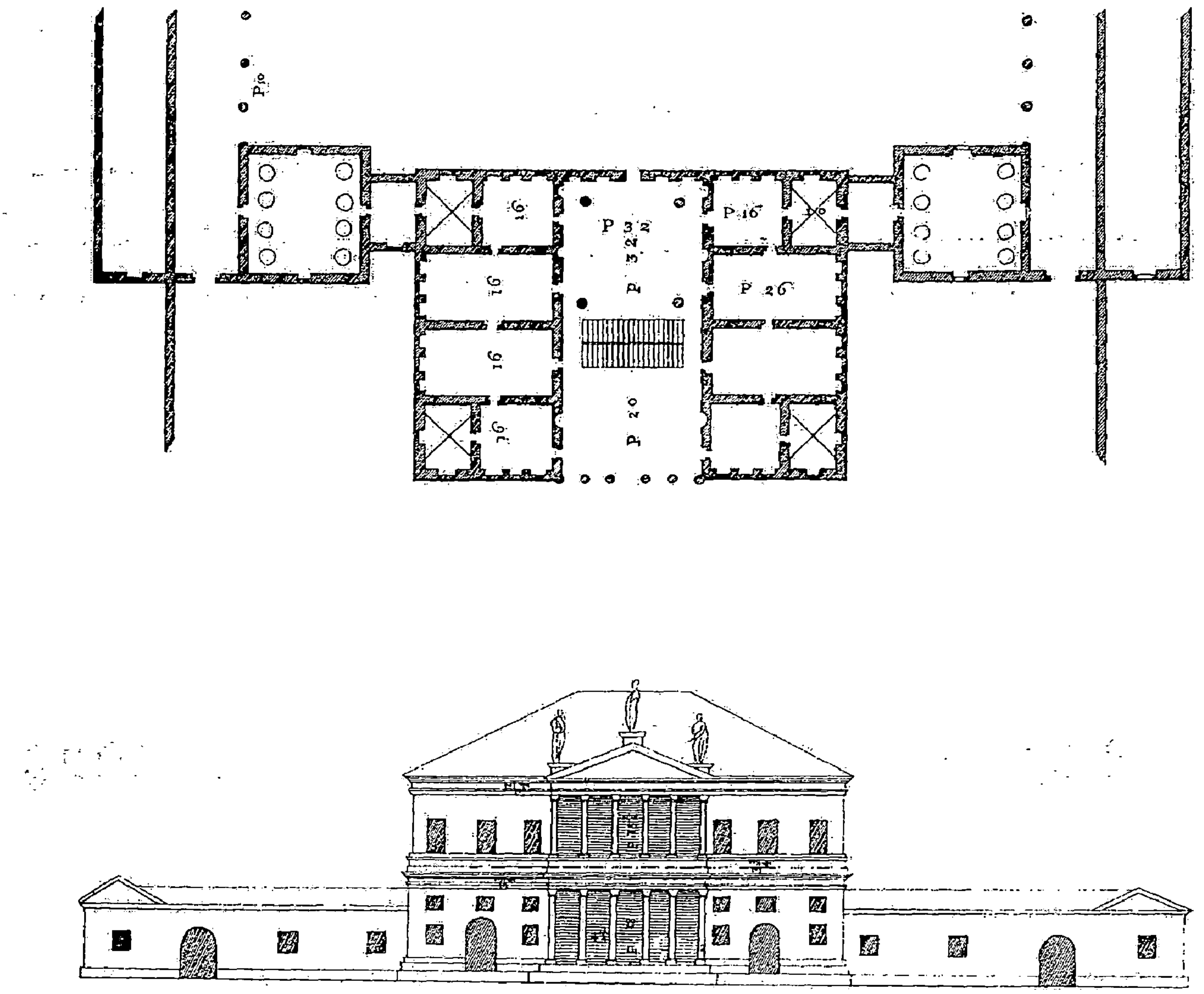


Plate 37 Villa Leonardo Mocenico at Marocco in plan and elevation

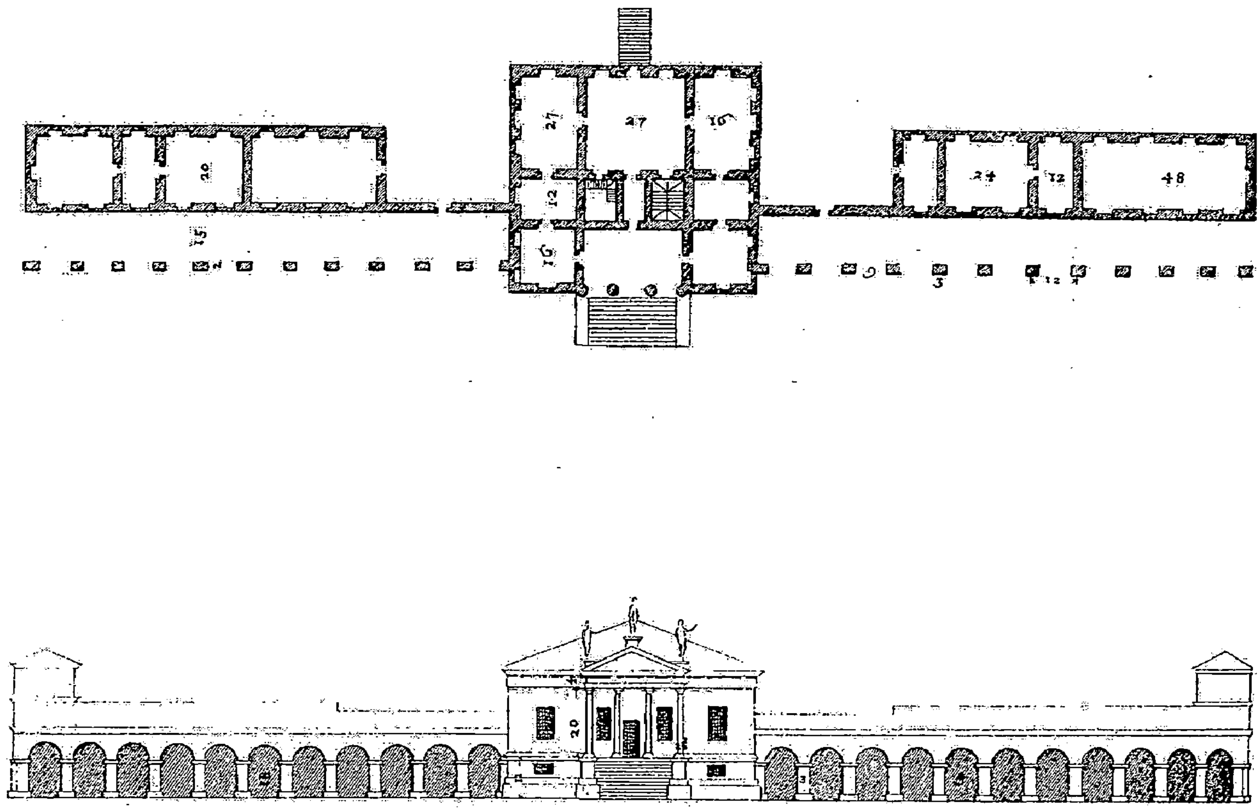


Plate 38 Villa Leonardo Emo (or Erno) at Fanzolo in plan and elevation

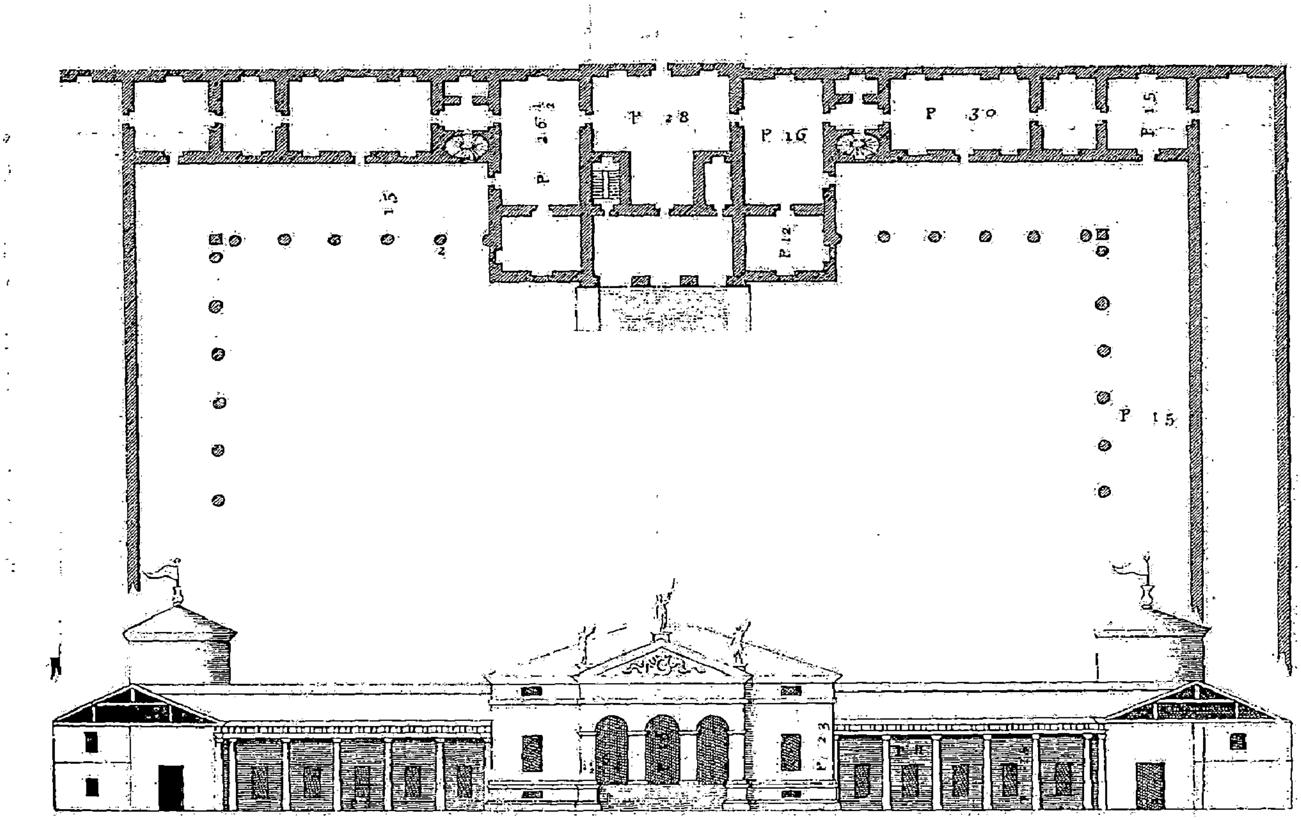


