

Monday - Week 8

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Chapter 5: we will cover quickly (today only)

Heron's Formula for Triangular Area.

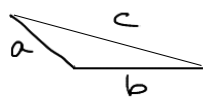
Reading Tip: Read beginning, skip long proof (geometry)  
Read Epilogue.

Next Homework:  
- on hold until Wednesday

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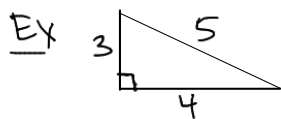
Heron of Alexandria (AD 75, 75 CE)

Formula for the  
Area of Triangles:



$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \text{semi-perimeter} \\ = \frac{1}{2}(a+b+c)$$

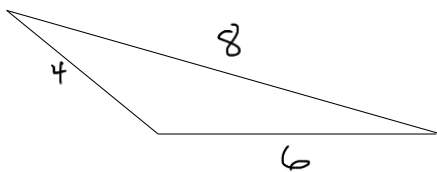


$$A_1 = \text{area computed} = \frac{1}{2} \cdot 4 \cdot 3 = 6 \\ \text{w/ } \frac{1}{2} B \cdot H$$

$$A_H: s = \frac{1}{2}(3+4+5) = \frac{1}{2}(12) = 6$$

$$= \sqrt{6 \cdot (6-3)(6-4)(6-5)} = \sqrt{6 \cdot 3 \cdot 2} = 6$$

Ex



$$A_H = \sqrt{9(9-4)(9-6)(9-8)} = \sqrt{9 \cdot 5 \cdot 3}$$

$$s = 9$$

$$= \sqrt{135}$$

$$\approx 11.6$$

75 AD

→ 1545

### Classical Mathematics After Archimedes:

- Syracuse fell to the Romans (212 BC)
  - Carthage fell 146 BC
  - Caesar conquered 49 BC
  - Anthony & Cleopatra fell to Octavia in 30 BC
- } Roman Empire Begins

Ancient Romans were a practical <sup>engineering</sup> people who did not have a taste for pure mathematics.

- No great Roman Mathematician mentioned in Dunham.

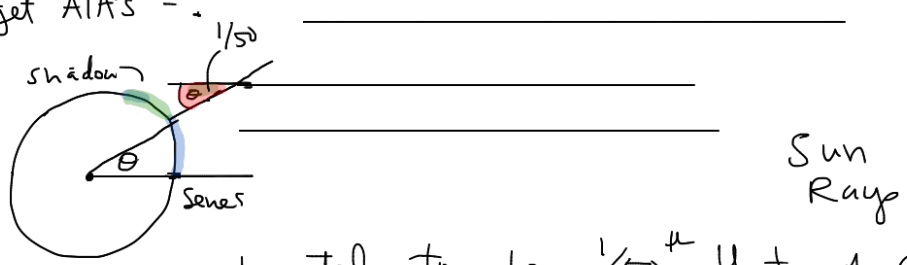
### Library at Alexandria:

- Romans eventually control (30 BC) many of the scholars there were forced to evacuate. They did, & spread knowledge teaching.

### Eratosthenes (284-197 BC)

- Machine
- Sieve for finding primes (Dunham)
- Accurate measure of circumference of the Earth.

B/C parallel, get AIA's =



1. Angle  $\theta$  was estimated to be  $1/50^{\text{th}}$  that of a full revolution
2. How far. from Senes to Syracuse? 5000 "stadia"

( stadium  
516.73' = 1 stadia

So:  $\frac{5000}{\text{Circumference}} = \frac{1/50}{1}$

Circumf =  $5000 \times 50 = 250000$  stades  
 $\approx 24,466$  miles

24,860  
"actual"

During the Roman rule,

- Mathematical progress was slow
- classical works of Euclid, et al were kept by the Arabians. (Baghdad)
- The Muslim inhabitants studied these classics.
- One bit of progress: Hindu-Arabic numeral system.  
BTW - The mathematics of India during this period 0-1000 CE was superior to European Mathematics
- Al-Khwarizmi - Al'jbr. (although <sup>there was</sup> no symbol manipulation  
400 CE (beginning of algebra) verbal descriptions of solving algebraic problems.)

• Crusades: Christian Conquest of Middle East (11-13<sup>th</sup> Century)

Christian Conquest

- Moors: \_\_\_\_\_ (Spain / Sicily)  
\_\_\_\_\_ found classical works.  
\_\_\_\_\_ this began the Renaissance.