Introduction to Theory and History of Architecture

SBEA 1513

Introduction to Theory of Modern Architecture

&

Theory of Proportion

Dr. Alice Sabrina Ismail l Dr. Hazrina Haja Bava Mohidin

Introduction

THEORY OF MODERN ARCHITECTURE

- Theory of architecture is important as it sets the basic understanding of design before architects design a building into reality.
- It is a framework or a process that helps to answer the meaning and understanding of architecture vocabulary such as the chosen element of architecture.

5 MAIN Theory of modern architecture

a) Theory of Proportion

b) Organic Architecture

c) Form Follows Function

d) Theory of Style

e) Theory of Communication

Theory of Proportion

- ## Proportion & Scale
- Material Proportions
  - All materials have rational proportions
  - Inherent strength & weaknesses
- Structural Proportions
  - Structural tasks
  - Visual indicators of size & scale
- Manufactured Proportions
 - manufacturing

Three Proportioning System

- Proportion & Ratio done by comparing two or more elements (Architecture with its surrounding context) eg: building and site elements such as human being, trees etc.

- Proportion & Ration done by comparing elements on the subject (Architecture and its architectural features) eg: building and its windows, doors, arch, column to column, floor levels etc.

- Mathematical ratio.

Theory of Proportion

- Golden Ratio
- Classical Orders
- Renaissance Theories
- Modulor
- Ken
- Anthropometry
- Scale

Golden Ratio

•Originated from Ancient Greek civilization
•A proportion between two dimensions of a plane figure or two divisions of a line, in which the ration of the smaller to the larger is the same as the ratio of the larger to the whole: a ratio of approx. 0.618 to 1.000.
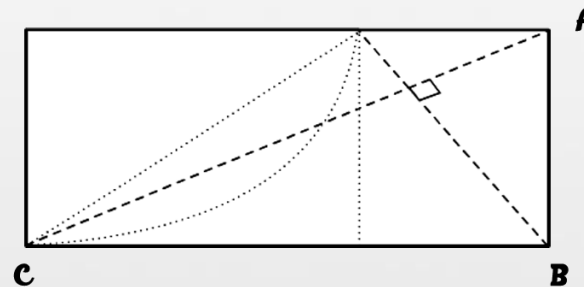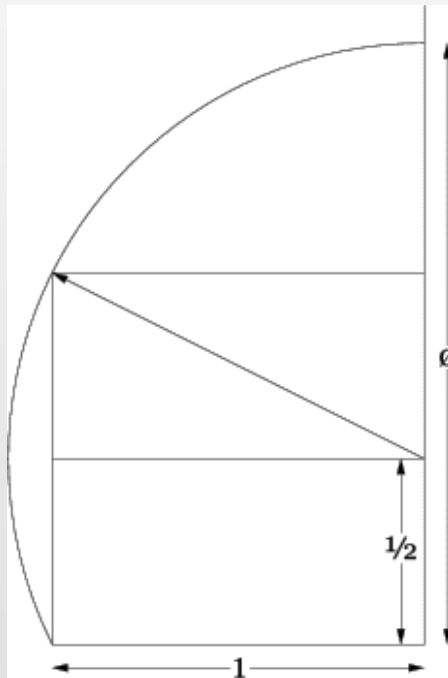

$$AB = a$$
$$BC = b$$
$$Ø = Golden\ Section$$
$$Ø = \frac{a}{b} = \frac{b}{a+b} = 0.618$$

A redrawn image of Golden Ratio

The geometric construction of the Golden
Section, first by extension and then by division

