Math 181

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What are the Origins of Greek Theoretical Math?

Famous Euclidian quote about the purity of learning mathematics for the purpose of knowledge. Greek mathematics was very unconcerned with application and focused on abstract gains in knowledge.

- Katz textbook has a confident guess
  - From Thales (624-547 BC) and Pythagoras (572-497 BC)
  - Brough from Egypt
  - Pythagoras was a mystic/religious leader who preached "all is numbers"
- Pros:
  - primary sources say it

    Also comes with a great story about the square root of two and murder.

- Cons:
  - sources are very late, hundreds of years later and had clear agendas.
  - No mathematical sources before 400 BC, nothing from Pythagoras' followers
  - Inconsistent with Greek culture at the time.

    One source, The mathematics of Pythagoras. We don't have any direct sources of Pythagoras. The proofs Katz shows in his textbook comes from:
    * Nichomachus' introduction to arithmetic

      English translation avalible in a 1926 translation.

      Probably written only 100AD, which is hundreds of years after Pythagoras.

      Nichomachus probably lived in Gerasa near the Jordanian city of Jerash

    * 44 sources for Nichomachus' writing, earliest dates to 1000AD which is hundreds of years after he lived.

Nichomachus

- Even in the introduction of his book he refers to Pythagoras as the one of the ancients.
- Ancient Greeks saw mathematics as encompassing several subjects
  - Arithmetic
  - Geometry (focus on plane)
  - Music
  - Astronomy
- He attempts to raise mathematics and philosophy above the common people, people like handymen, artisans, etc.
- First Math Text

Nichomachus says that the cubes can be made by summing n odd numbers. In other words:

$$1, 8, 27, 125 = 1, 3 + 5, 7 + 9 + 11, ... \tag{1}$$

For a closed formula:

$$\sum_{i=0}^{n-1}(2(i + \frac{n(n+1)}{2}) + 1) = n^3 \tag{2}$$

Which works for $n > 1$

Nichomachus doesn't state where this formula comes from, but he describes cubes as a geometric object, and he has many other formulas which he proved via geometric reasoning, which hints at what he did to solve.

Looking at the trianglular numbers you can form them by adding a row to the previous term. You can do the same thing with squares, showing that the nth square is the (n-1)th square plus an odd number.

Nichomachus goes on to dicuss pentagonal heptagonal, etc numbers.

Nichomachus says that mathematics is the work of Pythagoras, but that seems unlikely. Modern consensus is that Pythagoras had no relation to these results, but that leaves the origin unknown.

Current theory is that is comes from common everyday mathematics, accounting, carpentry, etc. The same kinds of people Nichomachus denigrated in the introduction to his book.