

Pappus of Alexandria

(c. 290-350 A.D. - could be decades either way for both) ⑦

- we know very little about him, mostly from clues in his surviving writings:
 - taught in Alexandria
 - had a son named Hermodorus
 - calculated the date and location of the conjunction that gave rise to an eclipse in 320 A.D.

- wrote a number of works that have not survived, either lost entirely or ^{survived only} in small fragments or quotes by others.

- The Rivers in Libya
- Description of the Inhabited World
- The Interpretation of Dreams
- a commentary on Ptolemy's Almagest
- a commentary on Diodorus' Analemma
- a commentary on Euclid's Elements

→ one work has survived in large part, though parts are missing, the Collection (Synagoge in Greek), which attempts to organize, summarize, explain, and extend all the major results of Greek and Hellenistic mathematics.

This originally had eight books:

I - entirely lost - clues in later books suggest it was concerned with arithmetic

II - preface & beginning lost, we have the rest from the middle of the 14th proposition

- discusses Apollonius' techniques for representing and multiplying large numbers, a contemporary counterpart to Archimedes' techniques in The Sand-Reckoner

- examples in the surviving fragment involve numbers up to about 10^{58} .

III - appears to have survived in its entirety

- concerned with plane and solid geometry, including:
 - various methods for solving the problem of finding two mean proportionals [basically, computing $\sqrt[3]{2}$, or duplicating a cube], as well as approximation techniques. (The problem can't be solved with only ruler and compass, as it turns out.)
 - arithmetic, harmonic, & geometric means
 - inscribing the five regular polyhedra in a sphere

IV - title and preface lost, the rest seems complete

- concerned with properties of circles, curves, and angles:
 - Apollonian problems
 - special curves:
 - Archimedes' spiral
 - conchoid of Nicomedes
 - quadratrix
 - helices
 - conics
 - trisection of angles with the help of some of the special curves (another problem that can't, in general, be solved only with ruler & compass)

V - appears to have survived in its entirety

- concerned with plane & solid geometry, especially areas and volumes:
 - properties of polygons and their areas & perimeters
 - volumes & surface areas of polyhedra (not just the five regular ones)
 - computation of the surface area and volume of a sphere using Archimedean methods.

VI - seems to have survived entirely

- commentary on and fixing errors in "lesser astronomical works" (is not Ptolemy's Almagest)

VII - seems to have survived entirely

- concerned with geometry and geometrical algebra
- preface discusses mathematical reasoning, including the distinction between problems and theorems. It also enumerates 33 works by Euclid, Apollonius, Aristaeus, and Eratosthenes [most now lost] whose main results he intends to give, along with the lemmas necessary to prove them
- the book also includes several original results of Pappus, including Pappus' Theorem (a.k.a. Pappus' Hexagon Thm.)
- the book has very sophisticated use of similarity, cross-ratios, and other geometric techniques.

VIII - seems to have survived entirely

- mainly concerned with mechanics: centres of gravity, mechanical advantage, etc.
- does include some purely geometric results as lemmas.

Next time we'll look at a couple of Pappus' original results.