- A rectangle whose sides are proportioned according to the Golden Section is known as a **Golden Rectangle**.
  - If a square is constructed on its smaller side, the remaining portion of the original rectangle would be a smaller but similar Golden Rectangle.
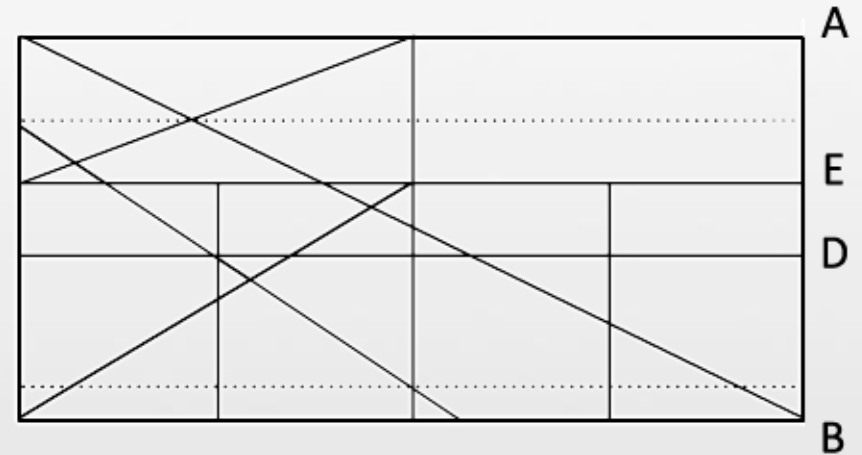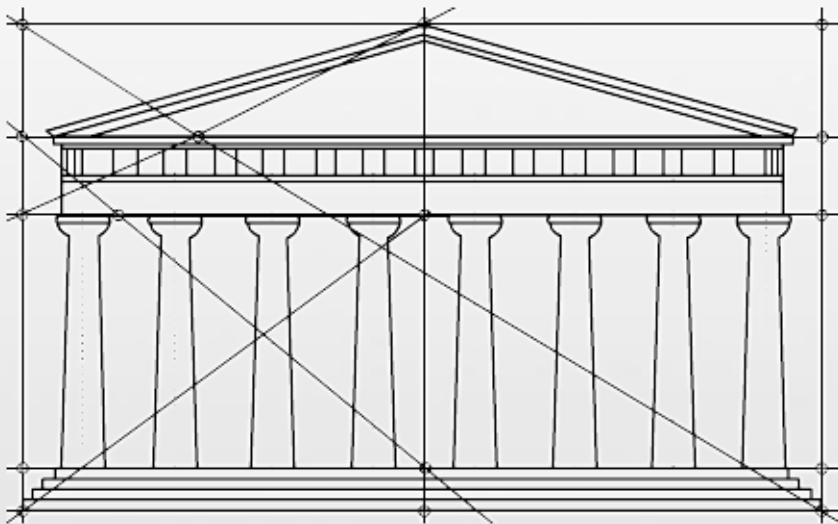
$$\frac{AB}{BC} = \frac{BD}{AB} = \frac{AD}{BD} = \frac{AE}{AD}$$

A redrawn image of Golden Section

Classical Orders

•To the Greeks and Romans, the Orders represented in their proportioning of elements the perfect expression of <u>beauty and harmony</u>.

•The basic unit of dimension was the **diameter of the column**.
From this module were derived the dimensions of the shaft, the capital, as well as the pedestal and the entablature above, the spacing between two adjacent columns, down to the smallest detail.

•**INTERCOLUMNIATION** is the system of spacing between columns, which is also based on the diameter of the column.

•Standardized by Marcus Vitruvius Polio during the reign of Augustus in his *The Ten Books on Architecture*.

Greek orders
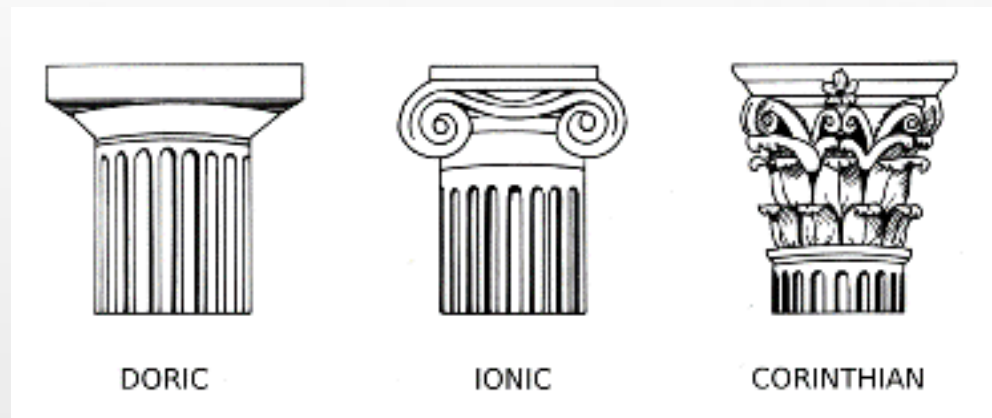
https://commons.wikimedia.org/wiki/File:Order_%28PSF%29.png

