**History of Mathematics -- Exam # 2**

**Name: .**

**Part 1: Definitions**

Define the terms below, ensure that each definition only uses terms available in the year indicated.

1. (4 pts) , *k, m* (300BC):
2. (3 pts)Cycloid (roulette) (1600s)
3. (3 pts)Given with side lengths *a, b, c* , define (algebraically) semi-perimeter.

**Part 2: Questions**

1.(10 pts) Describe *k* and *m* in terms of , show your work using algebraic expressions.

2. (5 pts) What lower and upper bounds for did Archimedes establish in *Measurement of a Circle*?

2.5. (EC - 10 pts) What are three other (non-Archimedean) approximations of , who and when were they used? (Hint: there are two pre-Archimedean approximations and one post-Archimedean approximations). Show your work (there should be little).

3. (10 pts) Without using algebraic terms,

* describe the surface area and volume of a sphere
* describe the surface area and volume of a cylinder.

4. (5 pts) What is the sieve of Eratosthenes

5. (10 pts) Solve, y - z = 10, where yz = 9, like Diophantus in 200 BC might have.

6.(15 pts) a) Solve using Cardano’s verbal solution.

b) Solve the same equation as above using the algebraic solution derived from Cardano’s solution.

7. (Extra Credit- 5 pts) How did Niccolo Fontana get his nickname, Tartaglia?

**Part 3: Formal Proofs**

**Please write each proof as formal as necessary. Explain well, give details.**

1. (20 pts) What is the formula for the area of a triangle, if you are only given the lengths of the sides.

* Who discovered this and when?
* Name four of the five propositions necessary in proving this formula, how/why were they used in the proof?
* Prove one of these propositions and state which one your prove.

2. (15 pts) What two propositions were necessary in Archimedes proof of the area of a circle?

* Prove one of them and state which one your prove.

3. (Extra Credit - 15 pts) Use Heron’s formula of a triangle to prove the pythagorean theorem.