Name_____ Radians

Trace a circular object in the space below:

1. Find the longest chord across the circle and draw it. What is the name of this chord?

2. Bisect the diameter. What is half the diameter called?

3. Label the center of the circle, **C** and the other end of the radius **A**. Measure the radius with a piece of licorice or string, biting or cutting off as needed, to fit the radius. Draw its length below.

4. Starting from point A, using your licorice, measure an arc length along the circumference of the circle as long as the radius. Mark the end of the arc length on the edge of the circle as point **B**.

5. Draw a line from the center of the circle to the point on the circle you marked. What is this line segment CB called?

How does the length of CB compare to the length of CA?

How do the lengths of CB and CA compare with the arc length, AB that you constructed in step 4?

The angle formed by the two radii you drew has an angle measure of **1 radian**.

6. Compare the measure of the angle you drew with the measure of the angles drawn by the other members of your group who have circles of a different size. The circles each have a radius of a different size.
Is the angle smaller, bigger, or the same size?

7. Measure the circumference of your circle using another piece of licorice or string. Draw its length below.

8. About how many radii would it take to get around the whole circle? Round to the nearest whole number.

9. The circumference of a circle, in terms of π is $C = 2\pi r$. Exactly how many radii (radians) must there be in a complete circle?

10. Use your calculator to find an approximate decimal value for # 9 above (round to the nearest hundredth.)

How does this number compare to the approximation you made in question # 8 above?

11. Compare your answers to other group members. Does the size of the circle (the length of the radius) affect your answers?

Complete this statement:

THE NUMBER OF RADIANS IN A COMPLETE CIRCLE IS _____.

12. How many degrees are in a complete circle?

13. If the number of radians in a complete circle is 2π, how many <u>radians</u> are in a half circle?

14. How many <u>degrees</u> are in a half circle?

Since the measure of a straight angle is π radians or 180° you can easily convert angles between radians and degrees.

15. Convert each of the following from the given angle measure (degrees or radians) to the other angle measure. Show how you got your answers. DO NOT use a calculator.

a. 30° b. $\frac{\pi}{6}$ c. $\frac{7\pi}{4}$ d. 90° e. 135°

Though the above gives us a way to convert between radians and degrees algebraically, we want to be able to both do these conversions in our heads as well as be able to quickly draw a sketch of an angle in radian measure the same way we can draw a sketch of an angle measured in degrees. We want to learn to **think** in radians. **The key is to remember that a straight angle equals π radians** as easily as we remember that it equals 180°.

16. If you wanted to draw a sketch of a 60° angle your thinking might be: "How does 60° compare to 180°? 60° is one-third of 180° so I need to draw an angle that's one-third of a straight angle."
Draw a 60° angle below. Don't use a protractor. Just make a sketch.

17. The same challenge is actually <u>easier</u> of you are asked to draw an angle of $\frac{\pi}{4}$. Remember that a straight angle is π radians. Make a sketch below of an angle with a measure of $\frac{\pi}{4}$ radians.

Angles are measured as the rotation from an initial ray to a terminal ray. An angle is said to have positive measure if the rotation is counterclockwise, and negative measure if the rotation is clockwise.

18. Draw a sketch of each of the following angles. Use this as an initial ray: 
Then give the equivalent degree measurement.

a. $\frac{5\pi}{6}$ b. $\frac{\pi}{6}$ c. $\frac{2\pi}{3}$

d. $-\frac{\pi}{6}$ e. $\frac{7\pi}{12}$ f. $\frac{3\pi}{2}$

g. $\frac{4\pi}{3}$ h. $\frac{\pi}{6}$ i. $-\frac{\pi}{2}$

j. $\frac{5\pi}{4}$ k. $-\frac{3\pi}{4}$ l. $\frac{\pi}{2}$