MA 350 Dr. G. Stoudt
Third Reading Assignment

Readings

- Chapter III (Mathematics in the West During Hellenistic and Roman Times) Introduction, page 91
- Biography of Euclid, page 109
- Reading 27: From Book I of the *Elements*: Definitions, Postulates, Axioms, and Propositions 1-13
- Reading 28: From Book I of the *Elements*: Propositions 27-32 (Theory of Parallels)
- Reading 29: From Book I of the *Elements*: Proposition 47 (Pythagorean Theorem)-Euclid
- Reading 30: From Book VII of the *Elements*: Propositions 1 and 2 (Euclidean Algorithm)
- Reading 15: From *Elements* X. Scholium (The Irrational or Incommensurable)-Euclid
- Reading 16: From *Elements* X. Definitions-Euclid
- Reading 31: From Book IX of the *Elements*: Propositions 14 (Fundamental Theorem in the Theory of Numbers), 20 (Infinitude of Primes), and 25-30

Notes for the Readings

Note the following from the *Elements* for your reading:

Proposition I.15: If two straight lines cut one another, they make the vertical angles equal to one another.
Proposition I.16: In any triangle, if one of the sides be produces, the exterior angle is greater than either of the interior and opposite angles.
Proposition I.23: On a given straight line and at a point on it to construct a rectilinear angle equal to a given rectilineal angle.
Proposition I.41: If a parallelogram have the same base with a triangle and be in the same parallels, the parallelogram is double of the triangle.
Proposition I.46: On a given straight line to describe a square.
Proposition VI.30: To cut a given finite straight line in extreme and mean ratio.
Proposition VI.31: In right-angled triangles, the figure on the side subtending the right angle is equal to the similarly described figures on the sides containing the right angle.
(not necessarily squares on the sides!)
Proposition IX.21: If as many even numbers as we please be added together, the whole is even.
Proposition IX.23: If as many odd numbers as we please be added together, and their multitude be odd, the whole will also be odd.
Proposition IX.24: If from an even number and even number be subtracted, the remainder will be even.
Definition 7, Book VII: An odd number is that which is not divisible into two equal parts, or that which differs by an unit from an even number.
Definition 15, Book VII: A number is said to multiply a number when that which is multiplied is added to itself as many times as there are units in the other, and thus some number is produced.

Questions for Discussion

Reading 27

1. Look at the first few definitions. Why do you think many modern geometry books start out with undefined terms?
2. What is a “line” by Euclid's definition? Where is the definition of what we would call a line?
3. What is an “angle” by Euclid's definition?
4. If the only tools you have to construct geometric objects are an unmarked straightedge and a circle compass, do you see why Postulates 1-4 are what they are?
5. Do modern geometry books still do constructions? Look at a few books and see.
6. Find a modern book that does constructions. How do the constructions compare with Euclid's in Propositions 1, 2, 3, 9, 10, 11, and 12?
7. What strikes you as different about Postulate 5 (different from the others)?
8. In Proposition 4, what does “applying one triangle to another” mean? (It is not application of areas!)
9. How is triangle congruence (SAS, SSS, etc.) handled in modern books? Compare this to Euclid's treatment.

Reading 28

1. Where is Postulate I.5 first used?
2. How do these propositions and their proofs compare to modern proofs? Look them up in a modern book and see.

Reading 29

1. This is obviously a famous theorem and proof. Know it.

Reading 16

1. Give an example of two commensurable numbers.
2. Give an example of two incommensurable numbers.
3. Give an example of two commensurable in square numbers.
4. Give an example of two incommensurable in square numbers.
5. Is Euclid's definition of “rational” and “irrational” the same as ours? Can you give an example of a Euclidean rational that is irrational in the modern sense?

Reading 30

1. Find the Euclidean algorithm in a modern text. Bring it to class for analysis.

Reading 31

1. Can you find the famous analogue to Proposition 14? (A number theory book might help here.)
2. Can you find the really famous analogue to Proposition 20? (The proof is just as famous!)