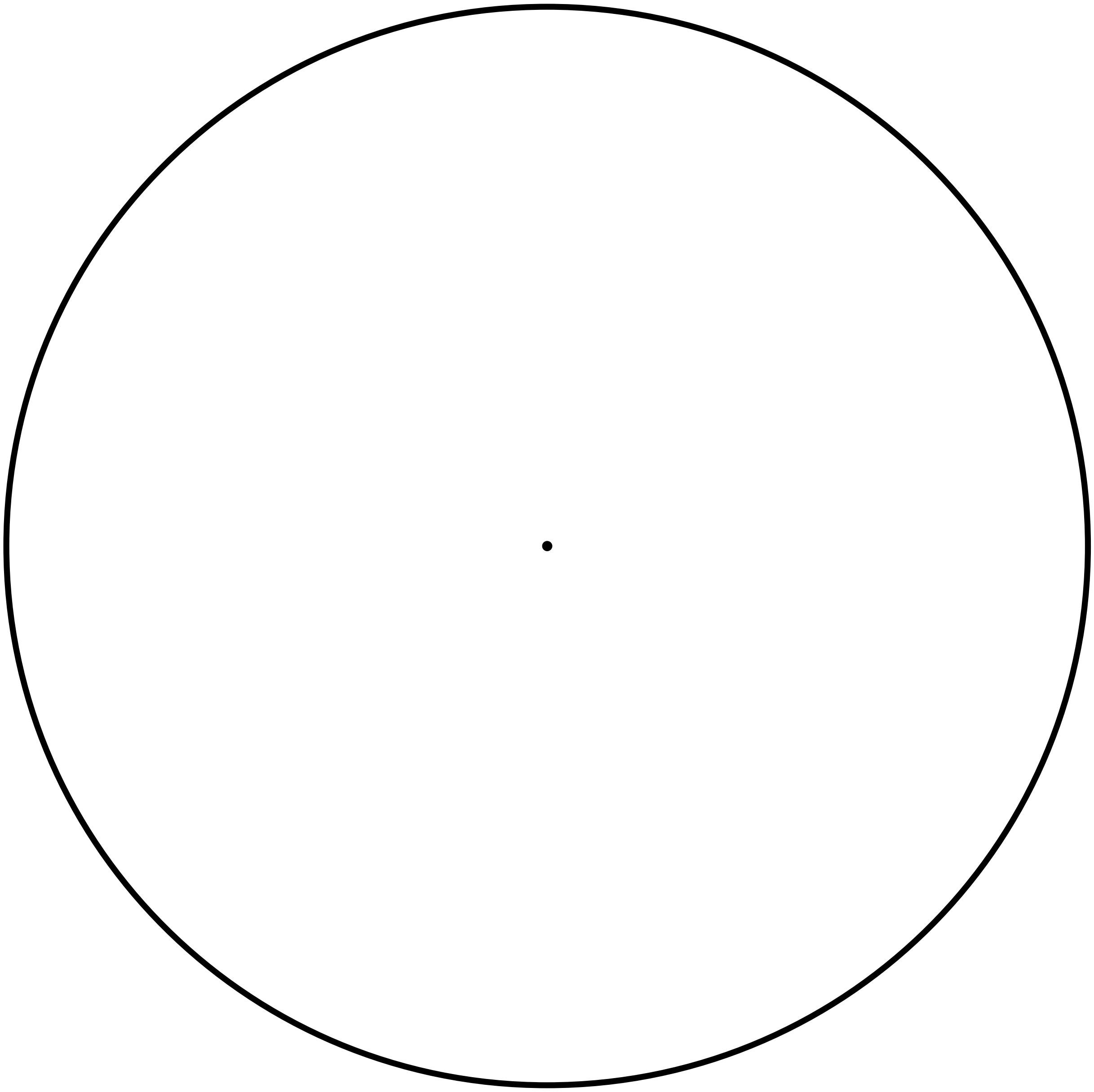
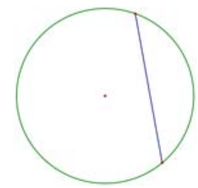
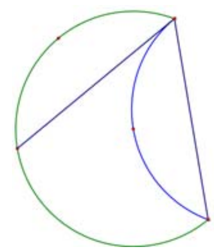
# Folding A Circle



Have students cut out the circle. Ask students to fold the edge of the circle (circumference) until it hits the center.



