**Paper Plate Activity-The Unit Circle**

Today we are going to create our own unit circles.

1. On the 45°, 45°, 90° triangle, if the hypotenuse is 1, what are the lengths of the two legs?

1

45°

1. On the 30°, 60°, 90° triangle, if the hypotenuse is 1, what are the lengths of the two legs?

1

60°

Cut out the triangles on the blue *Cut Out for Special Right Triangles* sheet. Then use the information from questions a. and b. to label the angles and lengths on both sides of the triangles.

Now you are going to create an x-axis on your paper plate. You can do this by folding your paper plate in half. Use your favorite color and a ruler to draw this axis. You want to be as accurate and as neat as possible. Then, label this as the x-axis. We will be constructing all of our angles off of the x-axis today.

Next, we will create the y-axis. Do this by folding the paper plate in half again connecting the two end points of your first fold. Draw in and label this y-axis in a different color. Now we have created our own coordinate plane on the paper plate which should look like the following picture.

(0,1)

y-axis

(1,0)

x-axis

Let’s look at the ordered pairs of the points on the ends of these axes. Since the radius of our unit circle is 1 unit long, the ordered pair of the point at 0° is (1,0). The one at 90° degrees would be (0,1). Fill in these and the other two ordered pairs on your paper plate.

Now, we can use our blue triangles whose radii are 1 unit to help us draw in angles on our unit circle (whose radius is also 1 unit). First, let’s make a 30° angle. Do this by putting the end of triangle with 30° at the vertex and have the right angle sit on the x-axis. We will always measure our angles from the x-axis. Neatly draw in the line and label it 30°. Also, draw in the point where the line intersects the circle (aka draw in the point where the triangle touches the end of the plate).

y-axis

1 unit

30°

x-axis

If we think about this unit circle as sitting on the coordinate plane, we find the x coordinate of this point by looking at the length of the side of the triangles. We see that the length in the x direction is $\frac{\sqrt{3}}{2}$. The length in the y direction is $\frac{1}{2}$. Therefore, the ordered pair of this point is $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$. Label this on your paper plate. So, it should look like the following:

y-axis

$$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$$

1 unit

x-axis

Continue drawing in angles and labeling the coordinate pairs all the ways around the circle. You should create 30°, 45°, and 60° angles in all 4 quadrants. Make sure to think about how the quadrant will affect the signs of your coordinates. For example, if you are in quadrant II, what will be the sign of your x value and your y value?

Now look at your yellow *Unit Circle* sheet. First, let’s fill in the degrees on the unit circle. Start at the x-axis with 0°. Then we made 30°, 45°, and 60° angles. Since the intersection of the two axes is a right angle, we can label blank at the top as 90°. The next blank is 30° away from the 90° angle, so it would be 90+30=120°. Continue around the circle to fill in all the angles. Remember, there are 360° in a circle. Lastly, fill in all of the ordered pairs around the unit circle on this sheet with the help of your paper plate and blue triangles.