

Notes: A Brief History of Algebra, Part 2

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From Part 1

A global provenance

Ancient Near East → Ancient Greece → India → medieval Islamic empire → late Medieval and Renaissance Europe

- I. The “pre-mathematical” era (40,000 to 5000 B.C.E.)
- II. The math of early civilization (5000 to 500 B.C.E)
 - A. The Egyptians
 - B. The Babylonians
 - C. The Chinese

Part 2

- III. The Greek tradition (roughly 600 B.C.E. to 400 C.E.)

What do we mean by Greek (Hellenistic) mathematics?

- A shared language, tradition and way of thinking, not nationality. Euclid may have gone to school in Athens, but he lived in Egypt; Archimedes lived in what is now Sicily.
- Proof and logical reasoning is at its center.
- The primary focus is geometry.
- The word mathematics itself comes from the Greek *mathematike*, meaning “that which is learned.”
- Mathematics pursued by those whom had the means, the time and the ability; perhaps a thousand existed in the thousand years of this period. Key names:

Thales	Innovator (?) in trigonometry
Pythagoras	Geometric ratios
Euclid	Synthesis of math knowledge (<i>Elements</i>)
Archimedes	Areas and volumes
Apollonius	Conic sections (<i>Conics</i>)
Pappus	Commentaries on <i>Elements</i>
Diophantus	“The father of algebra” (<i>Arithmetica</i>)
Theon	Editions of <i>Elements</i> and Ptolemy
Hypatia	Commentaries on Theon, <i>Conics</i>
Proclus	Commentaries on <i>Elements</i>

A. Pythagoras

- Uncertain whether or not Pythagoras was a mathematician
- A philosophical brotherhood of unusual parts
- Since no numbers were attached to the objects they studied, ratios were at the center of problems, rather than calculation.
- Pythagorean Theorem
- Incommensurable ratios (irrational numbers)

B. Euclid

- *Elements* his masterwork
- A collection of the entire Greek math tradition
- Taught until the early 20th century
- A paragon of logic and precise reasoning
- Systematically presented as a formal science
- Definitions – postulates – “common notions” – propositions – proofs

C. Apollonius

- *Conics* his essential work
- Geometric figures derived from a cone
- Coined “ellipse,” “parabola,” “hyperbola”

D. Diophantus

- The father of algebra – maybe
- *Arithmetica*'s list of 189 problems and solutions
- Specific to the general
- No zero, no negative values, no irrational values
- Mostly indeterminate equations