greek architecture: a search for perfection
harmony in a proportional relationship

mathematics, a system of building

outward beauty of a building is largely derived from the dimensions of its parts and their relationship to one another

Greek architecture: a search for perfection
Mesopotamia
Ziggurat of Ur
Tallal – Mugayyar, Southern Iraq
2100 BCe
Sumerian, Unknown
Citadel of Sargon II
Dur Sharrukin, Khorsabad
713 – 707 BCE
unknown
Minoan Architecture
Palace of Minos
Knossos, Crete
1700 BCE
Minoan, Unknown
Mycenaean Megaron

- Throne Room
- Throne
- Hearth
- Vestibule
- Porch
Treasury of Atreus
Mycenae, Greece
1250 BCE
Mycenaean, Unknown
### Ancient Greece

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Town Plan of Miletos / Miletus

Miletus, Greece
450 BCE
Grid Plan, Hippodamos
MYCENAEAN MEGARON

GREEK TEMPLE
Greek temple
A temple built as a shrine to the ancient Greek god or goddess to whom it was dedicated. Since the temple was not intended for internal worship, it was built with special regard for external effect. It stood on a stylobate of three or more steps, with a cela containing the statue of the deity and front and rear porticoes, the whole being surmounted by a low gable roof of timber, covered in terracotta or marble tiles.

altar
An elevated place or structure upon which sacrifices are offered or incense burned in worship, or before which religious rites are performed.

cella
The principal chamber or enclosed part of a classical temple, where the cult image was kept. Also called naos.

epinaos
The rear vestibule of a classical temple. Also called opisthodomos, posticum.

pronaos
An open vestibule before the cela of a classical temple. Also called anticum.

pteroma
**pediment**
A wide, low-pitched gable surmounting a colonnade or a major division of a facade.

**tympanum**
The triangular space enclosed by the horizontal and raking cornices of a pediment, often recessed and decorated with sculpture.

**stylobate**
A course of masonry forming the foundation for a row of columns, esp. the outermost colonnade of a classical temple.

**stereobate**
A solid mass of masonry visible above ground level and serving as the foundation of a building, esp. the platform forming the floor and substructure of a classical temple. Also called crepidoma, podium.

**acroterium**
A pedestal for a sculpture or ornament at the apex or at each of the lower corners of a pediment. Also called acroterion.
The Greek Column

As proportional, regulating *system* of building.
The Greek Column

The order of things
Entablature

Architrave
Frieze
Cornice
The Doric Order
The Ionic Order
**IONIC ORDER**

**Egg and dart**
An ornamental motif for enriching an ovolo or echinus, consisting of a closely set, alternating series of oval and pointed forms. Also called **egg and tongue**.

**Dentil**
Any of a series of closely spaced, small, rectangular blocks forming a molding or projecting beneath the coronas of Ionic, Corinthian, and Composite cornices.

**Fascia**
One of the three horizontal bands making up the architrave in the Ionic order.

**Attic base**
A base to a classical column, consisting of an upper and a lower torus separated by a scotia between two fillets.

**Scotia**
A deep concave molding between two fillets. Also called **trochilus**.

**Torus**
A large convex, semicircular molding, commonly found directly above the plinth of the base of a classical column.

**Volute**
A spiral, scroll-like ornament, as on the capitals of the Ionic, Corinthian, and Composite orders.

**Cathetus**
The vertical guideline through the eye of a volute in an Ionic capital, from which the spiral form is determined.

**Echinus**
The circular molding under the cushion of an Ionic capital between the volutes, usually carved with an egg-and-dart pattern. Also called **cymatium**.

**Fillet**
A narrow part of the surface of a column left between adjoining flutes.

**Apophyge**
A small, concave curve joining the shaft of a classical column to its base. Also called **apophysis**.
The Corinthian Order
**CORINTHIAN ORDER**

**modillion**
An ornamental bracket, usually in the form of a scroll with acanthus, used in series beneath the corona of a Corinthian, Composite, or Roman Ionic cornice.