Plate 39 Villa Biagio Sarraceno at Finale in plan and elevation

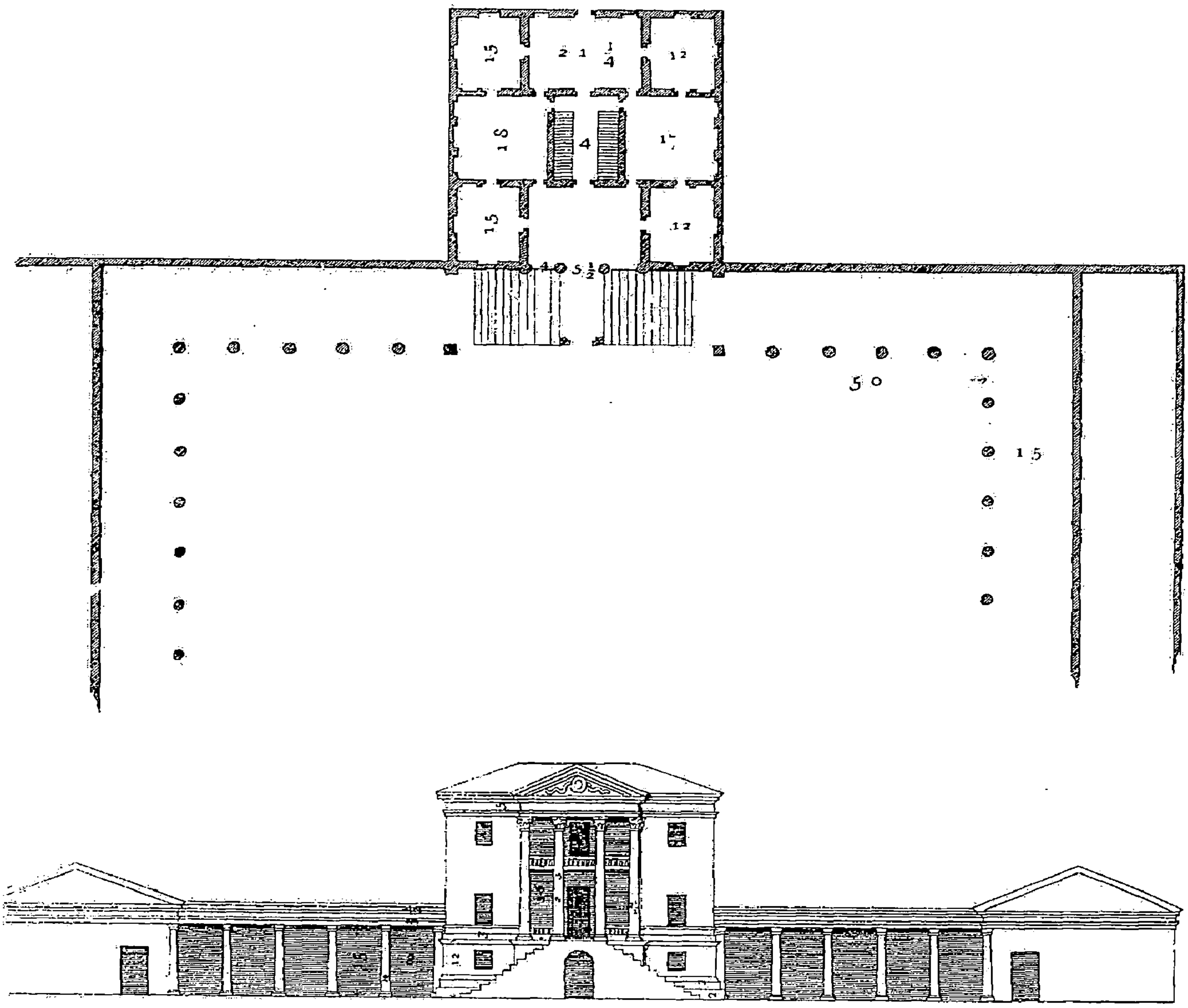


Plate 40 Villa Gioralmo Ragona at Ghizzole in plan and elevation

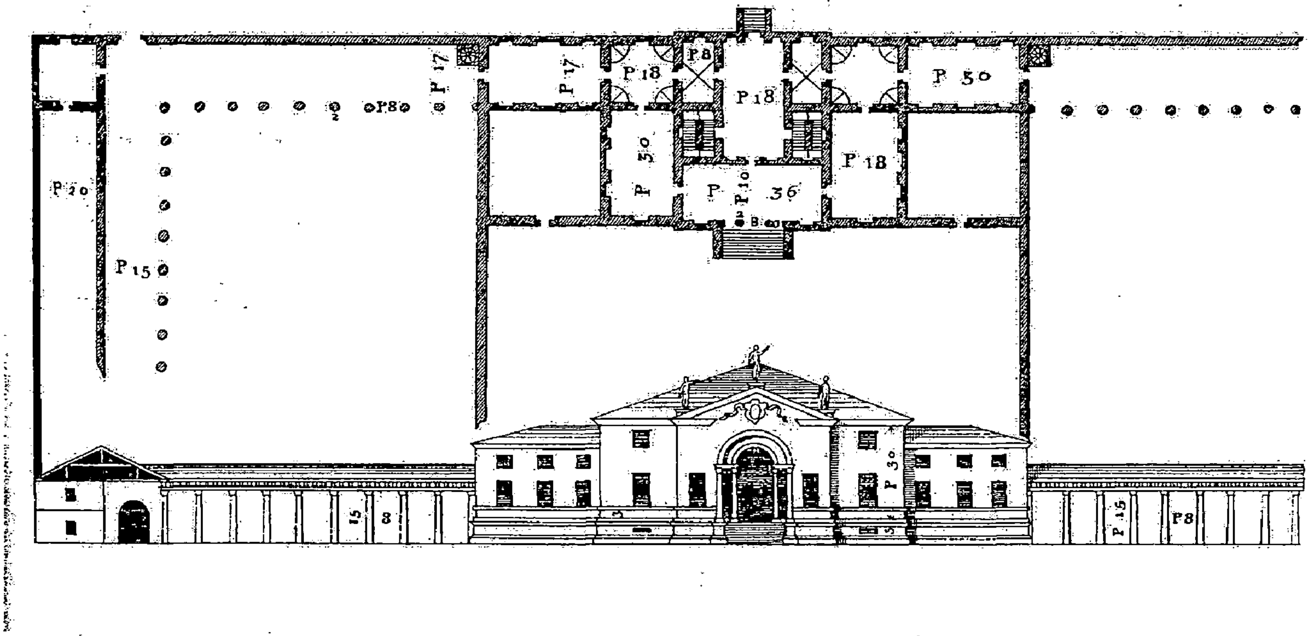


Plate 41 Villa Cavalier Pogliana (or Poiana) at Pogliana in plan and elevation

