Math 113: Exam 3

Name: _____

Monday, March 9, 2009

Directions: Answer every question. Show appropriate work.

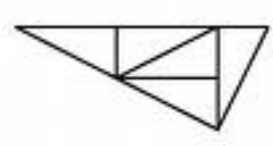
1. What does the Art Gallery Theorem say?

2. (a) What is the exact value of the Golden Ratio?

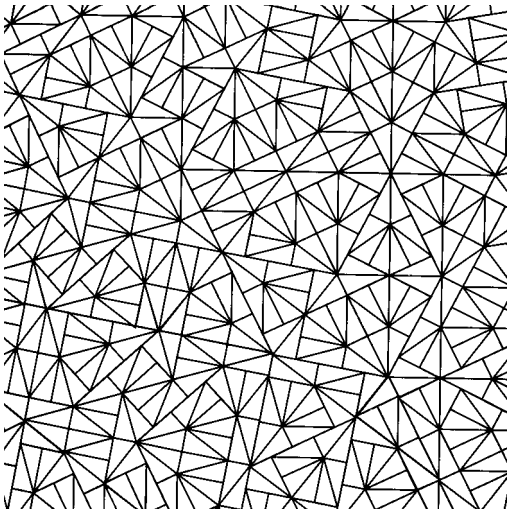
   (b) How is a Golden Rectangle defined?

3. There is an art gallery (polygonal closed curve) where we can view every spot in the interior with 15 cameras, but we can't do it with 14 or fewer. What can you say about the number of vertices?

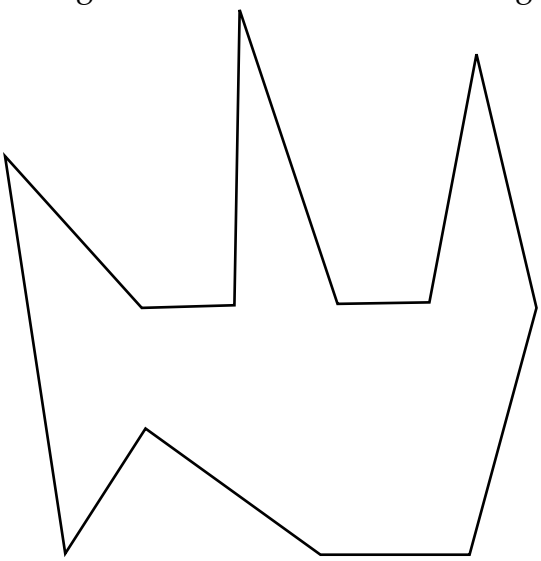
4. Pictured below is a large triangle made out of five small triangles. Each of the five small triagles has sides of length 1, 2, and $\sqrt{5}$. How long are the sides of the large triangle?



5. (a) What is the name of the pattern illustrated below?
   (b) Outline a super-tile and a super-super-tile.



6. Triangulate and tricolor the following gallery. Where would you put the cameras?



7. What does it mean for a shape to be a **polygonal, simple, closed curve**? Explain clearly, and include diagrams.

8. (a) A rectangle has sides of length 5.8 cm and 10.3 cm. Show why this is not a Golden Rectangle.

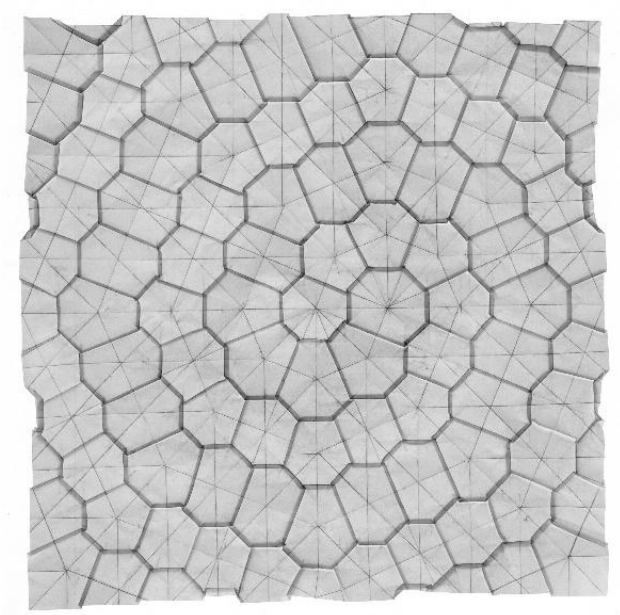
   (b) How would you change the length of **the long side** to make this a Golden Rectangle?

9. A Golden Rectangle has a short side that is 4.3 cm long.

   (a) Find the length of the long side.

   (b) Find the length of the diagonal of the rectangle.

10. Does the following pattern have symmetry of scale? Why or why not?



11. Identify one of the mathematicians who appeared in *The Math Life*.

12. Prove the Pythagorean Theorem. You must have a complete proof, not just an example.