**helix**
A spiral ornament, as any of the volutes issuing from a cauliculus in a Corinthian capital.

**cauliculus**
Any of the ornamental stalks rising between the acanthus leaves of a Corinthian capital, from which the volutes spring. Also called caulicoel.

**bell**
The underlying part of a foliated capital, between the abacus and neck molding.

**acanthus**
An ornament, as on the Corinthian capital, patterned after the large, toothed leaves of a Mediterranean plant of the same name.

**Corinthian order**
The most ornate of the five classical orders, developed by the Greeks in the 4th century B.C. but used more extensively in Roman architecture, similar in most respects to the Ionic but usually of slenderer proportions and characterized esp. by a deep bell-shaped capital decorated with acanthus leaves and an abacus with concave sides.
Temple of Hera II
Paestum, Italy
470 – 460 BCE
Greek – Doric, Unknown
Acropolis
Athens, Greece
450 – 433 BCE
Greek, Perikles
Agora
Athens, Greece
Stoa of Attalus II
Agora – Athens, Greece
159 - 132 BCE (reconstructed 1952)
Greek, Doric & Ionic, Unknown
Propylaea

Acropolis - Athens, Greece
437 BCE
Doric, Mnesicles
Temple of Athena Nike
Acropolis – Athens, Greece
425 BCE
Ionic, Kallikrates
Erectheion
Acropolis – Athens, Greece
421 - 407 BCE
Ionic, Mnesicles
Porch of the Caryatides
Acropolis – Athens, Greece
Rear of the Erectheion
Mathematical systems of proportion originate from the Pythagorean concept of "all is number" and the belief that certain numerical relationships manifest the harmonic structure of the universe. One of these relationships that has been in use ever since the days of antiquity is the proportion known as the Golden Section. The Greeks recognized the dominating role the Golden Section played in the proportions of the human body. Believing that both humanity and the shrines housing their deities should belong to a higher universal order, they utilized these same proportions in their temple structures.

Renaissance architects also explored the Golden Section in their work. In more recent times, Le Corbusier based his Modulor system on the Golden Section. Its use in architecture endures even today.

The Golden Section can be defined as the ratio between two sections of a line, or the two dimensions of a plane figure, in which the lesser of the two is to the greater as the greater is to the sum of both. It can be expressed algebraically by the equation of two ratios:

\[ \frac{a}{b} = \frac{b}{a+b} = 0.618 \]

The Golden Section has some remarkable algebraic and geometric properties that account for its existence in architecture as well as in the structures of many living organisms. Any progression based on the Golden Section is at once additive and geometrical.

Another progression that closely approximates the Golden Section in whole numbers is the Fibonacci Series: 1, 1, 2, 3, 5, 8, 13, \ldots Each term again is the sum of the two preceding ones, and the ratio between two consecutive terms tends to approximate the Golden Section as the series progresses to infinity.

In the numerical progression: \( \varphi, \varphi^2, \varphi^3, \ldots \), each term is the sum of the two preceding ones.
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. This operation can be repeated indefinitely to create a gradation of squares and Golden Rectangles. During this transformation, each part remains similar to all of the other parts, as well as to the whole. The diagrams on this page illustrate this additive and geometrical growth pattern of progressions based on the Golden Section.

\[
\begin{align*}
AB &= BC = CD = \cdots = 0 \\
BC &= CD = DE = \cdots \\
AB + BC &= CD \\
BC + CD &= DE \\
\text{etc.}
\end{align*}
\]
The Parthenon, Athens, 447–432 B.C., Ictinus and Callicrates

These two graphic analyses illustrate the use of the Golden Section in the proportioning of the facade of the Parthenon. It is interesting to note that while both analyses begin by fitting the facade into a Golden Rectangle, each analysis then varies from the other in its approach to proving the existence of the Golden Section and its effect on the dimensions and distribution of elements across the facade.
\[ \frac{a + b}{a} = \frac{a}{b} = \phi \]
Parthenon
Acropolis - Athens, Greece
448 - 438 BCE
Greek - Doric, Perikles
Propylaea
Temple of Athena Nike
Erechtheion
Parthenon
Harmony in a proportional relationship

Mathematics, a system of building

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