# Activity 0.1-1
Folding Polygons from a Circle

This activity is best when led by the teacher. The instructions that follow are included for your information.

Materials Needed: Cutout paper circle. (See next page.)

Terminology:

|	
diameter	tetrahedron
equilateral triangle	truncated tetrahedron
similar triangle	chord
regular hexagon	rhombus
circumference	surface area
isosceles triangle	

1. Guess where the center of the circle is, and mark it.

2. See if you can figure out a way to find the exact center of the circle. How close was your guess? Describe your way of finding the true center.

3. What do you call the crease or segment that you get when you fold the circle in half? *(diameter)* (You probably already have such a fold on your paper.)

4. Place a point on the circumference of the circle. Fold the point to the center as pictured and crease. What is this crease or segment called? *(chord)*
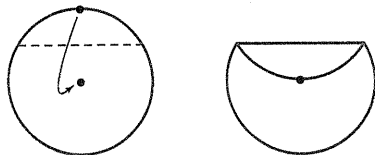
5. Fold again to the center, using one endpoint of the first chord as an endpoint of your new chord.

6. Fold the remaining arc to the center. What have you formed? *(equilateral triangle)*
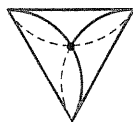
We consider this triangle to have area one square unit.

7. Can you figure out a way to find the midpoint of one of the sides of your triangle? Mark this midpoint.

8. Fold the opposite vertex to the midpoint. What shape have you formed? *(isosceles trapezoid)*

What is the area of this trapezoid if the area of the original triangle is 1?

9. Notice that the trapezoid consists of three congruent triangles. Fold one of these triangles over the top of the middle triangle. What geometric shape have you formed? *(rhombus)* What is its area?


10. Fold the remaining triangle over the top of the other two. What shape do you now have? What is the area?

This triangle is *similar* to the unit triangle we started with. How do the lengths of the sides compare? How do their areas compare?

11. When the tips of the three folded-over triangles are brought together, a three-dimensional shape is formed. What new shape have you made? *(tetrahedron or triangular pyramid)*
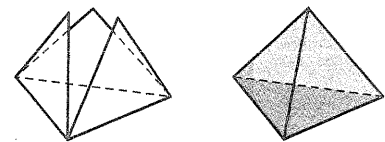

What is the surface area of this pyramidal shape?

