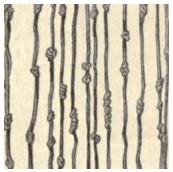
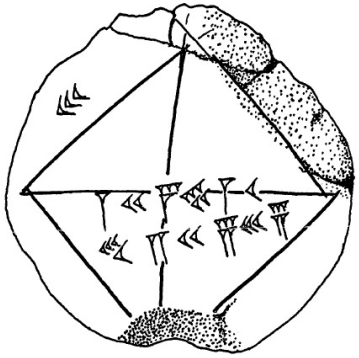


Lecture

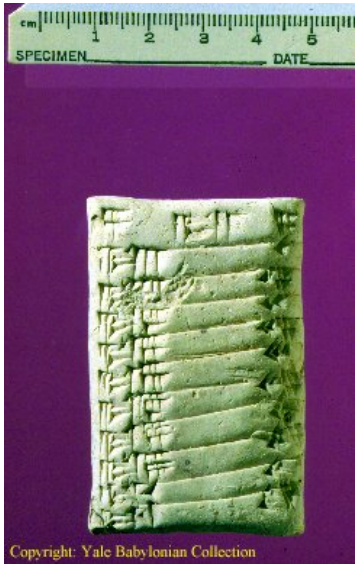
MAT 336

Topic Title

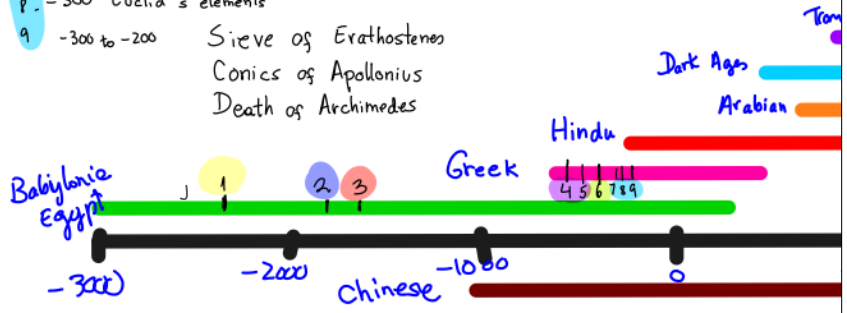


This sketch of the tablet appears on page 27 of the book by Aaboe

https://www.maa.org/press/periodicals/convergence/the-best-known-old-babylonian-tablet

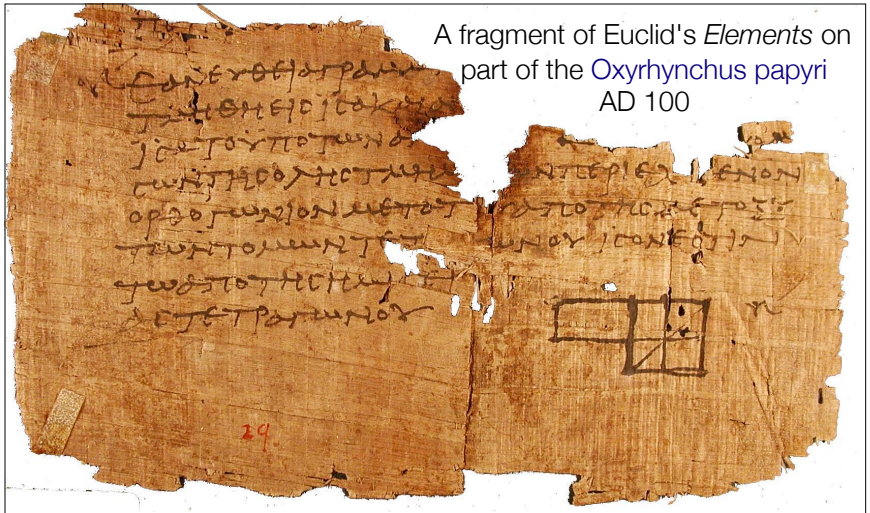


1. -2900 Positional number system
2. -1850 Moscow Papyrus
3. -1650 Rhind Papirus
4. -585 Thales
5. -518 Pythagorean arithmetic and geometry
6. -427 Birth of Plato
7. -332 Alexandria is founded
8. -300 Euclid's elements
9. -300 to -200 Sieve of Erathostenes
   Conics of Apollonius
   Death of Archimedes