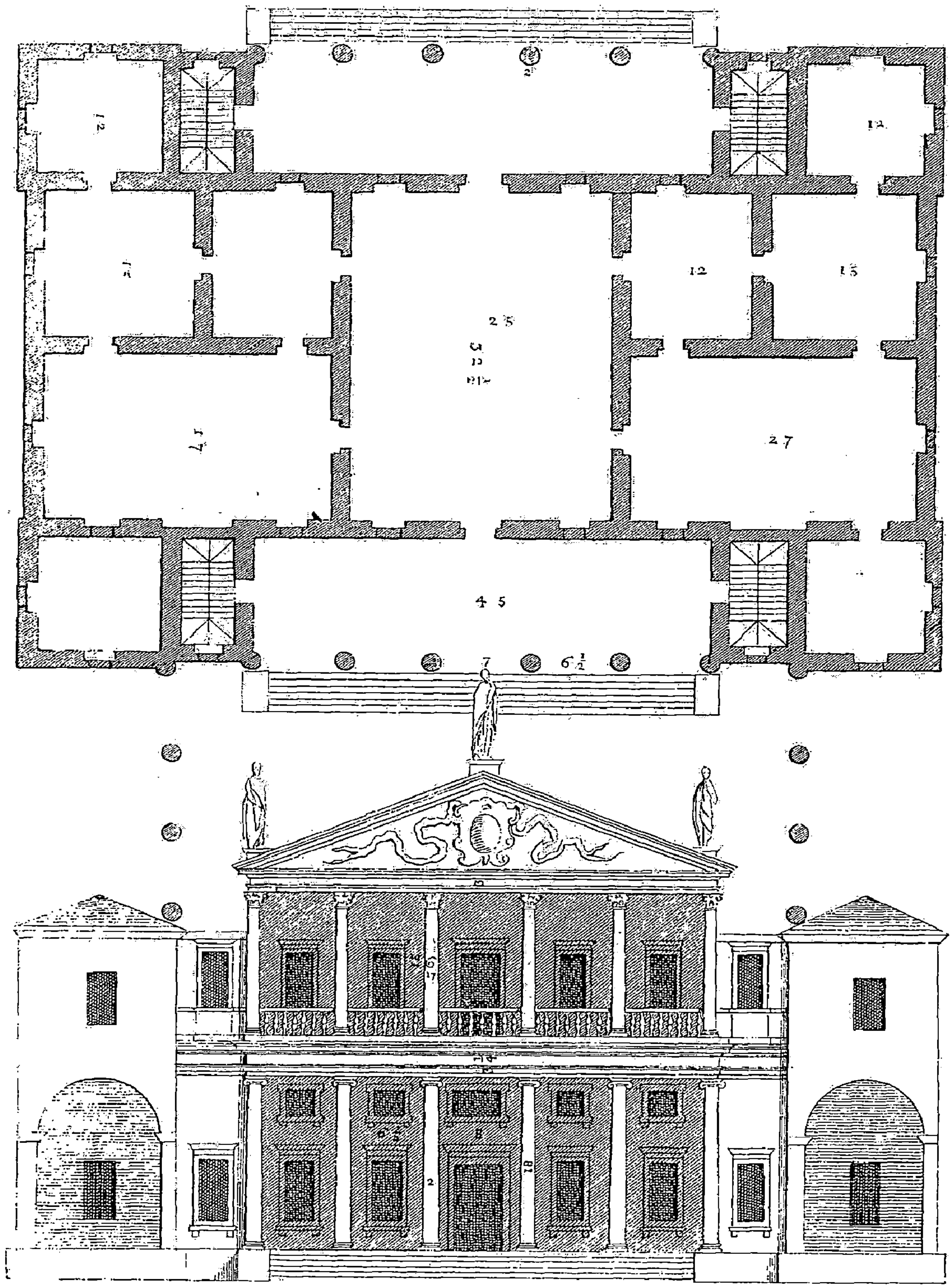


Plate 42 Villa Francesco Valmarana at Lisiera in plan and elevation

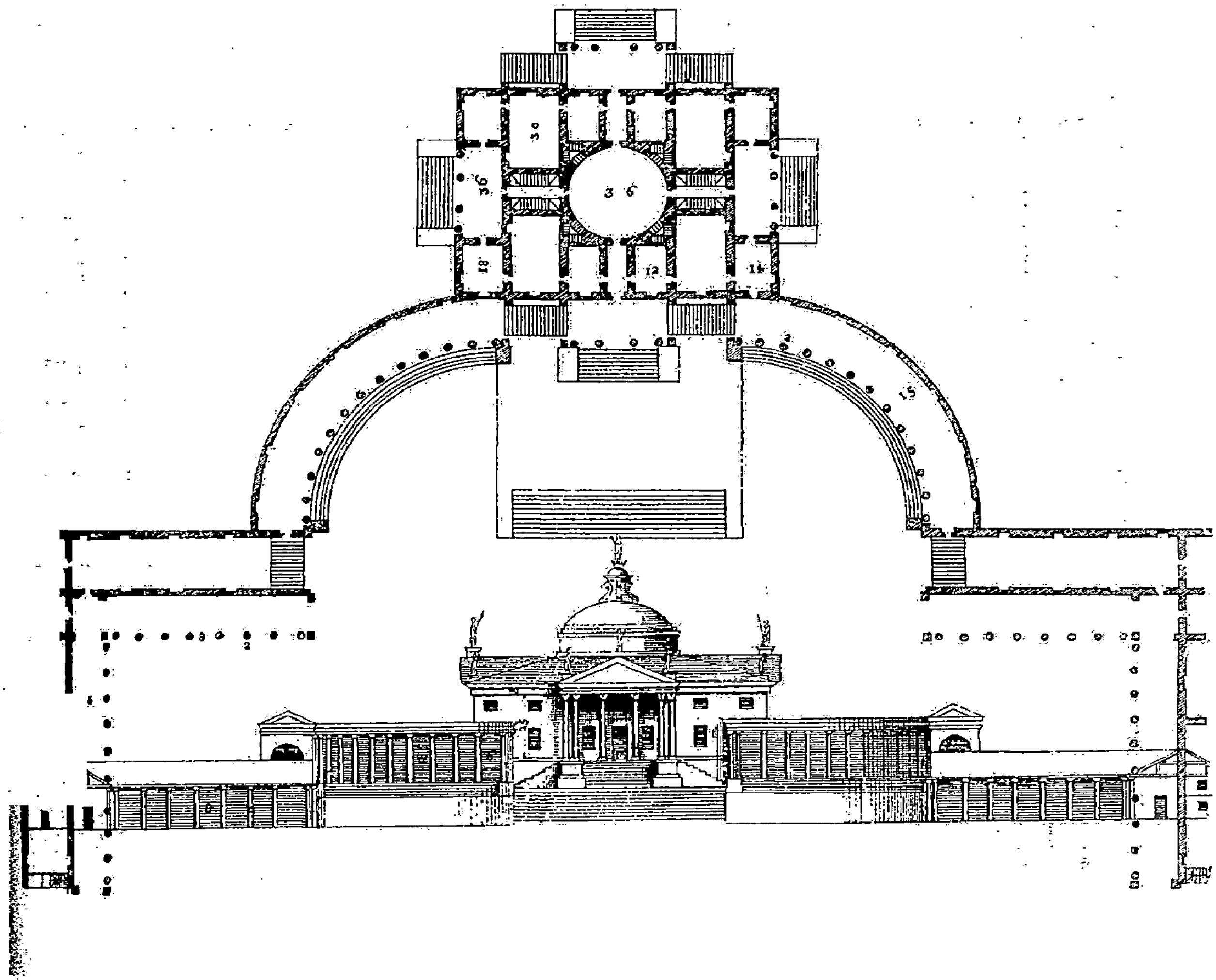


Plate 43 Villa Francesco and Lodovico De Trissini at Meledo in plan and elevation