Roman orders

Composite Capital

https://www.flickr.com/photos/psulibscollections/5833158736
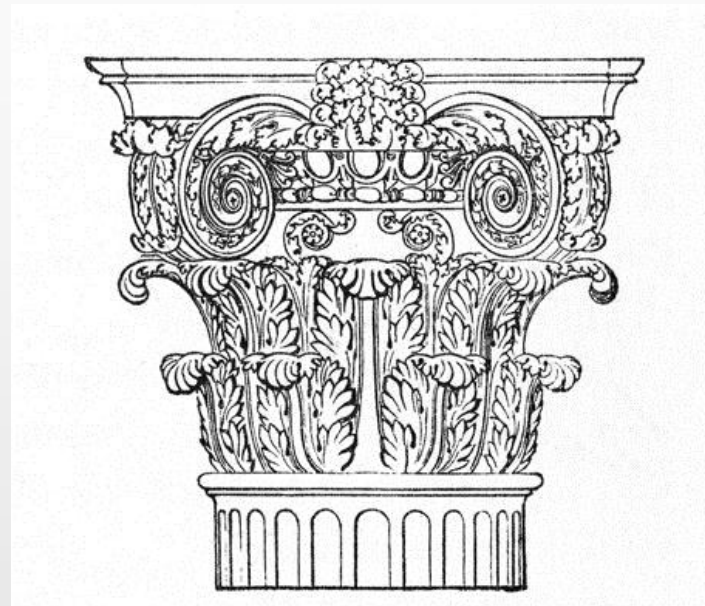
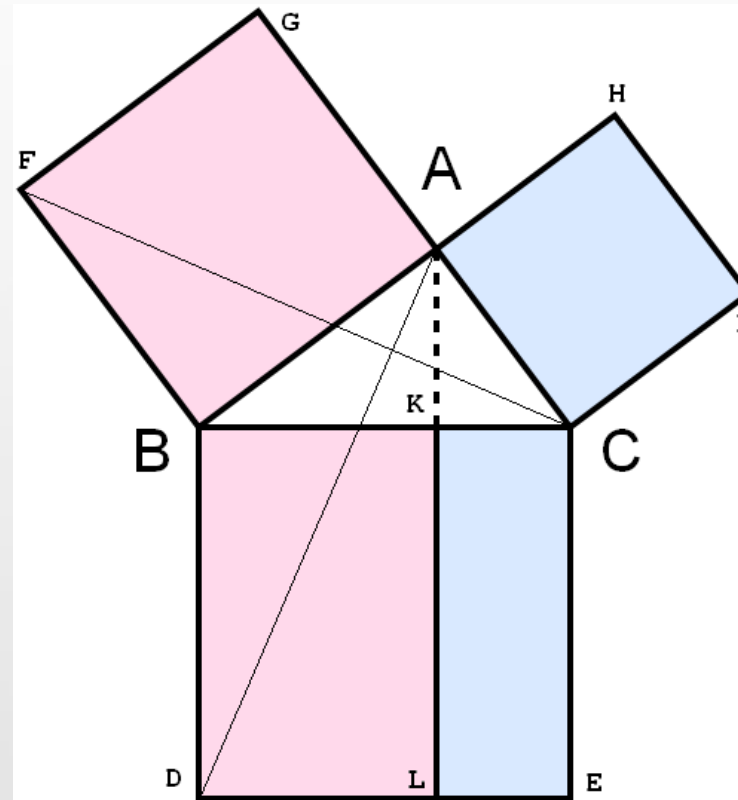**Renaissance Theories**

•The architects of the Renaissance, believing that their buildings had to belong to a higher order, returned to the Greek mathematical system of proportions. The Pythagorean creed was " Everything is arranged according to numbers."

•The Greeks conceived music to be geometry translated into sound, Renaissance architects believed that architecture was mathematics translated into spatial units.

•Renaissance architects applied **PYTHAGORAS'S THEORY OF MEANS** to the ratios of the intervals of the Greek musical scale, and soon developed an unbroken progression of ratios that formed the basis for the proportions of their architecture.

series of interlocking ratios that results form applying Pythagoras theory of means to the intervals of the Greek musical scale.
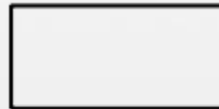
Renaissance Theories

