Tools: You will need the following items:

- Unit Circle

- 30-60-90 Triangle

- 45-45-90 Triangle

- Two colored pens

- Your trig knowledge!

Set-up:

- Draw the coordinate axes on your circle. I would use the edge of a piece of paper or a ruler. You may also fold the circle but the card stock can be difficult.

- Cut out your triangles.

- Color the hypotenuse of each triangle with a different color and label the hypotenuses with 1 unit.

- Label the angles and side lengths of your triangles on both sides.

Goal: Compute the coordinates of special points on the unit circles to aid in evaluating trigonometric functions. We're going to build our own unit circle!

Directions:

1. Start at the point on the circle corresponding to $0°$. Find the coordinates of that point.

   - Repeat for $90°$, $180°$, and $270°$.

2. Align the 45-45-90 triangle in Quadrant 1 so that the hypotenuse goes from the center of the circle to the edge and one of the legs is on the x-axis.

   (a) Draw the ray from the center to the edge of the circle using the color of the hypotenuse.

(b) Find the coordinates of that point using sine and cosine.

(c) Label the ray with the angle measurement in degrees and radians (always measured from the positive x-axis moving counter-clockwise).

- Repeat in the remaining quadrants.

3. Align the 30-60-90 triangle in Quadrant 1 so that the hypotenuse goes from the center of the circle to the edge and the long leg is on the x-axis.

   (a) Draw the ray from the center to the edge of the circle using the color of the hypotenuse.

   (b) Find the coordinates of that point using sine and cosine.

   (c) Label the ray with the angle measurement in degrees and radians (always measured from the positive x-axis moving counter-clockwise).

   - Repeat in the remaining quadrants.

4. Align the 30-60-90 triangle in Quadrant 1 so that the hypotenuse goes from the center of the circle to the edge and the short leg is on the x-axis.

   (a) Draw the ray from the center to the edge of the circle using the color of the hypotenuse.

   (b) Find the coordinates of that point using sine and cosine.

   (c) Label the ray with the angle measurement in degrees and radians (always measured from the positive x-axis moving counter-clockwise).

   - Repeat in the remaining quadrants.

Reflection Questions:

1. How can you confirm that the side lengths given in our triangles are reasonable?

2. Using a calculator, plug in $\sin^{-1}(y)$ and $\cos^{-1}(x)$ for all of points in Q1 and Q3 of our unit circle. Record them below. What do you notice?

3. What will be your strategy for "memorizing" the unit circle?