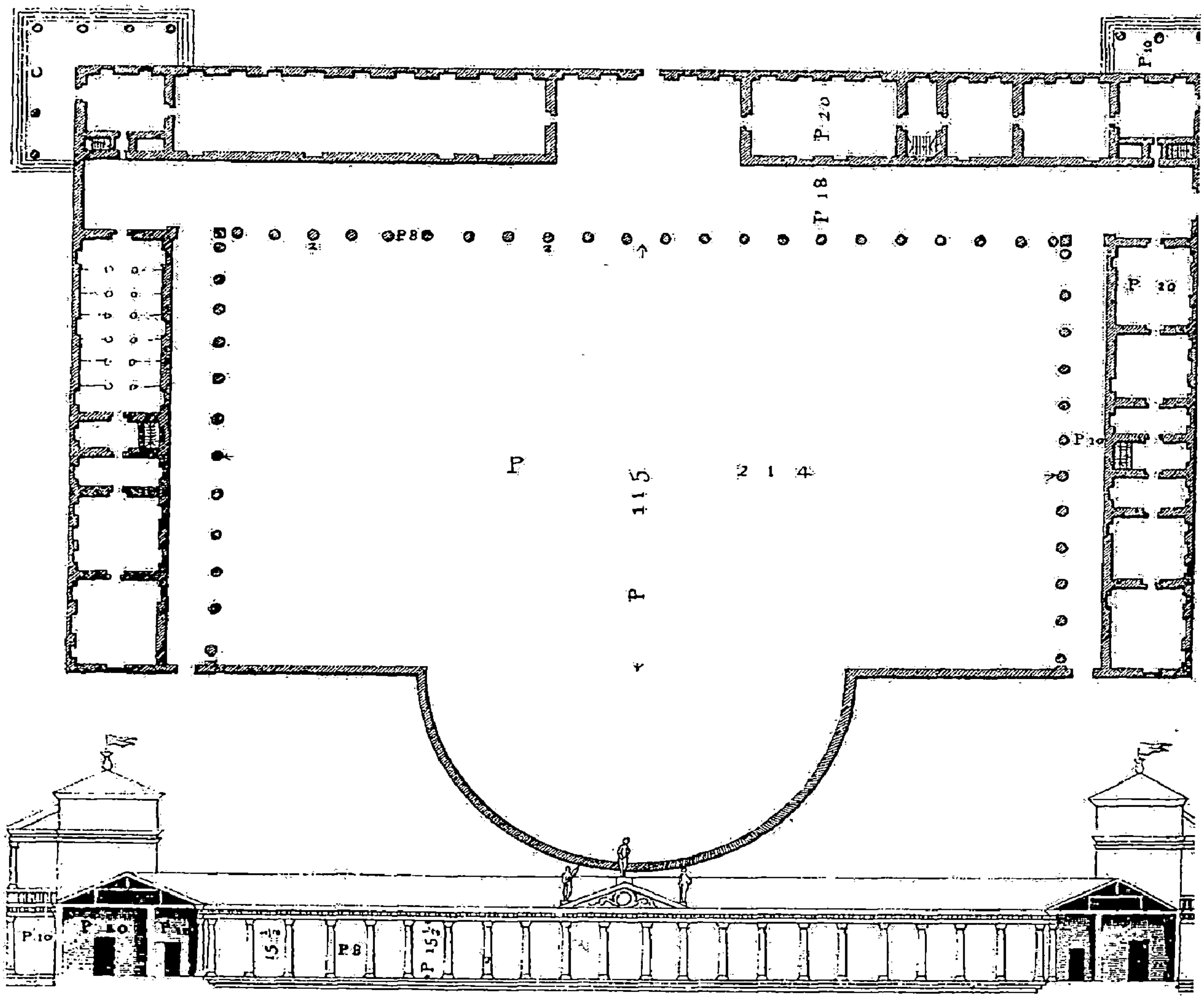


Plate 44 Villa Mario Repeta at Campiglia in plan and elevation

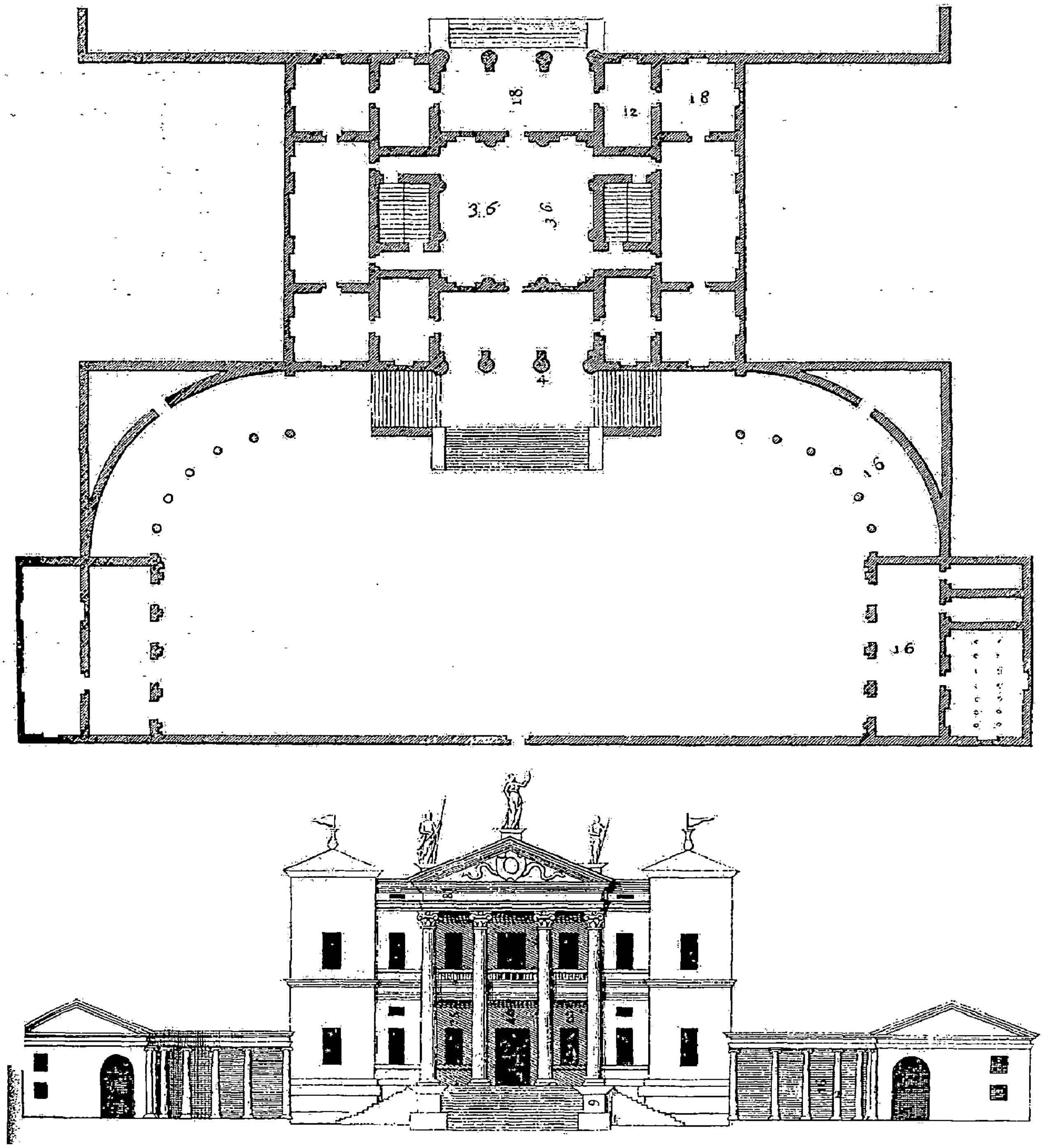


Plate 45 Villa Odoardo (Oleardo) and Theodoro De Thiene at Cicogna

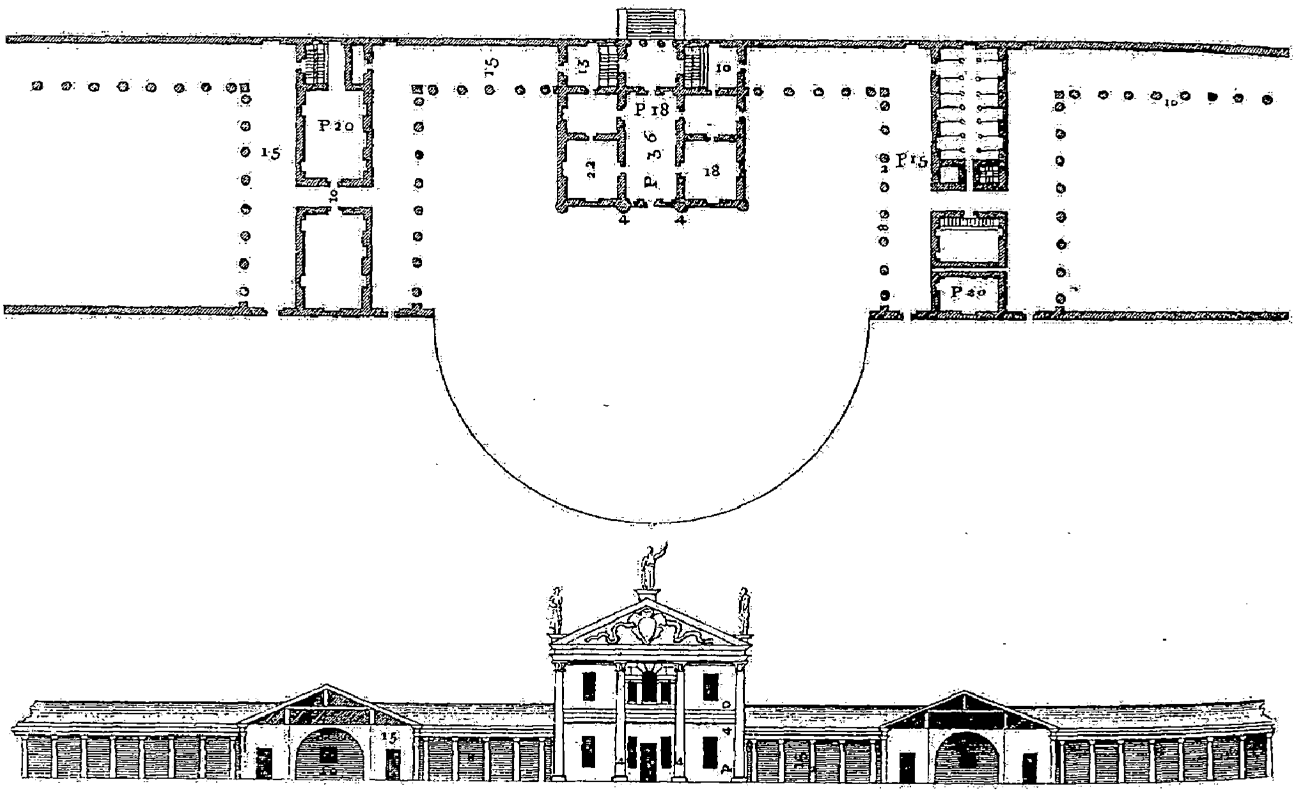


Plate 46 Villa Giacomo Angarano at Angarano in plan and elevation

