Geometry #1

Before Thursday, August 23

1. Bookmark and explore the website www.ms.uky.edu/~lee/ma501fa07/ma501fa07.html, which is the course website.

2. Be sure you can login to the moodle website, moodle.math.wvu.edu, and view the Geometry course materials. Bookmark this site and explore it.

3. Be sure your Adobe Connect account is ready and working. Try out a practice session with me or Rick Holsberry, rth@math.wvu.edu, if you haven't done so already.

4. Go to the Moodle Forum "Introduction" and make at least one substantive contribution. What is your favorite geometric fact or theorem? When did you first learn of it? Why is it significant to you?

5. Go the website http://sketchup.google.com and download the free version of Google SketchUp. Learn how to get started making sketches with it—you can get some introductory material and lessons by going to the "Help" menu of the program. Create an interesting image to share with the class at the Thursday session.

Thursday, August 23, 7–9 pm

Attend the Adobe Connect session ready to discuss the forum, share your Google SketchUp image, and ask any questions you may have so far on the assigned homework due on Sunday.

Homework Problems Due Sunday, August 26, 11 pm and uploaded to Moodle as a single file

1. Solve the puzzle of Section 3 of the Notes on Geometry available from the website www.ms.uky.edu/~lee/ma501fa07/ma501fa07.html. Do not use outside sources for this problem, though you may talk with each other.

2. Find and describe an interesting proof of the Pythagorean Theorem, that if a right triangle has legs of length a and b and hypotenuse of length c, then $a^2 + b^2 = c^2$. Choose a different proof than the one in Euclid's *Elements*.

3. Find and describe a proof of the converse of the Pythagorean Theorem, that if a triangle has side lengths a, b, and c such that $a^2 + b^2 = c^2$, then the triangle is a right triangle.

4. Geometrically the Pythagorean Theorem states that if squares are erected on the three sides of a right triangle, then the sum of the areas of the squares on the legs equals the area of the square on the hypotenuse. But what if we erect equilateral triangles instead? Or semicircles? Are the area sum results still true or not? Prove your answer. Do not use outside sources for this problem, though you may talk with each other.

5. What trigonometric result for general triangles can be considered a generalization of the Pythagorean Theorem for right triangles? Why?

6. What do you think would be a good three-dimensional analog of a right triangle? (Think about certain kinds of tetrahedra.) Can you think of a possible analog of the Pythagorean Theorem for such objects? Test your conjecture with some specific examples. Do not use outside sources for this problem, though you may talk with each other.