Euclid's Elements Thirteen Books

I Plane geometry (triangles, parallels, and area.)	II and V, geometric algebra	III and IV, circle geometry, construction of circumscribed figures
V and X theory of proportions, classification of incommensurables	VI Similar figures and proportions in geometry.	VII,VIII and IX: Number theory
XI solid geometry	XII measurement of figures	XIII platonic solids



A fragment of Euclid's *Elements* on part of the Oxyrhynchus papyri
AD 100

By Euclid - http://www.math.ubc.ca/~cass/Euclid/papyrus/tha.jpg, Public Domain, https://commons.wikimedia.org/w/index.php?curid=1259734

Book I proposition 47
The Pythagorean Theorem

Version from 900 - without Theon's note

An illumination from a manuscript based on Adelard of Bath's translation of the *Elements*, *circa* 1309–1316; Adelard's is the oldest surviving translation of the *Elements* into Latin, done in the 12th-century work and translated from Arabic. (Wikipedia)

The Italian Jesuit Matteo Ricci (left) and the Chinese mathematician Xu Guangqi (right) published the Chinese edition of Euclid's Elements (幾何原本) in 1607. (Wikipedia)

Definition 1.
A *point* is that which has no part.

Definition 2.
A *line* is breadthless length.

Definition 3.
The ends of a line are points.

Definition 4.
A *straight line* is a line which lies evenly with the points on itself.

Definition 5.
A *surface* is that which has length and breadth only.

...Definition 29.

Definition 1.
A *point* is that which has no part.

Definition 2.
A *line* is breadthless length.

Definition 15.
A circle is a plane figure contained by one line such that all the straight lines falling upon it from one point among those lying within the figure equal one another.

Common notion 1.
Things which equal the same thing also equal one another.

Common notion 2.
If equals are added to equals, then the wholes are equal.

Common notion 3.
If equals are subtracted from equals, then the remainders are equal.

Common notion 4.
Things which coincide with one another equal one another.

Common notion 5.
The whole is greater than the part.

unique **Postulate 1.**
To draw a straight line from any point to any point.

Postulate 2.
To produce a finite straight line continuously in a straight line.

Postulate 3.
To describe a circle with any center and radius.

Postulate 4.
That all right angles equal one another.

Postulate 5.
That, if a straight line falling on two straight lines makes the interior angles on the same side less than two right angles, the two straight lines, if produced indefinitely, meet on that side on which are the angles less than the two right angles.

Postulate 1.
To draw a straight line from any point to any point.
unique

Postulate 2.
To produce a finite straight line continuously in a straight line.

Postulate 3.
To describe a circle with any center and radius.

Postulate 4.
That all right angles equal one another.

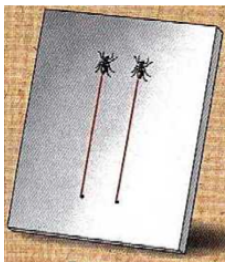
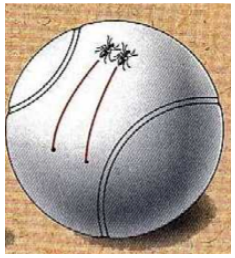
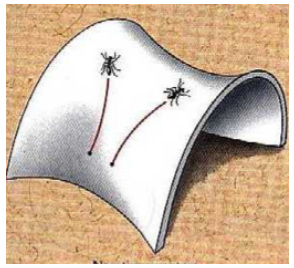
Proposition 1.
It is possible
To construct an equilateral triangle on a given finite straight line.

Postulate 5.
That, if a straight line falling on two straight lines makes the interior angles on the same side less than two right angles, the two straight lines, if produced indefinitely, meet on that side on which are the angles less than the two right angles.

This postulate is not used until Proposition I.29

Playfair axiom.
In a plane, given a line and a point not on it, at most one line parallel to the given line can be drawn through the point.

Two ants start walking straight in the same direction. Will they meet?