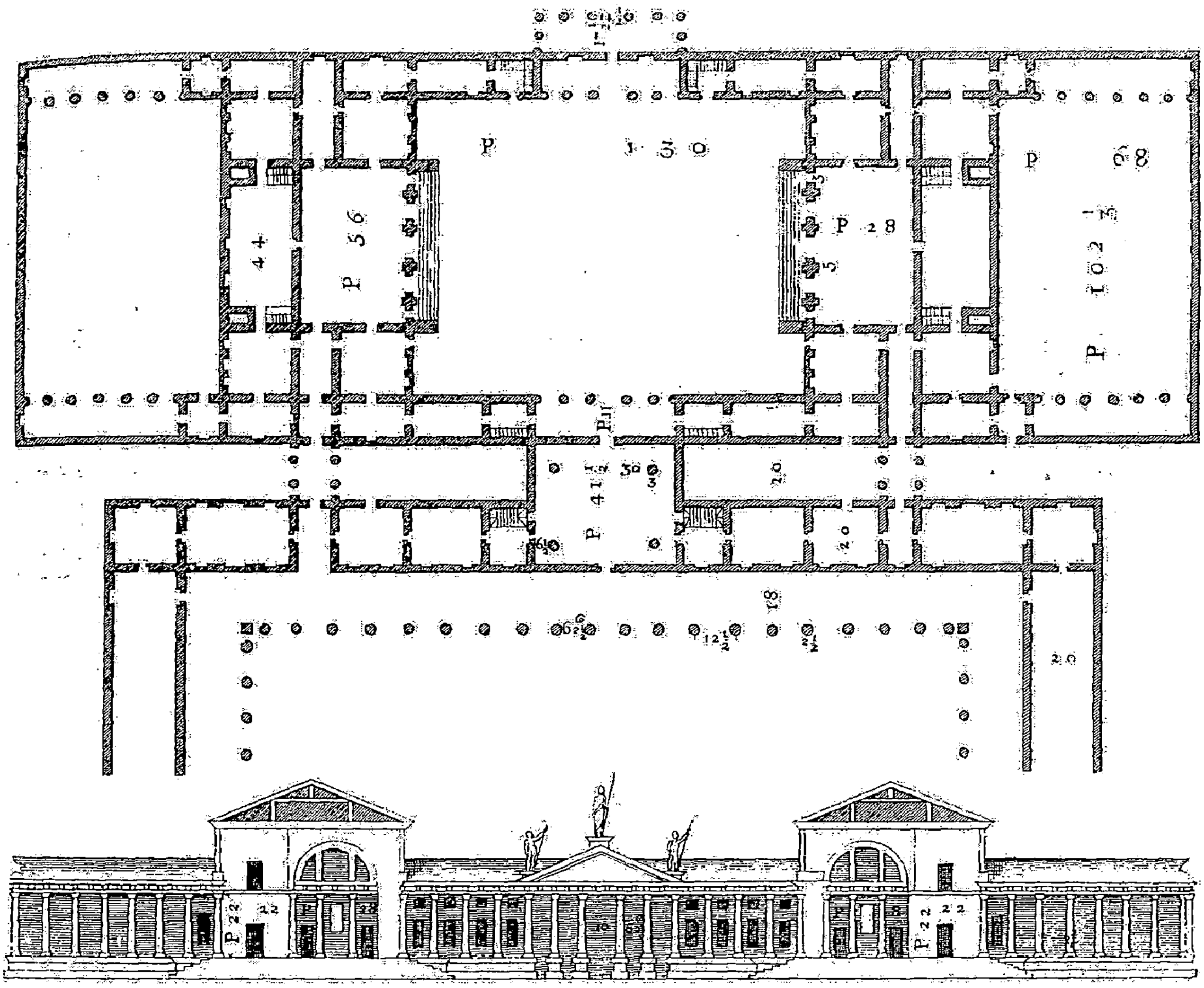


Plate 47 Villa Ottavio (Ottavie) Thiene at Quinto in plan and elevation

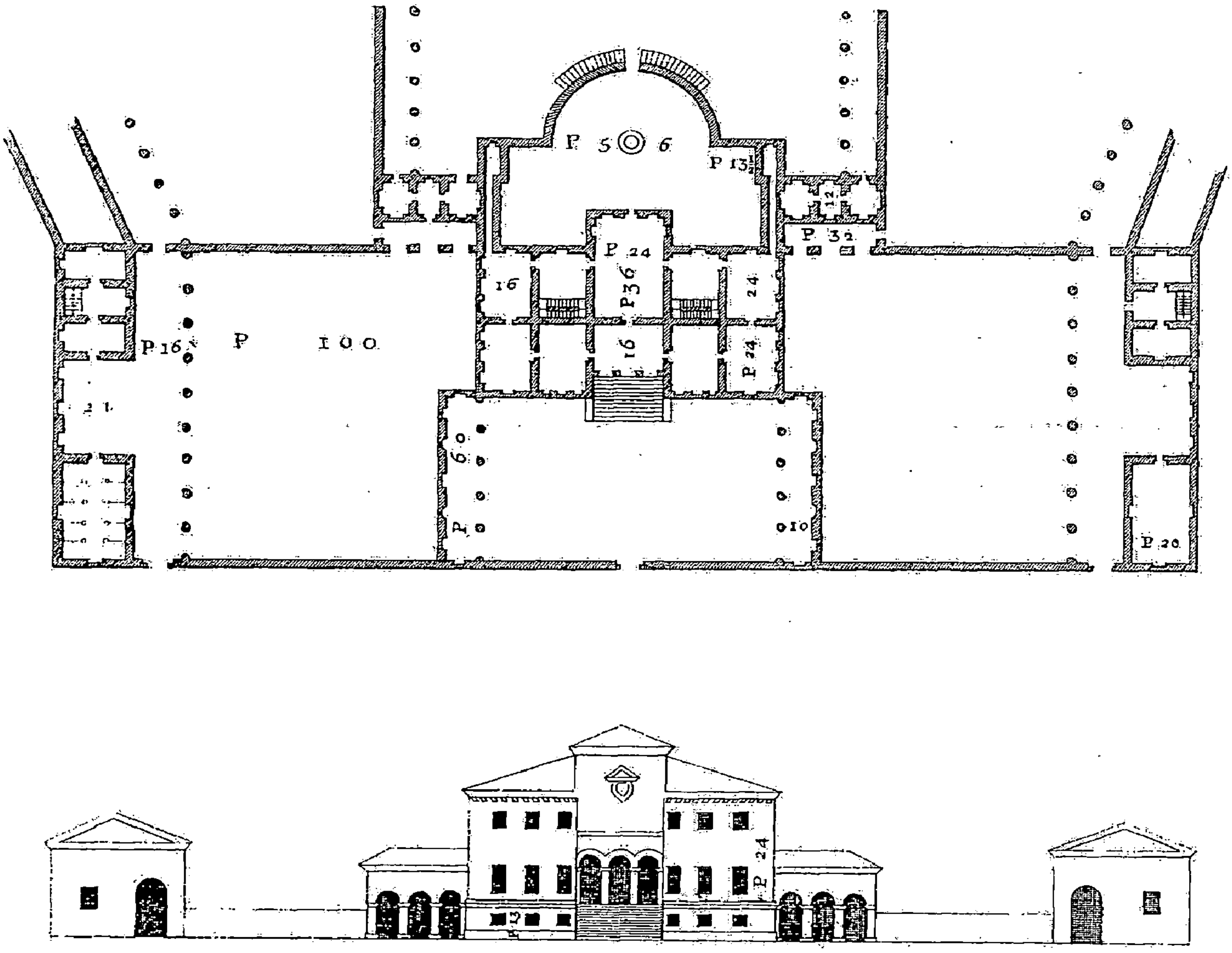


Plate 48 Villa Girolama De Godi at Lonedo in plan and elevation

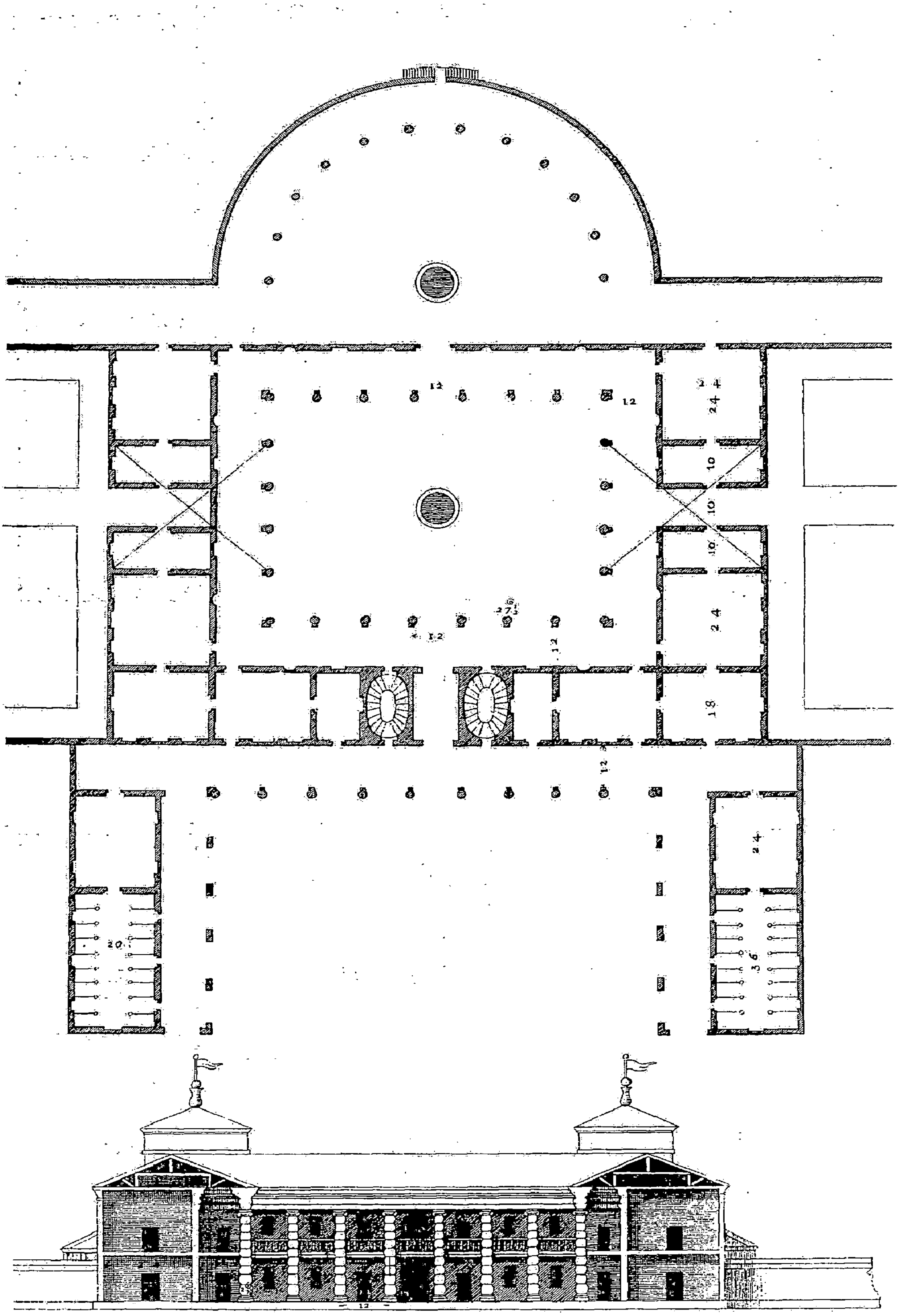


Plate 49 Villa Marc' Antonio Sarego at Santa Sofia in plan and sectional elevation