- **_7 Ideal Plan Shapes for Rooms by Andrea Palladio_**
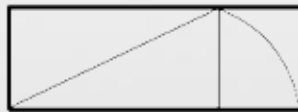 - Paladio's _The Four Books on Architecture_, he followed the footsteps of his predecessors, Alberti and Serlio, and proposed the seven "most beautiful and proportionate manners of rooms.
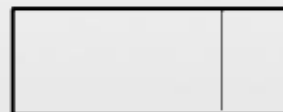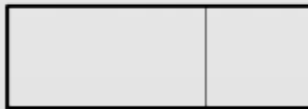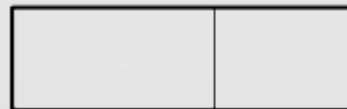
Circle

Square

$1:\sqrt{2}$

3×4

2:3

3:5

1:2

A redrawn image of 7 ideal plan for rooms by Andrea Palladio

Modulor

• Le Corbusier's own proportioning system developed in 1942 published as: *The Modulor: A Harmoniuos Measure to the Human Sale Universally Applicable to Architecture and Mechanics.* : to order *"the dimensions of that which contains and that which is contained."*

• He saw the measuring tools of the Greeks, Egyptians, and other high civilizations as being *"infinitely rich and subtle because they formed part of the mathematics of the human body, gracious, elegant, and firm, the source of that harmony which moves us, beauty."*

• He based the Modulor on both mathematics (the aesthetic dimension of the Golden Section and the Fibonacci Series), and the proportions of the human body (functional dimensions).

Le Corbusier saw the Modulor not as a series of numbers with an inherent harmony, but as a system of measurements that could govern lengths, surfaces, & volumes, & "maintain the human scale everywhere."

https://www.flickr.com/photos/eager/5032530784
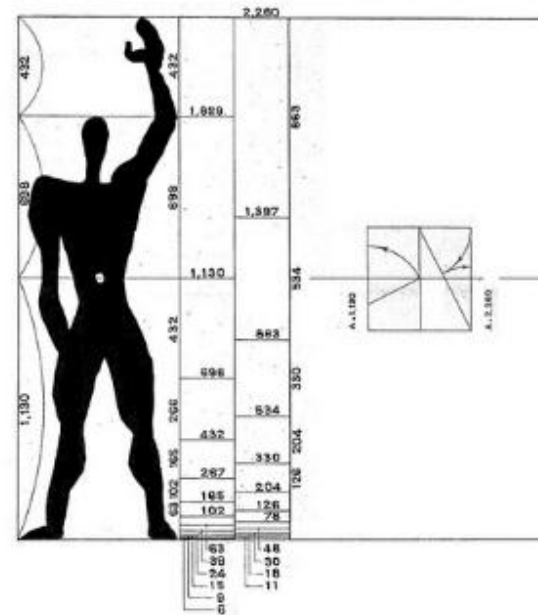
Ken

•The traditional Japanese unit of measure, the **shaku**, was originally imported form China.

•Originally used simply to designate the interval between two columns and varied in size, it was soon standardized for residential architecture and became an absolute measurement.

•Aside as a measurement system, it evolved into an aesthetic module that ordered the structure, materials, and space of Japanese architecture.
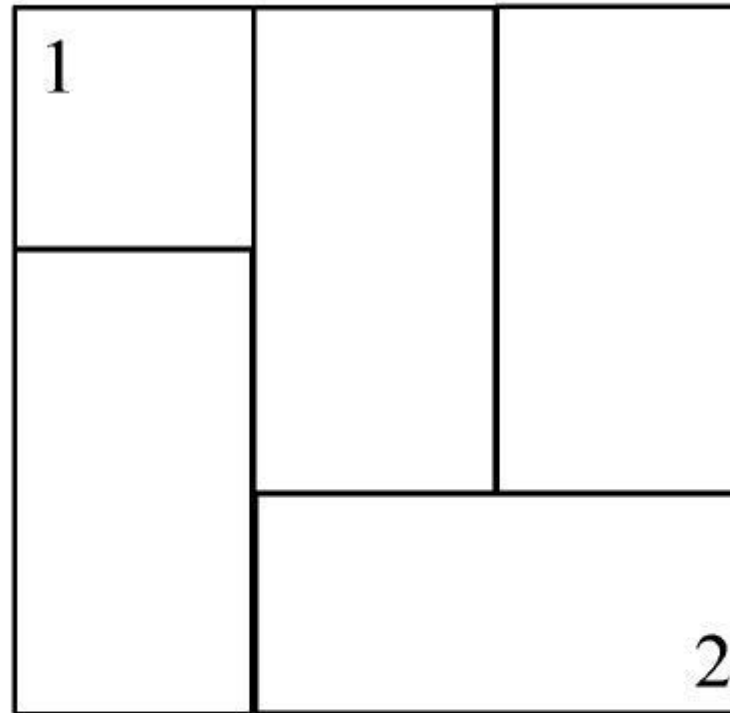
Key
1: Half mat
2: Full mat

https://commons.wikimedia.org/wiki/File:Tatami_layout_1.jpg

•Two methods of designing with the Ken modular method:

- •**Inaka-ma Method**
 The ken grid of 6 shaku determined the center-to-center spacing of columns.Therefore, the standard tatami floor mat (3 x ^ shaku or ½ x 1 ken) varied slightly to allow for the thickness of the columns.

- •**Kyo-ma Method**
  The floor mat remained constant (3.15 x 6.30 shaku) and the column spacing (ken module) varied according to the size of the room and ranged from 6.4 to 6.7 shaku.

Anthropometrics

•Refers to the measurement of the size and proportions of the human body.

•Its applicability to the design process is seen in the
physical fit, or interface, between the human body
and the various components of space

• anthro=man, pometry=measure
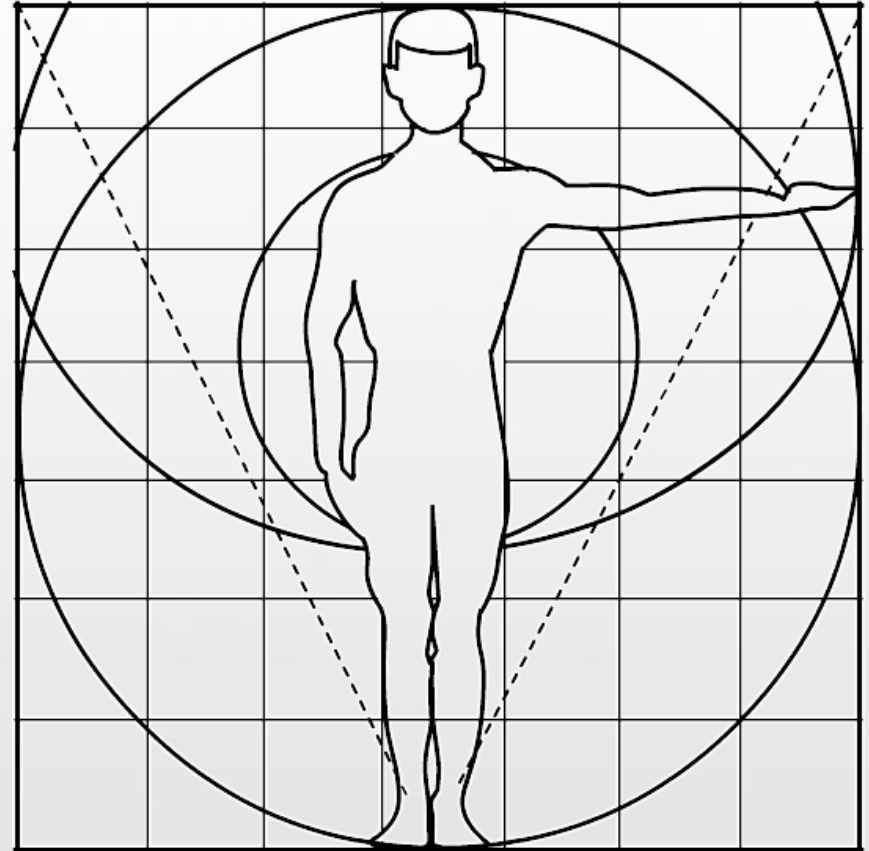
A redrawn image of anthropometry

Scale

•Refers to how we perceive or judge the size of something in relation to something else.

•The entity of a space or object is being compared to may be an accepted unit or standard of measurement.

•In drawing, we use scale to specify the ratio that determines the relationship between the illustration it represents.

- Mechanical Scale
    - The size or proportion of something relative to an accepted standard of measurement.

- Visual Scale
    - The size or proportion an element appears to have relative to other elements of known or assumed size.

- Human Scale
    - Based on the dimensions & proportions of the human body

The Taipei 101, one of the tallest tower in
In the world.
Dominant structure manipulating the skyline of the city with its visual scale

https://en.wikipedia.org/wiki/Taipei_101 - /media/File:Taipei_101_from_afar.jpg

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