unique

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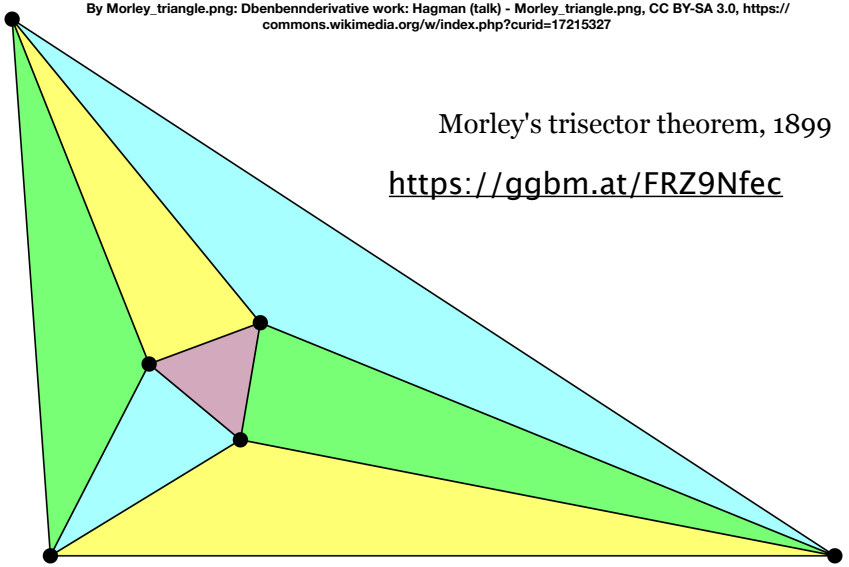
Playfair axiom.
In a plane, given a line and a point not on it, at most one line parallel to the given line can be drawn through the point.

Proposition 1. Book II
If there are two straight lines, and one of them is cut into any number of segments whatever, then the rectangle contained by the two straight lines equals the sum of the rectangles contained by the uncut straight line and each of the segments.

Number theory

Are all basic Euclidean geometry theorems proven?



Morley's trisector theorem, 1899

https://ggbm.at/FRZ9Nfec

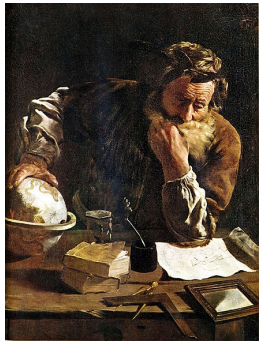
Platonic solids
V-E+F=2
Descartes
Euler

Ptolemy once asked Euclid if there was not a shorter road to geometry that through the Elements, and Euclid replied:

there is no royal road to geometry.

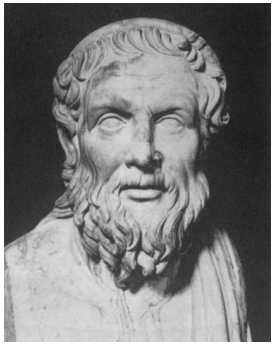
ΑΓΕΩΜΕΤΡΗΤΟΣ ΜΗΔΕΙΣ ΕΙΣΙΤΩ

"Let no one ignorant of geometry enter" According to tradition, this phrase was engraved at the door of Plato's Academy, the school he founded in Athens.



Archimedes ?-212BC

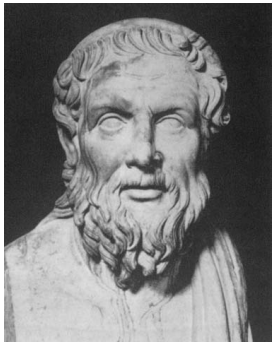
Apollonius 262BC-190 BC



He who understands Archimedes and Apollonius will admire less the achievements of the foremost men of later times.
Leibniz

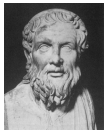
Apollonius 262BC-190 BC

https://www.geogebra.org/m/GmTngth7#material/T8TV2JqG



Parabolas, ellipses, hyperbolas

Apollonius 262BC-190 BC



Archimedes' Law of the Lever

1. Equal weights at equal distances are in equilibrium, and equal weights at unequal distances are not in equilibrium but incline towards the weight which is at the greater distance.
2. If, when weights at certain distances are in equilibrium, something is added to one of the weights, they are not in equilibrium but incline towards that weight to which the addition was made.
3. Similarly, if anything is taken away from one of the weights, they are not in equilibrium but incline towards the weight from which nothing was taken.
4. When equal and similar plane figures coincide if applied to one another, there centers of gravity similarly coincide.

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4. When equal and similar plane figures coincide if applied to one another, there centers of gravity similarly coincide.

Proposition 1: Weights that balance at equal distances are equal.

Propositions 6, 7: Two magnitudes, (whether commensurable or incommensurable) balance at distances reciprocally proportional to the magnitudes.

"Nōlī turbāre circulōs meōs!"

"Do not disturb my circles!"

Proposition (Archimedes) The area of a circle is equal to the area of a right triangle in which one of the legs is equal to the radius and the other to the circunference.