

MTG 3203
Homework 7
October 14, 2009

To begin: Download “hw7.gsp”. It will give you advice on how to do OP 6 in Sketchpad, and it also gives you a starting point for problems 1 and 7.

1) Show that Origami Postulate 5 can be done with a compass and straightedge: Given two points A and B and a line l with B closer to l than B is to A , construct a line m and a point C on l such that m passes through B and C is the reflection of A through m . Of course, you can do this in Sketchpad. (Hint: Find C first. Constructing C is a VERY simple construction. Once you have C , m will be the perpendicular bisector of \overline{AC} .)

2) Show by example that the condition “ B is closer to l than B is to A ” in Origami Postulate 5 is necessary.

3) Cut out a circle from a piece of paper, and draw a point on it. We’ll call the point A . For best results, the point should be about three-quarters of the way from the center of the circle and the circumference. Take a point on the edge of the circle and fold it on top of the point A . Make the crease, and then unfold. Now do it again: take a different point on the edge of the circle, fold it on top of A , make the crease, and unfold. Do this for lots of points (“lots” means 20 to 30 times, or until you see what is happening) all around the edge of the the circle. In the end, all the folds will make a shape. What is that shape?

4) Problem 3.3-12 from the book. Remember, I talked about this one in class. Do it with folding paper, not with Sketchpad.

5) Problem 3.3-14 from the book. It is good to start with an equilateral triangle (which we figured out how to do in class). Do it with folding paper, not with Sketchpad.

6) Problem 3.3-23, 24, 25. This is really all the same problem, split up into three parts. Do it with folding paper, not with Sketchpad.

7) Using the origami method (given in class, and also in the book on page 69), trisect an angle in Sketchpad. See the Sketchpad file for help on how to do OP 6. Also, three important thoughts:

i) Just like the marked ruler constructions, it is not possible to do this exactly. We can only approximate OP 6, as demonstrated in the Sketchpad file.

ii) In our construction, the fact that D , F , and B all lie on the same edge is important (though not explicitly pointed out in the construction). So you will need to have the lefthand side of the paper to follow out this construction.

iii) Even though it is explicitly mentioned, the top of the paper is totally unimportant in the construction. What is important is that the distance between \overleftrightarrow{DE} and \overleftrightarrow{FG} is the same as the distance between \overleftrightarrow{FG} and \overleftrightarrow{BC} . With origami, it is easy to make such parallel lines. I’ll let you figure out how to do it in Sketchpad.