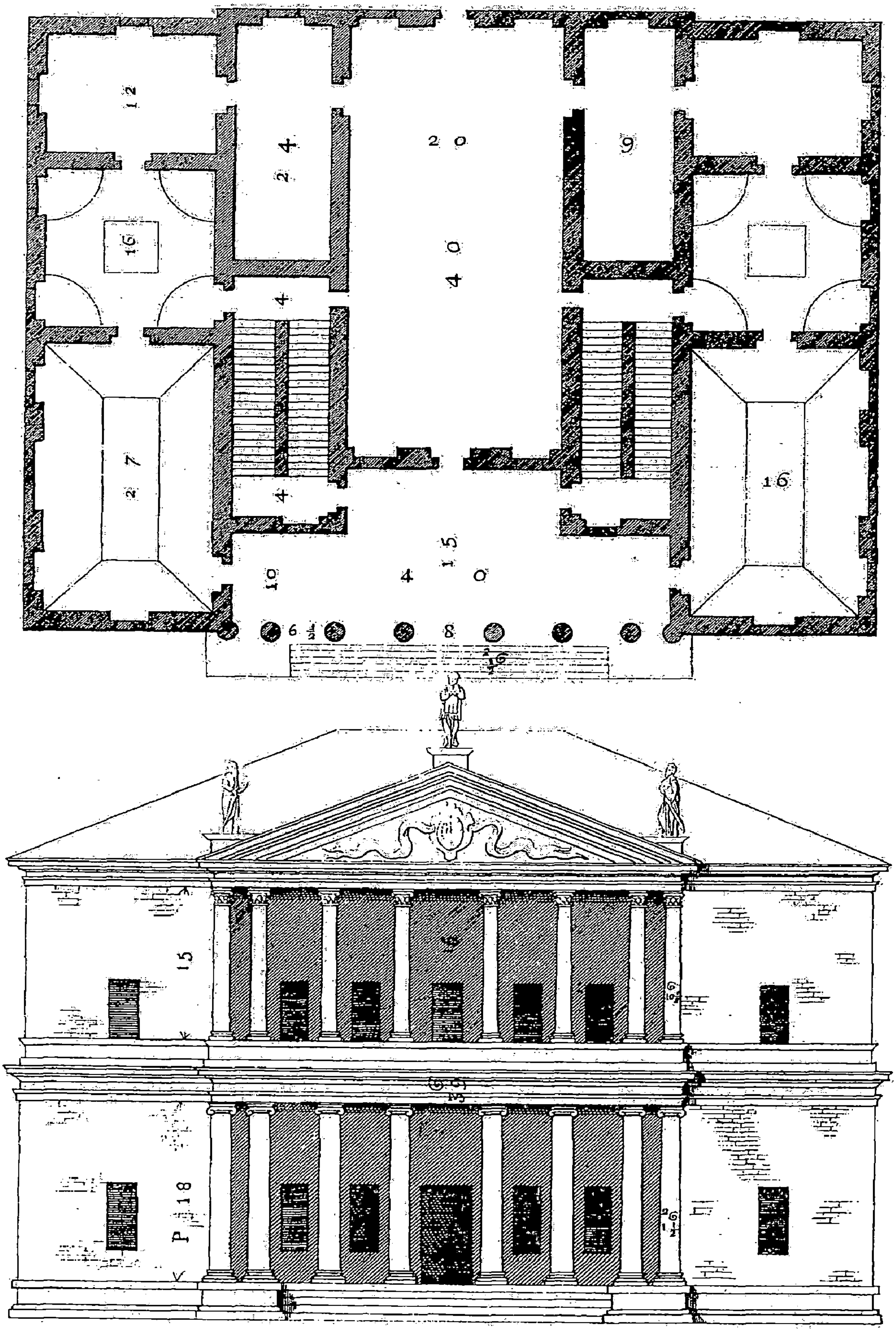


Plate 50 Villa Anibale Sarego at La Miega in plan and elevation

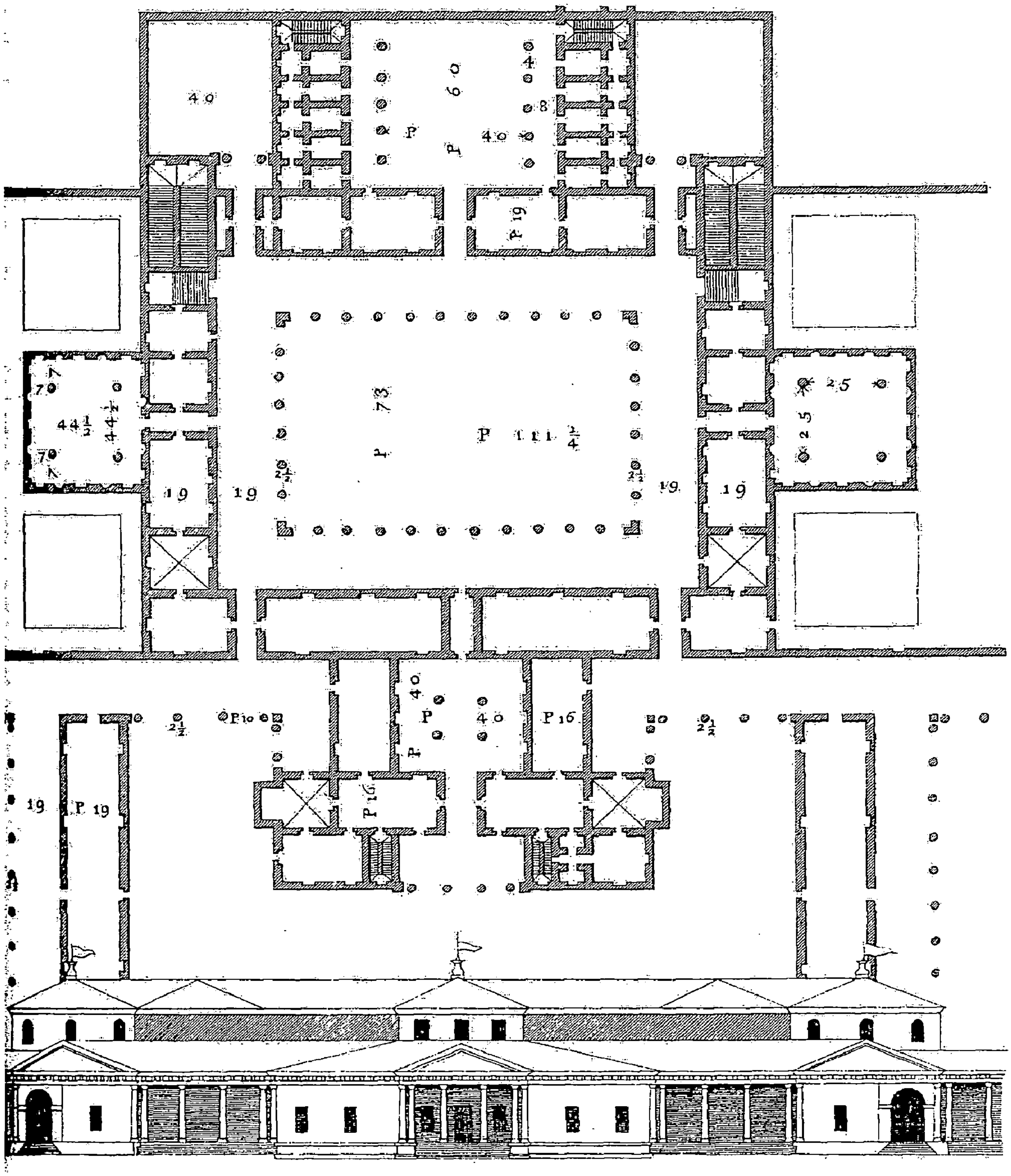


Plate 51 Villa of the Ancients in plan and elevation

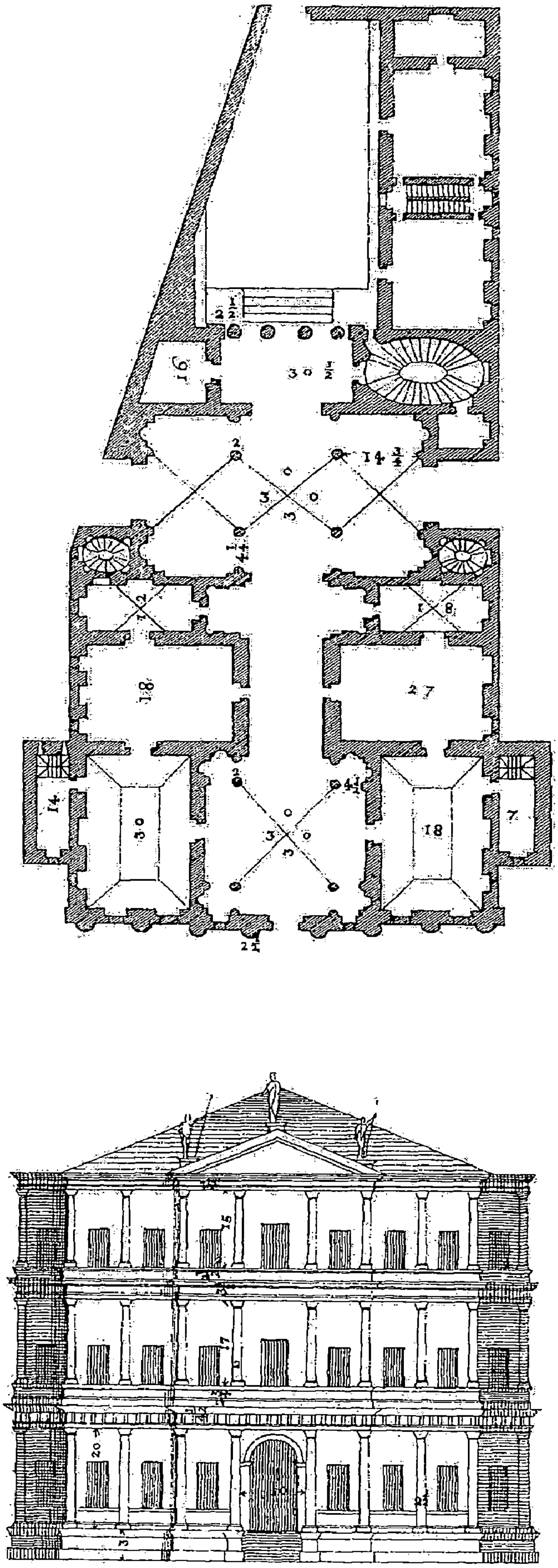


Plate 52 A project for a palazzo on a triangular site in plan and elevation

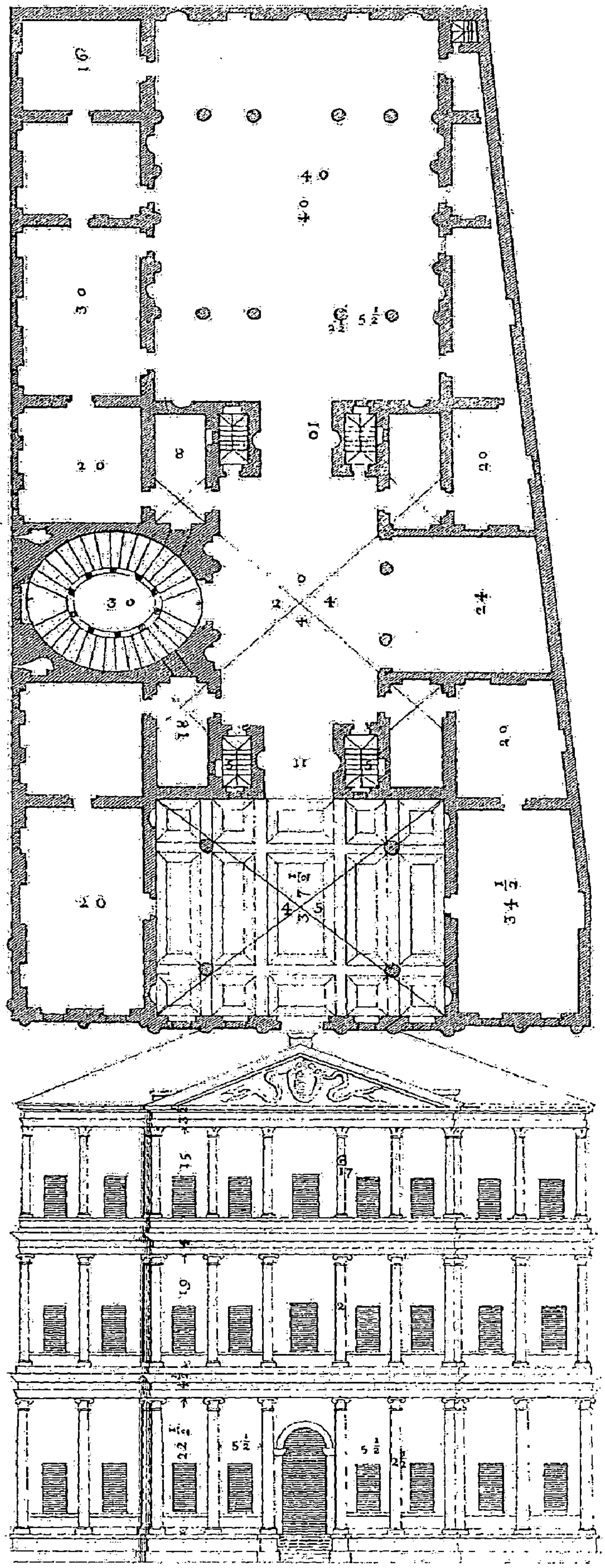


