Math 181
Day 7 Notes

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Mediterranian Mathematics

- Greek math is undoubtably important even if it is not the only place in the ancient world which made significant contributions.
- Greece was inhabited for thousands of years.
- Ancient Greece included much of the coast of the mediterannian, including parts of Asia Minor, Africa, Spain, Italy, etc.
- Ancient Greece was defined not by government but by culture, langauge, religion, and dress.
- Ancient Greece was made up of hundreds of small city states which were governed independently. Some example city states are:
  - Athens
  - Sparta
  - Corinth
  - etc.

Greek Numerals

How do they work?

- Letters have values
  - $\alpha = 1$
  - $\beta = 2$
  - $\gamma = 3$
  - $\delta = 4$
  - $\epsilon = 5$
  - $\digamma = 6$
  - $\zeta = 7$
  - $\eta = 8$
  - $\theta = 9$

  Tens:
  - $\iota = 10$
  - $\kappa = 20$
  - $\lambda = 30$
  - $\mu = 40$
  - $\nu = 50$
  - $\xi = 60$
  - $O = 70$
  - $\pi = 80$
  - qoppa$= 90$

  Hundreds:
  - $\rho = 100$
  - $\sigma = 200$
  - $\tau = 300$
  - $\upsilon = 400$
  - $\phi = 500$
  - $\chi = 600$
  - $\psi = 700$
  - $\omega = 800$
  - sampi$= 900$

They borrow three characters from the Venetician alphabet to fill out their values.

- First you pick one value from each group, ones, tens, hundreds.
- Then you order them from largest to smaller with the exception of numbers in the teens.
- For example
  - $\rho\mu\alpha = 100 + 40 + 1 = 141$
  - $\beta\iota = 2 + 10 = 12$

Structural Features

- Similar to our modern system but different than the Roman system.
- Known as a cipher system, which means there is one character for each power of ten.
- Largest number is 999.
- System is additive rather than positional.

> Western/Arabic/Hindu numeral system is positional which means we share symbols between values.

Some extensions were added over time to allow expression of numbers beyond 999.

1. For α through θ you can add a hasta mark ,α to multiply the value by a thousand. This allows for a maximum of 9999
2. A different system to extend the numbers even further was used. M was equal to ten thousand "myriad"

> In classical literature, myriad means both, 10,000 and also a large number.

3. M^x is equal to 10,000 times a number from the second or third column.
4. This gives all values up to 1 million.

Over a thousand years the means of writing each character changed drastically.

To distinguish numbers they used a combination of context, additional symbols, like dots, leaves, squiggles, lines, etc.

They also used different symbols for the start and stop of a line.

The modern convention is an overline to indicate a number.

Too much has been lost to know for sure how these numerals came about and why the system which won did. We do know they were in use around 500 BC but other than that little is known.

Greeks used numbers in a similar way to today where they can serve as ordinals or cardinals, order and amount.

Most written text we have is not literary, but stone inscriptions in churches, and buildings. Many mathematical or astronomical texts are copies of copies and we don't have the original text.

During the reign of Alexander the Great many Greek texts made their way to Egypt which had a good climate for preserving texts.

Where did they come from?

> Old theory was that it was based on the systems of venetcian peoples and Ancient Jews.

This theory became outdated since both Jews and Venetican peoples did not use their alphabets in a similar

way until after the Greeks.
Alternatives

- People in Turkey invented the system and it spread out
- Could be borrowed from Egyptian system

  While using completely different symbols, the later Egyptian system was structurally very similar to the Greek system.