12. Open back up to the large equilateral triangle with unit area that you first made. Fold each of the vertices to the center of the circle. What shape have you formed? *(regular hexagon)* What is its area?
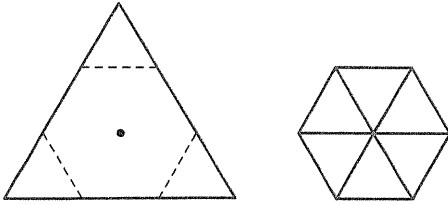
13. Turn the hexagon over, and shade it with a crayon, pen, or pencil. Turn the figure over again. Push gently toward the center so that the hexagon folds up to form a *truncated tetrahedron*. What is its surface area?
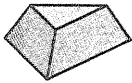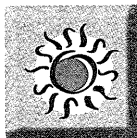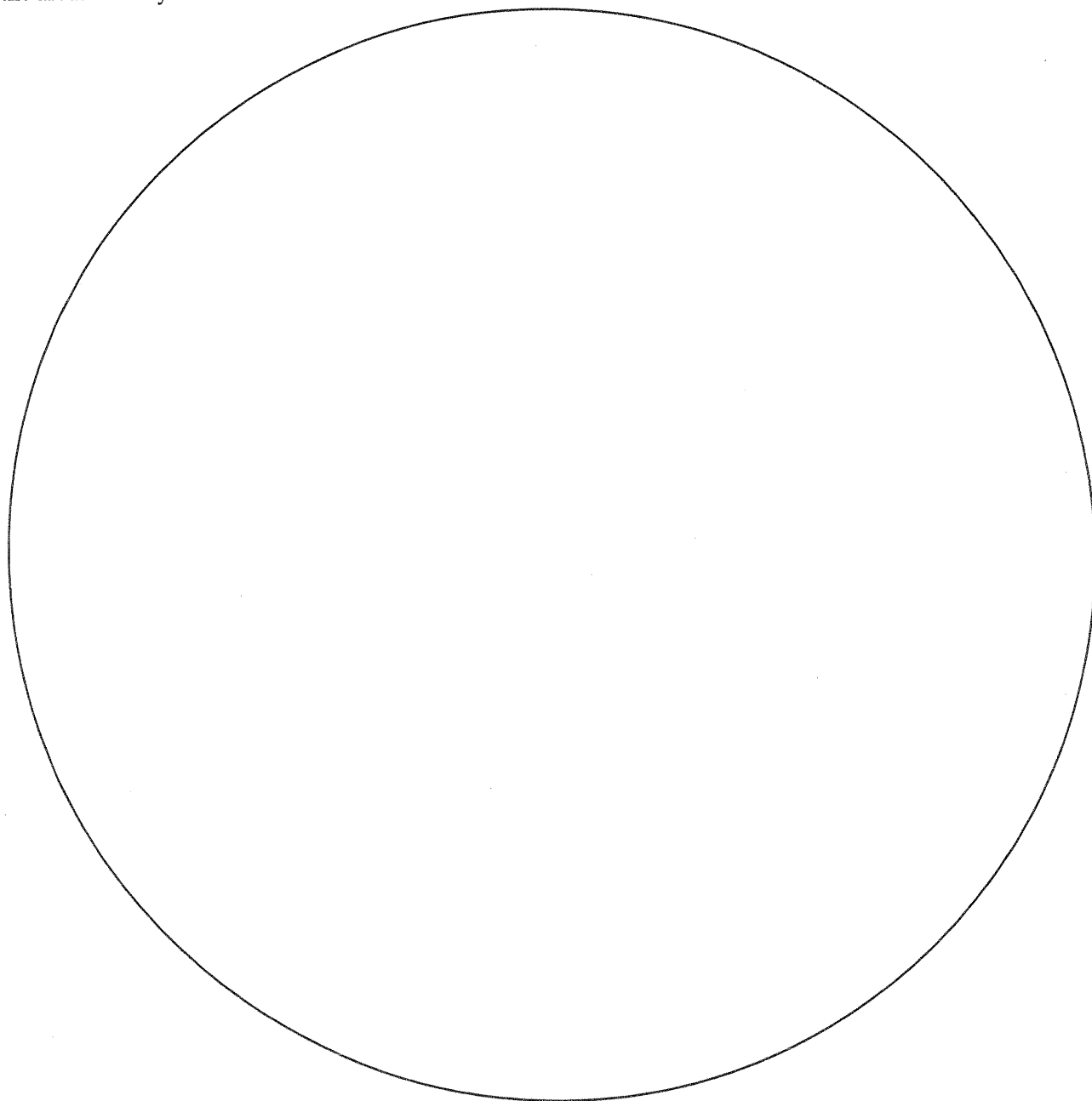
Activity 0.1-2 ◆
Folding Polygons from a Circle

◆ Homework: Areas of the Folded Circle

Complete the folding of the activity "Folding Polygons from a Circle" on the previous page. You end up with a triangle with several folds through it. Assume that this triangle has area 1.

Using the folds already determined, try to construct polygonal figures with these areas:

$$\frac{1}{4}, \frac{8}{9}, \frac{23}{36}, \text{ and } \frac{2}{3}$$

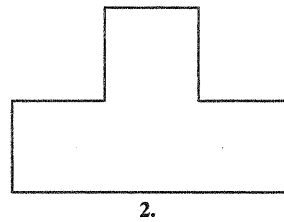Turn in a sketch of each of these five polygons. Present your sketch in such a way that your classmates will see that the areas are as you claim.
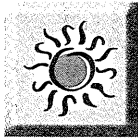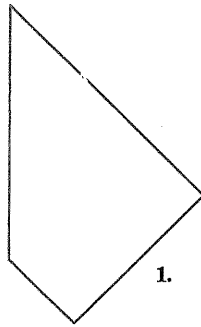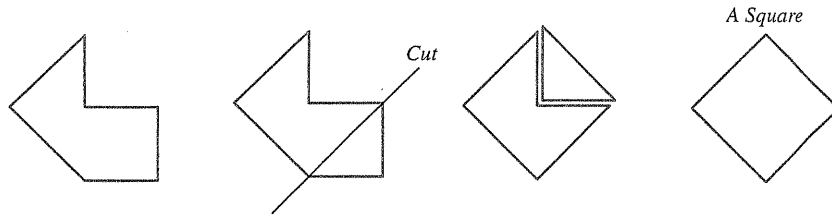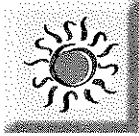
Activity 0.2 ◆
Making Squares

In each of the figures that follow, make one straight cut. If you do it right, the two pieces will form a square.

A Square

Cut

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.
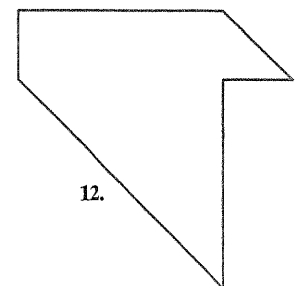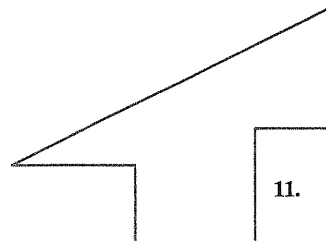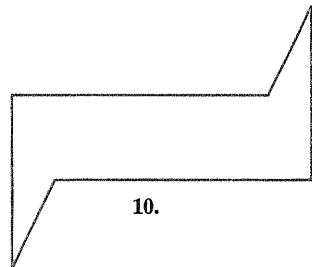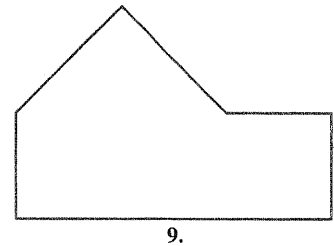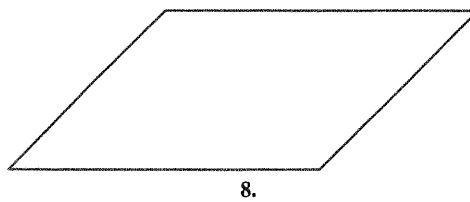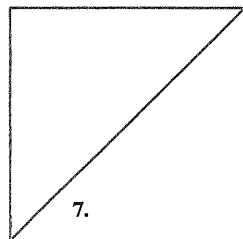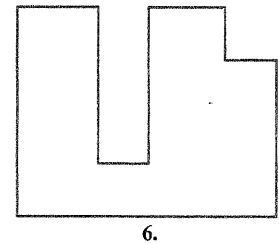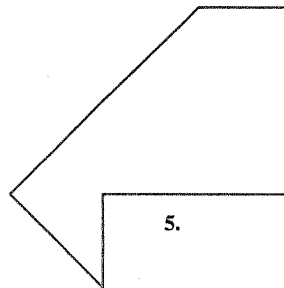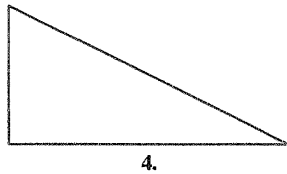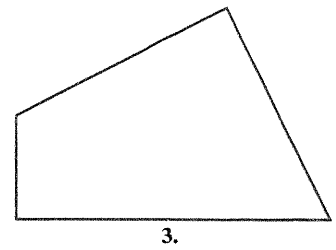
At least one of the figures shown can be cut in different ways that work. Can you figure out which one(s)?

Activity 0.3 ◆
Two Congruent Halves

In each of the figures that follow, draw a line from dot to dot to cut the figure in half in such a way that the two halves are congruent. The dotted line illustrates how the first one can be done.

Can you think of a way that could be used to check your answers to these problems? Describe the way on the back of this page: