Purpose: In this problem set, you will connect two trigonometric functions, sine and cosine, to points on circles.

A point on a circle is determined by the angle θ (measured from the positive x-axis) and the radius of the circle.

To better understand the point on the circle, we will use something called a *reference triangle*. Note: We ALWAYS use the x-axis (positive or negative) for a reference triangle, never the y-axis.

As the radius changes, the ratio of the the side lengths of the triangles will stay the same so we give the functions that record these ratios special names.

- The sine function is $\sin(\theta) =$
- The cosine function is $\cos(\theta) =$

1. Draw two circles with different radii.

   (a) When $\theta = \frac{\pi}{2}$, how big is y (the height of the reference triangle) relative to r (the hypotenuse of the reference triangle)?

   (b) How do your circles and ratios compare to your neighbor's?

   (c) What is $\sin\left(\frac{\pi}{2}\right)$?

   (d) What is $\cos\left(\frac{\pi}{2}\right)$?

2. Draw the unit circle below. For each of the following angles, sketch the corresponding ray and write the angle in degrees. Then find $\sin(\theta)$ and $\cos(\theta)$.

(a) $\theta = \pi$

$\sin(\pi) =$ $\qquad\qquad$ $\cos(\pi) =$

(b) $\theta = \dfrac{3\pi}{2}$

$\sin\left(\dfrac{3\pi}{2}\right) =$ $\qquad\qquad$ $\cos\left(\dfrac{3\pi}{2}\right) =$

(c) $\theta = 0$

$\sin(0) =$ $\qquad\qquad$ $\cos(0) =$

(d) $\theta = \dfrac{\pi}{4}$

$\sin\left(\dfrac{\pi}{4}\right) =$ $\qquad\qquad$ $\cos\left(\dfrac{\pi}{4}\right) =$

(e) $\theta = \dfrac{\pi}{3}$

$\sin\left(\dfrac{\pi}{3}\right) =$ $\qquad\qquad$ $\cos\left(\dfrac{\pi}{3}\right) =$

(f) $\theta = \dfrac{\pi}{6}$

$\sin\left(\dfrac{\pi}{6}\right) =$ $\qquad\qquad$ $\cos\left(\dfrac{\pi}{6}\right) =$

The Unit Circle