Purpose: In this activity, you will explore angles in both radians and degrees using a physical model.

1. Fold the circle in half both ways to find the center and the coordinate axes.

2. On the provided circle, draw a radius from the center to the right. Label this radius "1". Any circle of radius 1 unit is called the *unit circle*.

3. Lay a pipe cleaner on top of the radius and mark off length of radius. Cut the pipe cleaner so that its length is the same as the radius.

4. Now, place one end of the pipe cleaner at the intersection of radius and circle and lay it counter-clockwise along the circumference. Mark where the other end ends. Draw a line from this mark to the center of the circle.

5. In degrees, about how big is this angle? (This angle was found by moving one radius along the circumference so we call it 1 *radian*.)

6. About how many times does the pipe cleaner fit around the circumference?

7. How does the previous answer compare with a formula you know and love?

8. There are 2π radians in a circle and there are 360° in a circle. How many degrees are in 1 radian? How does this compare to your answer in Question 5?

9. There are 2π radians in a circle and there are 360° in a circle. How many degrees are in x radians?

10. How would you generally convert between radians and degrees?

11. For each of the angle measures below, mark them on your circle and then convert to the other type of angle measure.

    (a) 0°

    (b) $\frac{\pi}{4}$ radians

    (c) $100\pi^\circ$ (You may want to covert first)

    (d) $\frac{\pi}{2}$ radians

12. Suppose you want to know the arc length of a part of a circle of radius r given by some angle measured in radians. (We call this the arc length subtended by an angle.)

(a) What is the arc length corresponding to π radians? Can you use your model to confirm?

(b) What is the arc length corresponding to $\frac{\pi}{4}$ radians? Can you use your model to confirm?

(c) Make a conjecture about how to find the arc length given by an angle measure of θ radians.

(d) Take some notes here from the class discussion.

(e) What is the arc length of a circle of radius r subtended by θ radians?

13. Suppose you want to know the area of a part of a circle of radius r given by some angle measured in radians. (We call this the area of the sector of circle subtended by an angle.)

(a) What is the area of the sector corresponding to π radians?

(b) What is the area of the sector corresponding to $\frac{\pi}{4}$ radians?

(c) Make a conjecture about how to find the area of the sectorgiven by an angle measure of θ radians.

(d) Take some notes here from the class discussion.

(e) What is the area of the sector of a circle of radius r subtended by θ radians?