Plate 53 A project for a palazzo on a site in Venice in plan and elevation

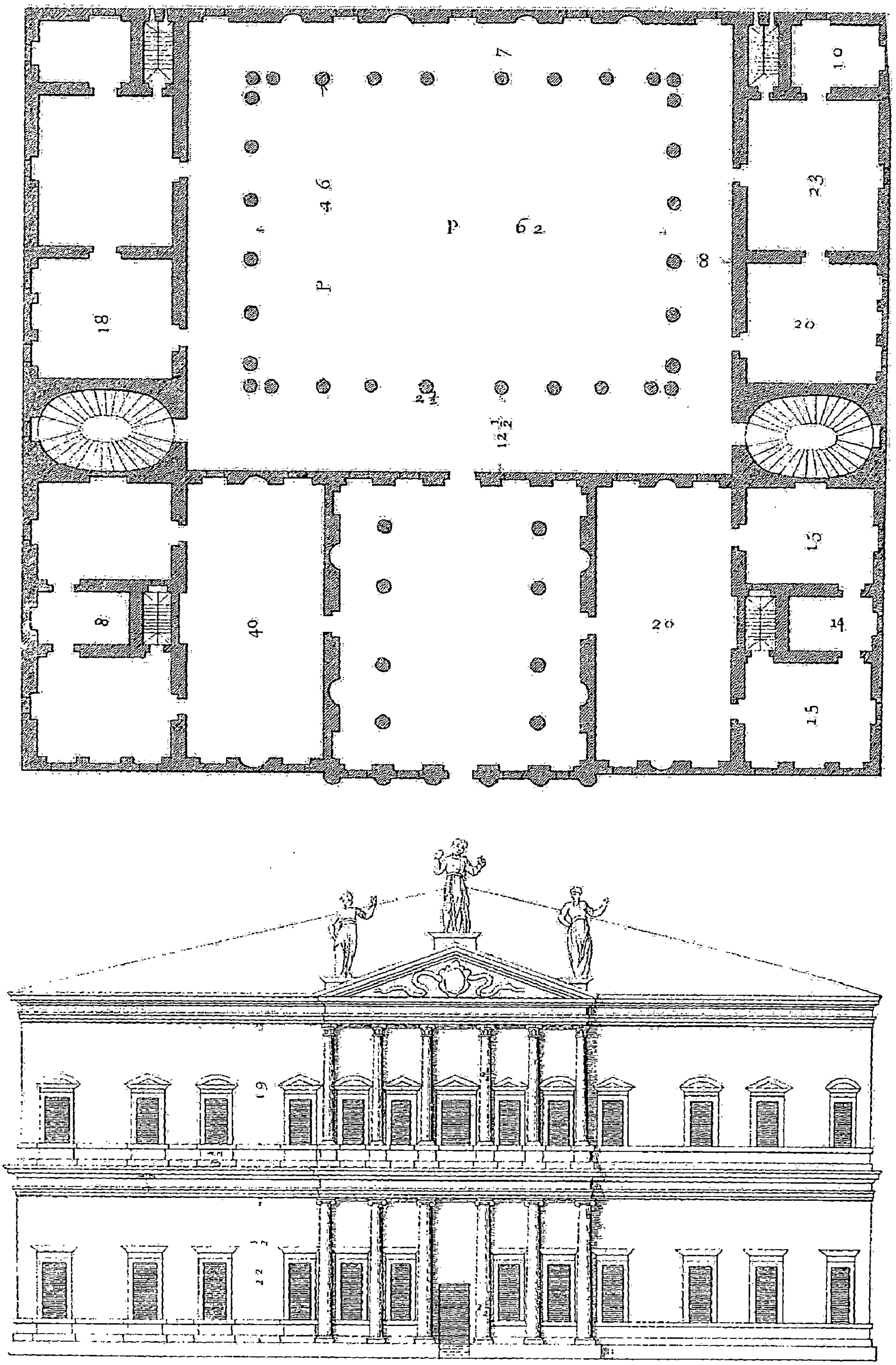


Plate 54 A project for a palazzo for Francesco and Lodovico Trissino in Vicenza in plan and elevation

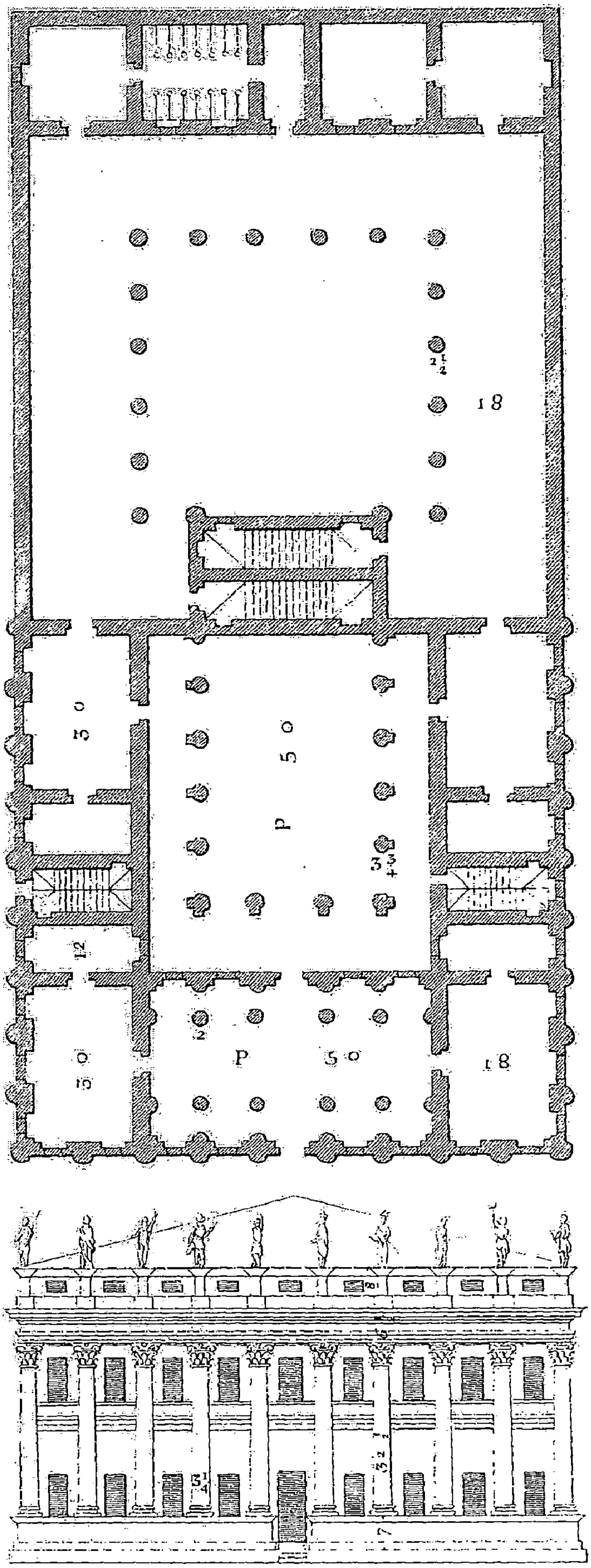


Plate 55 A project of Palazzo for Giacomo Angarano in Vicenza in plan and elevation

