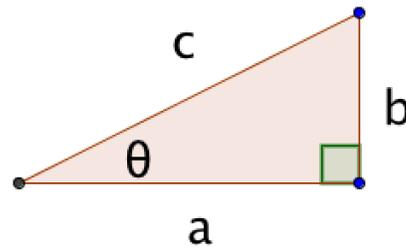
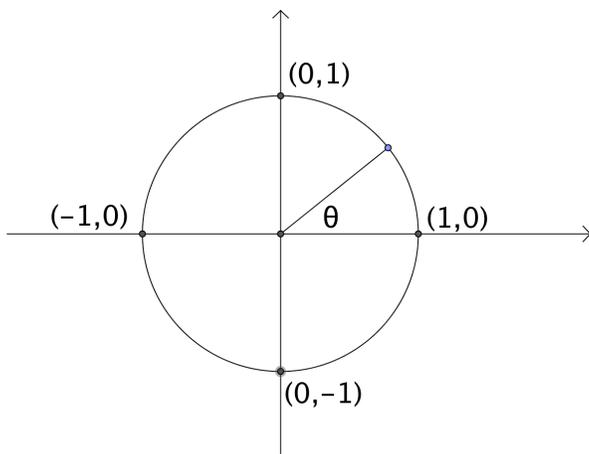


Recall from right triangle trigonometry the following definitions:

$\sin \theta = \frac{\textit{opposite}}{\textit{hypotenuse}} = \frac{b}{c}$
$\cos \theta = \frac{\textit{adjacent}}{\textit{hypotenuse}} = \frac{a}{c}$



We use the **UNIT CIRCLE** to describe the behavior of sine and cosine for ALL angle measures, even angles greater than 90° .



The unit circle has a radius of 1.

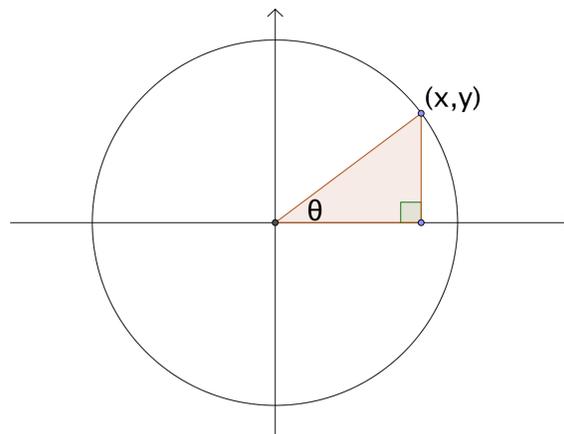
Angles are measured starting at the positive x-axis.

Positive angles rotate counterclockwise; negative angles rotate clockwise.

Given a rotation counterclockwise by θ degrees, the arrow reaches a point (x, y) on the unit circle. Use the right triangle below to find expressions for $\sin \theta$ and $\cos \theta$. (*recall right triangle definitions of sine and cosine*)

$\sin \theta =$

$\cos \theta =$



Conclusion: On the **unit circle**, sine and cosine represent the _____ and _____ coordinates of the point where the terminal ray of θ intersects the circle.

What would the x and y coordinates be if the radius were not 1?

Use the unit circle to find the following trig values. NO CALCULATOR!

$$\sin 0^\circ =$$

$$\cos 0^\circ =$$

$$\sin \left(\frac{\pi}{2}\right) =$$

$$\cos 90^\circ =$$

$$\sin \pi =$$

$$\cos 180^\circ =$$

$$\sin 270^\circ =$$

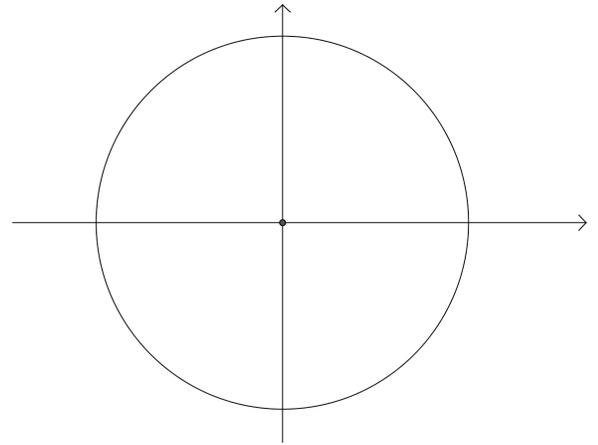
$$\cos \left(\frac{3\pi}{2}\right) =$$

$$\sin 360^\circ =$$

$$\cos 2\pi =$$

$$\sin 6\pi =$$

$$\cos (-3\pi) =$$

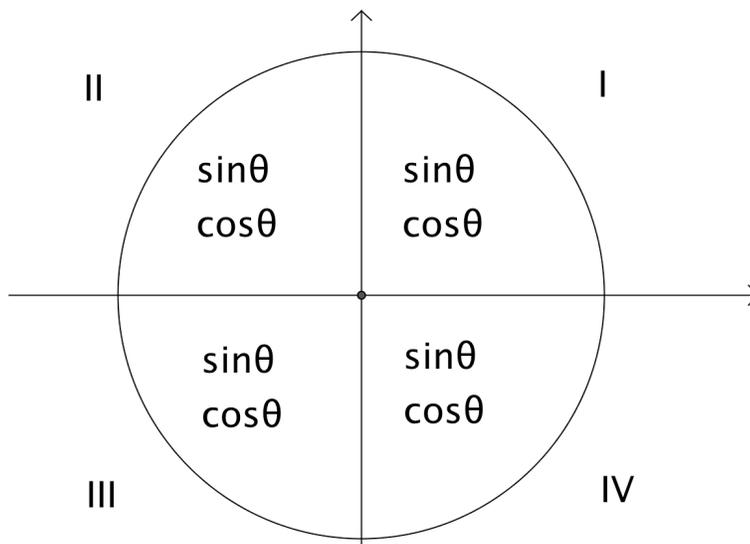


What if θ is not on one of the axes? To find the value of sine or cosine of ANY given angle, ask yourself two important questions:

1. Which **quadrant** am I in? This tells you if the value is positive or negative.
2. What is my **reference angle**? This tells you the magnitude.

Example: Find $\sin 210^\circ$.

Determine whether the sign should be + or - for the trig functions listed in the respective quadrants.



Compare these angles, NO CALCULATOR.

1. $\sin 70^\circ$ $\sin 80^\circ$

2. $\cos 40^\circ$ $\cos 50^\circ$

3. $\sin 315^\circ$ $\cos 315^\circ$

Solve the following trig equations for all possible values of θ . In other words, which angles of rotation result in the following trig values?

a) $\cos \theta = 1$

Start by making a list of all the angles whose cosine equals 1.

Notice a pattern? So $\theta =$ _____ (Write a general solution.)

In radian measure, $\theta =$ _____

b) $\sin \theta = -1$

What is the **period*** of the sine function? How about the cosine function?

In degrees: _____

In radians: _____

*We'll use period to mean the *smallest* section of the graph that repeats.