UW Math Circle

Week 3 – Origami

1 Hexaflexagons

1. Follow the instructions to fold your hexaflecagons! If you need help, let an instructor know!
2. Your hexaflexagon has two visible sides: a purple side and a green side. But when you fold it, new "sides" with a different color will be revealed! How many different colors can you get your hexaflexagon?

3. As you fold your hexaflexagon, you'll see its two sides in different combinations. For example, the hexaflexagon started with a purple side and a green side, so (purple, green) is one possible combination. How many different combinations can you find? *Note: some combinations might be impossible!*

4. What is the minimum number of flexes you can make so that you reveal every side of the hexaflexagon?

5. Are two appearances of a face with the same color really the same? Draw a circle in the center of one face then try "flexing" your hexaflexagon. How many "flexes" does it take to return to the same orientation of a given face?

6. When the orientation of a face changes, how are the triangles making up the hexagon changing? Are they spinning in place? Are they moving with other triangles?

Stop here. Request the next page from your instructor when your group is done.

2 Construction Problems

6. You have a perfectly square piece of origami paper. Without any measuring implements, can you fold it into an equilateral triangle? It has to be exact—no estimating! For example, you can fold a point exactly onto another point or a line exactly onto another line, but you can't fold a 60° angle by eye alone. If you succeed, write down how you know what you folded is an equilateral triangle.

7. How about a regular hexagon? If you succeed, write down how you know what you folded is a regular hexagon.

8. Was there any connection between how you folded the equilateral triangle and how you folded the regular hexagon?

9. Can you fold a square origami paper into a regular octagon? If you succeed, write down how you know what you folded is an regular octagon.

10. What do you notice about the number of sides of a square comparing to an octagon, and the numbers of sides of a triangle comparing to a hexagon?

11. Based on your answer from 8 and 10, do you think you can make a regular 16-gon? You do not have to fold this shape, describe how you would fold it.

Stop here. Request the next page from your instructor when your group is done.

12. (Challenge) Can you fold a square origami paper into a regular pentagon? If you succeed, write down how you know what you folded is an regular pentagon.

13. Which regular n-gons can be constructed using origami?