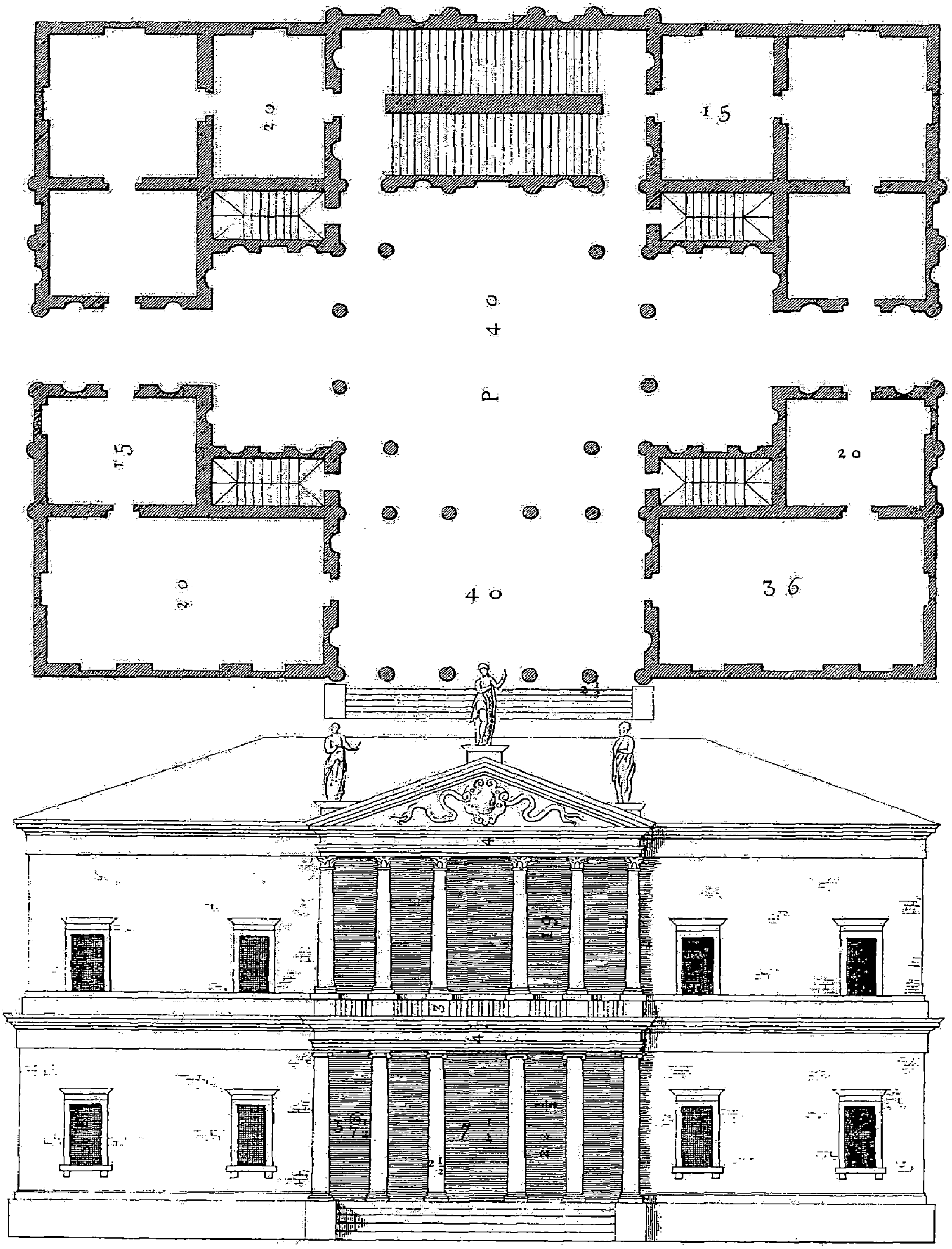


Plate 56 A project of Palazzo for Gio. Battista Della Torre in Verona in plan and elevation

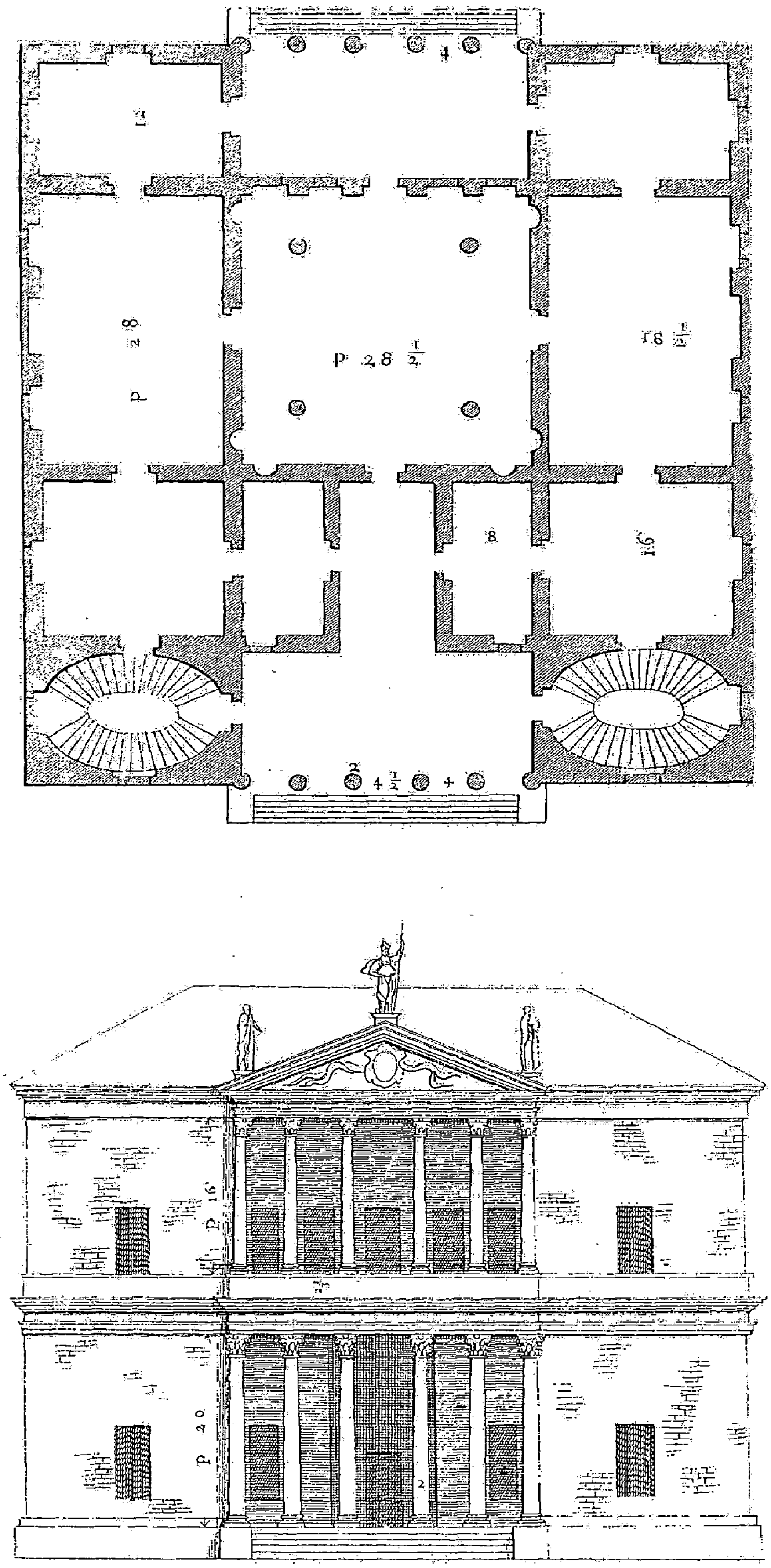


Plate 57 A project of Palazzo for Gio. Battista Garzadore in Vicenza in plan and elevation

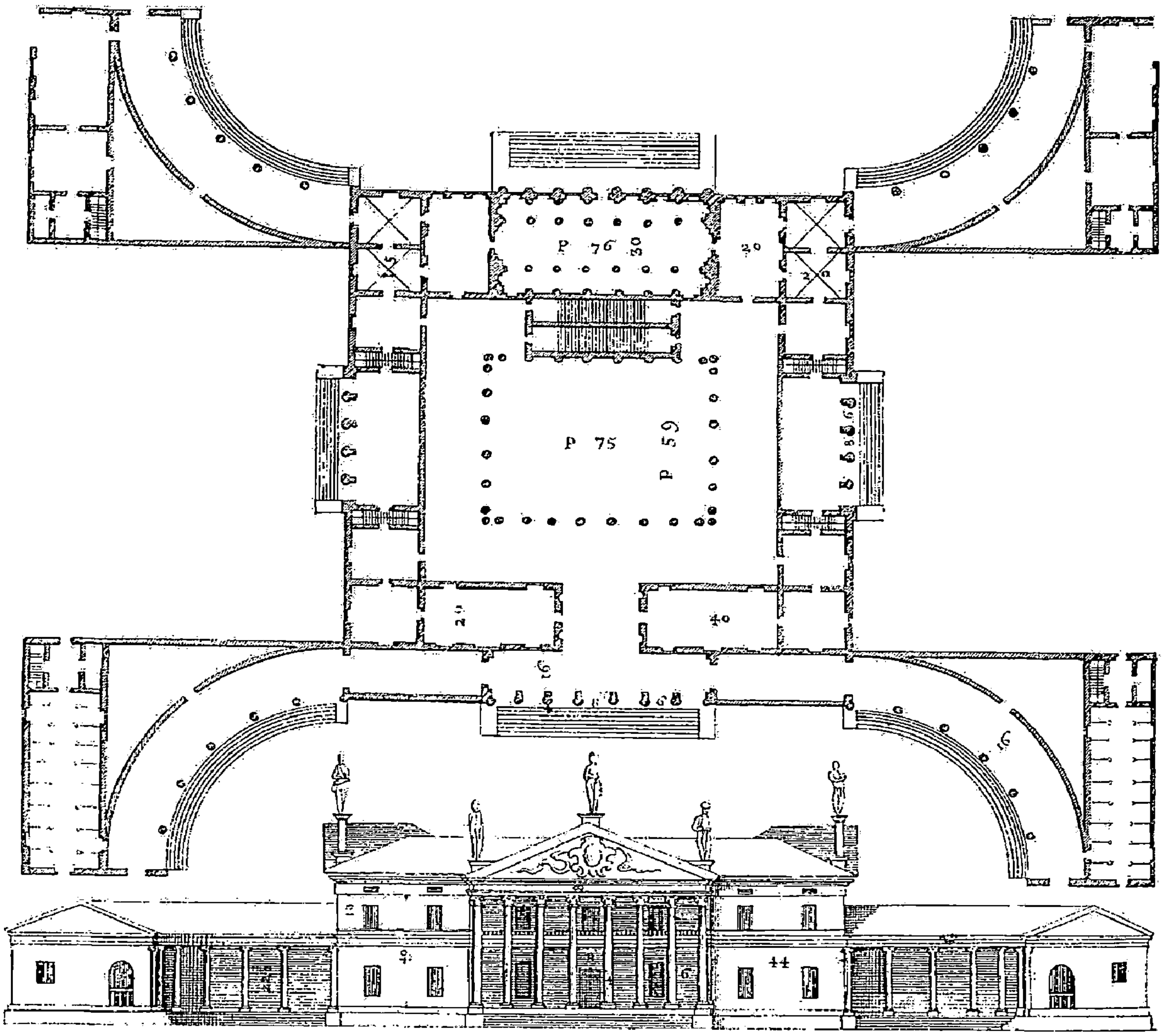


Plate 58 A project of Villa for Leonardo Mocenico in Brenta in plan and elevation

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- *Study of Proportions in Villa Plans of 'I Quattro Libri Dell' Architecttura'* March 2012
- *A Study in Palladian Palette of proportions* September 1997
- *Fractal Geometry in Indian Temple Architecture* April 1995
- *Jaisalmer, The Desert Citadel* April 1995
- *Architectural Styles of Fort Precinct* November 1994
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PHOTO ESSAYS:

• *Jaisalmer* (Colour)	January 1995
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