At the end of this workshop, the student should be able to
1. Convert radians and degrees
2. Describe movement of points around the unit circle relative to arc length, angle, and direction

**Prerequisites and vocabulary:**
1. Working knowledge of the unit circle
2. Working definitions of degrees, radians, reference angles, quadrants, \( y=\sin x (\theta) \), \( y=\cos x or (\theta) \)
   (available on unit circle handout, origin)

**Brief explanation:**
One way to think about a unit circle is as a compass or GPS in which point coordinates derived from angles or arc lengths provide the directions. For example, if I start from the origin of the unit circle, if I move right along the x axis all the way out to circumference of the circle \( (x=1) \) without traveling up the y axis \( (y=0) \), I’ll arrive at the coordinate \( (0, 1) \), where my angle is 0 and my position on the circumference is either 0 or some ratio of \( 2\pi \). If I move “left” (negatively) from the origin along the x axis for a distance of \( \frac{1}{2} \) and then travel “up” the y axis (positively) through quadrant II for a distance of \( \frac{\sqrt{3}}{2} \), I’ll arrive at the point on the circumference designated as \( (\frac{\sqrt{3}}{2}, -\frac{1}{2}) \), which I know as the reference angle of 120° (90° + 30°). I can arrive at the same point by starting at \((1, 0)\) on the circumference and traveling counterclockwise (positively) a length of \( \frac{2\pi}{3} \) (radians). I can also get to that same point by traveling clockwise (negatively) for a length \( -\frac{4\pi}{3} \), or, for that matter, any number of times around that circle (twice around the circumference = \( 2(2\pi/3) \), and so on.

These points can be expressed in either degrees or radians measures, which lets us convert radians and units: \( 2\pi=360° \).

I can also refer to the “x” value as \( \cos x \) or \( \cos \theta \) and the “y” value as \( \sin x \) or \( \sin \theta \).

**Here are some practice problems:**

1. Given the point on a unit circle represented by the coordinates \( (\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}) \), name the reference angle and then the angle itself. What’s the radians measure?
2. What is the sin of 60°?
3. What angles on the unit circle have the cos -1/2? What are their respective positive radians measures?
4. What is the lowest negative radians measure for an angle of 180°?
5. (Bonus) Using reference angles, determine
   a. the tangent of 30° the secant of \( 7\pi/4 \) (Secant = 1/cos = \( 1/ -\frac{\sqrt{2}}{2} \)) = \( \frac{\sqrt{2}}{2} \)
   b. The cosecant of 765° (Hint: 765° has the same reference angle as 45°)