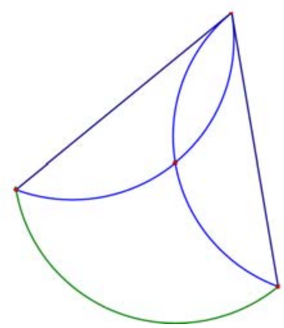
Open the circle and describe the name of the line segment. (Chord- whose two endpoints are on the circle) (A segment of a circle is also described.)



Fold the edge of the circle again so it hits the center of the circle. Be sure the one fold touches the previous fold.

Open the folds. Can you name the figures you see in the circle. (A second chord, a second segment of the circle and an inscribed angle).

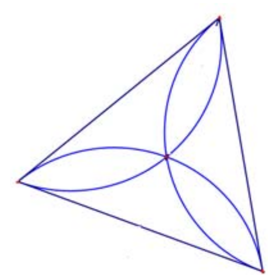
Fold the edge of the circle one final time.



Open the circle and describe what you see. (Three congruent chords, three inscribed angles, three congruent angles, equilateral triangle.)

How big are the three angles? How big are the three arcs? (By folding the diagram students can confirm that the three angles are congruent and the three chords are congruent.)

Do you see any radii? (No) Explain why not. No line segments begin at the center of the circle.

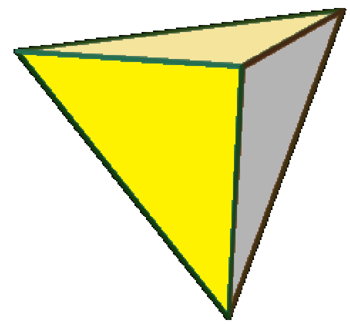


Make a conjecture on how you can find the size of an inscribed angle. (One half of the marked arc.)

Locate the midpoint of each side of the equilateral triangle. (Fold the vertices together.) Fold the one vertex to the midpoint on the opposite side. What is the name of the line segment formed by the fold? (Midsegment) What are the properties of this midsegment? (By comparing students can see that the midsegment is ½ of side of the equilateral triangle and also parallel to the side.

Study the small triangle formed by this fold. What fraction of the large equilateral triangle is this small triangle? (1/4)

Continue to fold each vertex to the midpoint on the opposite side. (This should confirm that each triangle is 1/4 of the large equilateral triangle.)



Create the three dimensional figure using this material. What is the figure called? (Tetrahedron - four faced pyramid or a triangular pyramid)

At this point you could count the number of faces, edges, and vertices on the tetrahedron. (4 vertices, 4 faces, and 6 edges.)

If the large equilateral triangle has an area of 4 square units, what is the area of each triangle? (1 square unit)

How do the lengths of the sides of these small triangles compare to the length of the sides of the larger triangle? (½) How do the area of the two triangles compare? (1/4)

How do the perimeters of the two triangles compare? (1:2) Give a convincing argument for this ratio?

A point has been identified on each side of the original equilateral triangle. What is the name of this point? (Midpoint)

Line segments connect these midpoints. How do these segments compare to the sides of the large equilateral triangle. (Parallel and ½ the length). Give support for your answer.

The large equilateral triangle has been subdivided into what? (Four congruent equilateral triangles) Fold each vertex of the original equilateral triangle to the center of the circle. Stop and look at the figure. What figure have you formed? (A regular hexagon)

Form the three dimensional figure with this net. Each face of this new solid should be a polygon. What is it called? (A truncated tetrahedron or a pentahedron)

What shapes make up this truncated tetrahedron? (Two triangles and 3 isosceles trapezoids) Count the number of faces, edges, and vertices for this truncated tetrahedron. (5 faces, 6 vertices, and 9 edges)

Ask students to look for a pattern for how the number of faces, edges and vertices are related. (F + E = V+2 or V = F + E -2 or any other arrangement that is equivalent.)

Gather 20 of these tetrahedrons to form an icosahedron.

Watch a video on You Tube on how to complete this task: http://www.youtube.com/watch?v=VatLApO3XiY