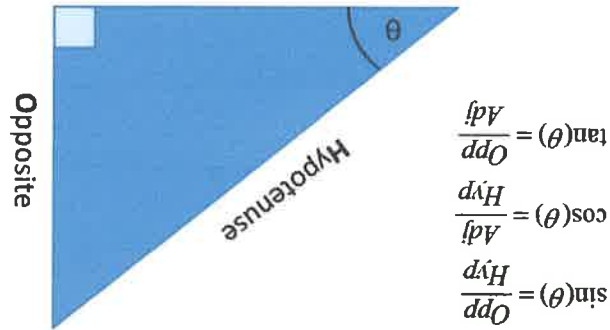


Name: Key
 Date: _____
 Period: _____

Special Right Triangles and The Unit Circle

Objective: Students will be able to use the unit circle to find the value of any of the six trigonometric functions.
 The "3 right triangle trig functions" that you learned in geometry can be recalled using the following mnemonic:

SOHCAHTOA

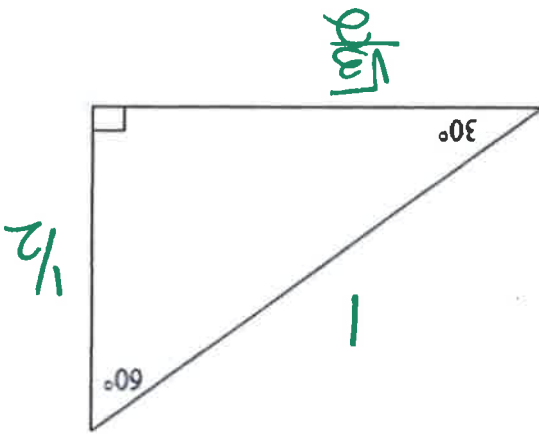
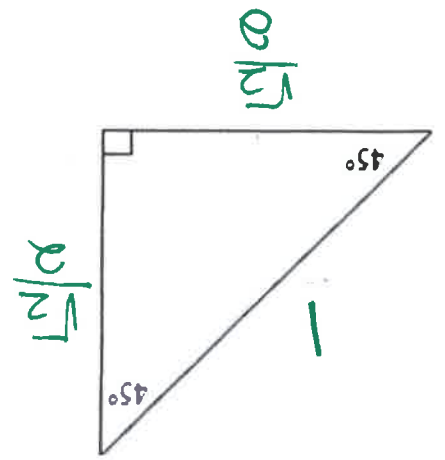


In addition to these three functions there are also three reciprocal functions

Sine & Cosine & Secant	$\frac{Opp}{Hyp} = \sin \theta$	$\frac{Hyp}{Opp} = \csc \theta$
Tangent & Cotangent	$\frac{Opp}{Adj} = \tan \theta$	$\frac{Adj}{Opp} = \cot \theta$

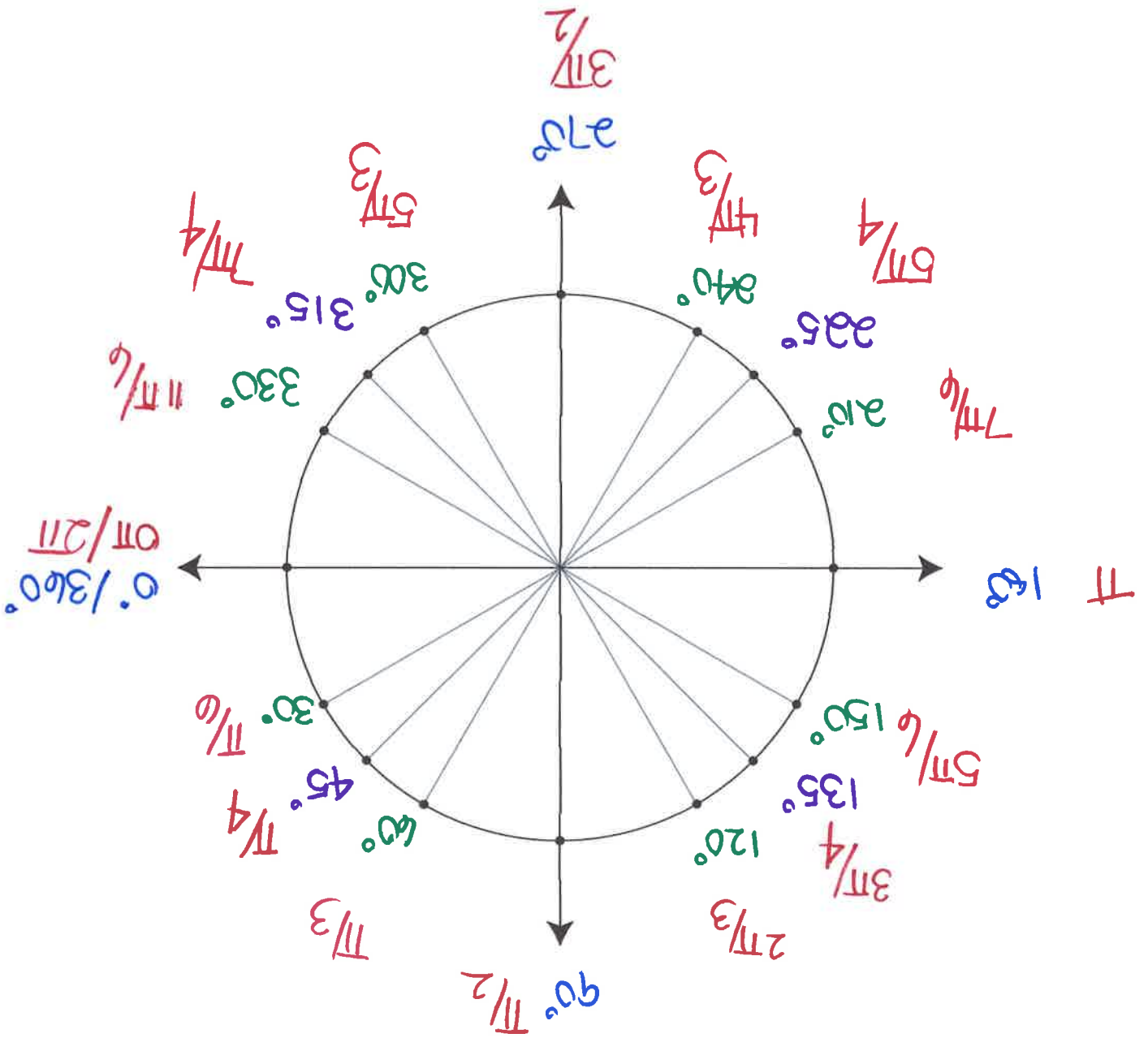
Special Right Triangle Relationships

The unit circle is a circle with a radius of 1 unit. The unit circle is comprised of 30-60-90° and 45-45-90° triangles

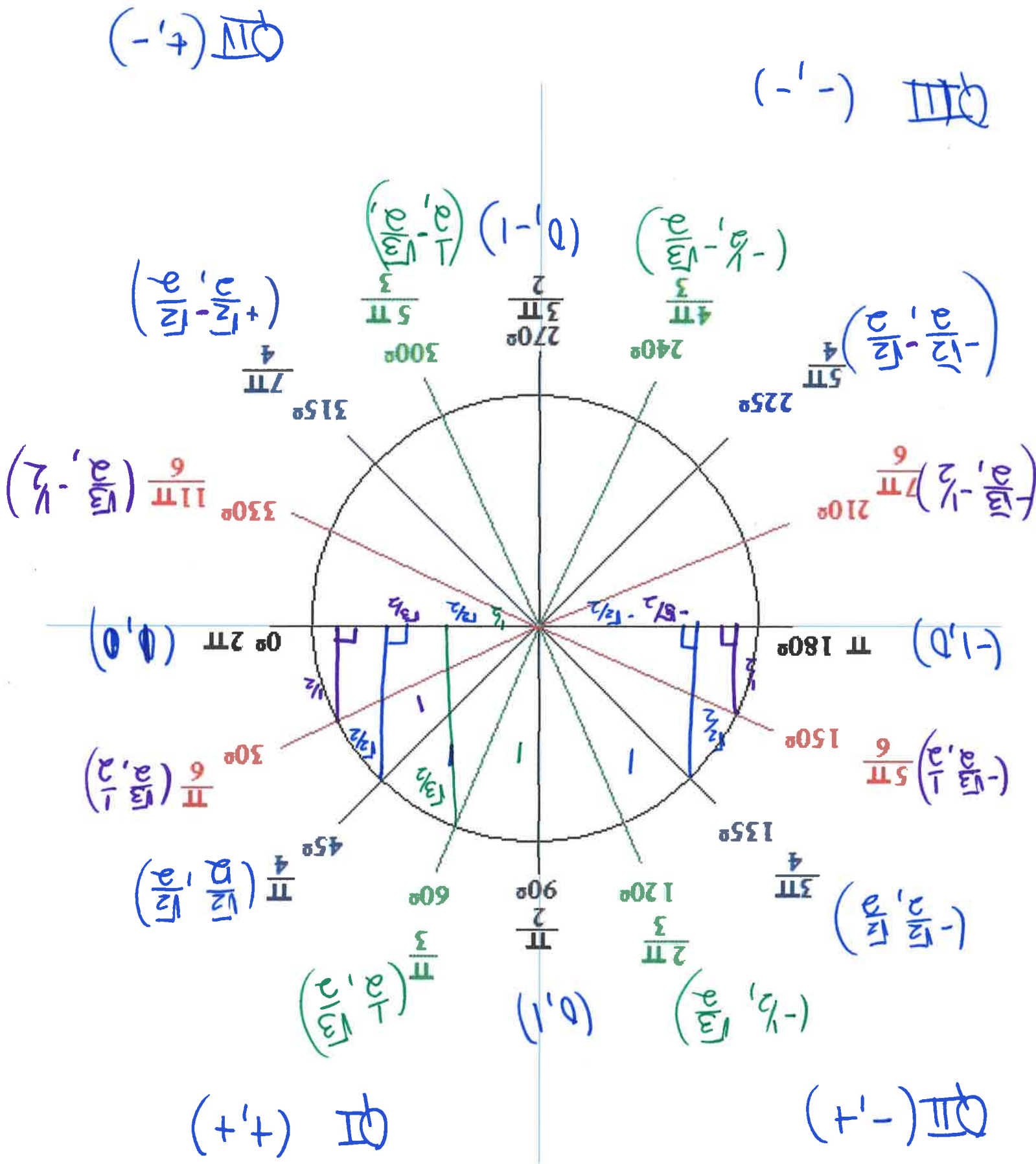


Angles on the unit circle can be expressed in two forms _____ and _____
 To convert from _____ to _____ multiply by $\frac{\pi}{180}$
 To convert from _____ to _____ multiply by $\frac{180}{\pi}$

Fill in the unit circle in degrees and radians for every 30° and 45° increment.



* What are the signs for the x-y coordinates in each quadrant
 Now draw the special right triangle on the unit circle and find the coordinates for each angle on the unit circle.

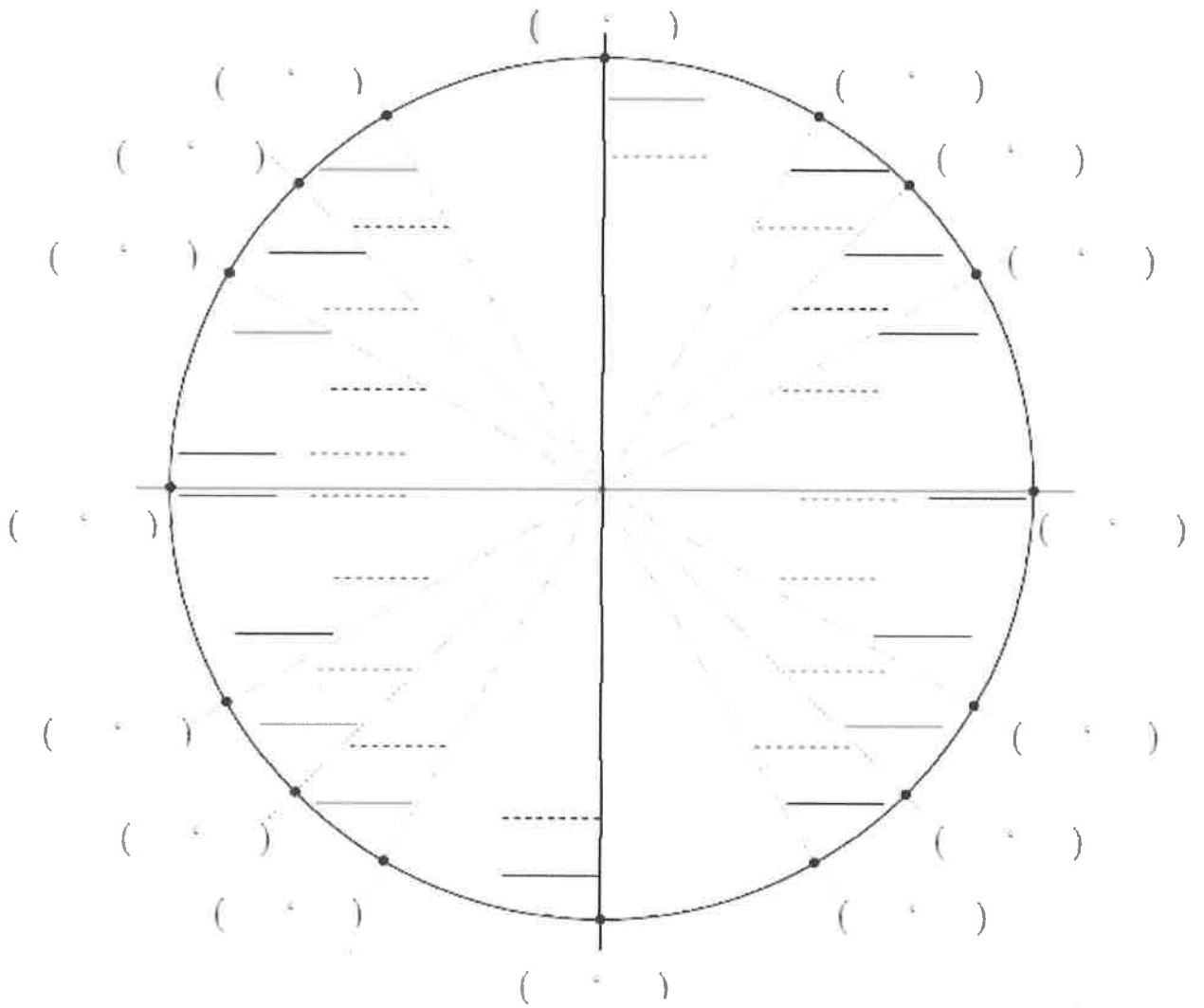


QI (+,+)

QII (-,+)

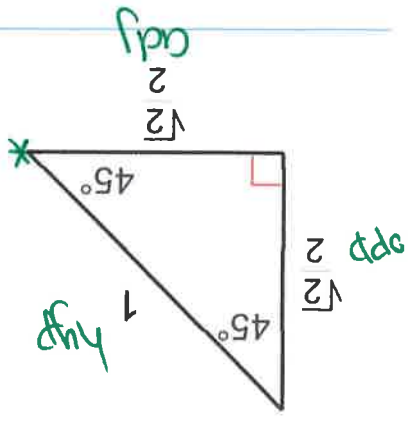
QIII (-,-)

QIV (+,-)

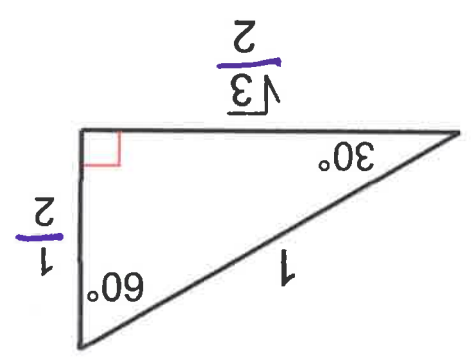


Fill in the blank unit circle

Using Special Right Triangles find the value of each of the six trig functions



$\sin 45^\circ = \frac{\text{opp}}{\text{hyp}} = \frac{\sqrt{2}}{2}$
 $\cos 45^\circ = \frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{2}}{2}$
 $\tan 45^\circ = \frac{\text{opp}}{\text{adj}} = 1$
 $\csc 45^\circ = \frac{\text{hyp}}{\text{opp}} = \sqrt{2}$
 $\sec 45^\circ = \frac{\text{hyp}}{\text{adj}} = \sqrt{2}$
 $\cot 45^\circ = \frac{\text{adj}}{\text{opp}} = 1$

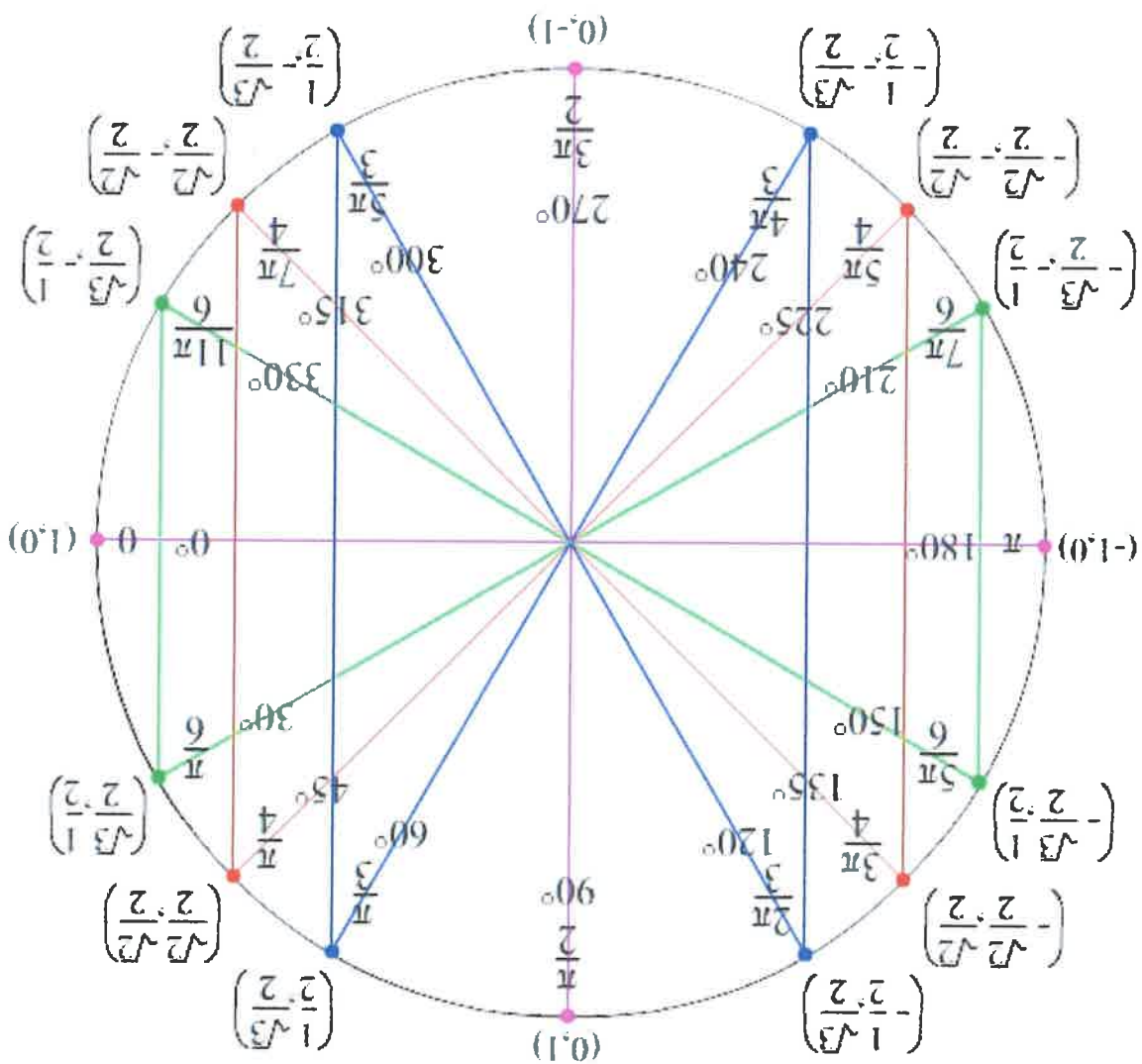


$\sin 30^\circ = \frac{\text{opp}}{\text{hyp}} = \frac{1}{2}$
 $\cos 30^\circ = \frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{3}}{2}$
 $\tan 30^\circ = \frac{\text{opp}}{\text{adj}} = \frac{1}{\sqrt{3}}$
 $\csc 30^\circ = \frac{\text{hyp}}{\text{opp}} = 2$
 $\sec 30^\circ = \frac{\text{hyp}}{\text{adj}} = \frac{2}{\sqrt{3}}$
 $\cot 30^\circ = \frac{\text{adj}}{\text{opp}} = \sqrt{3}$
 $\sin 60^\circ = \frac{\text{opp}}{\text{hyp}} = \frac{\sqrt{3}}{2}$
 $\cos 60^\circ = \frac{\text{adj}}{\text{hyp}} = \frac{1}{2}$
 $\tan 60^\circ = \frac{\text{opp}}{\text{adj}} = \sqrt{3}$
 $\csc 60^\circ = \frac{\text{hyp}}{\text{opp}} = \frac{2}{\sqrt{3}}$
 $\sec 60^\circ = \frac{\text{hyp}}{\text{adj}} = 2$
 $\cot 60^\circ = \frac{\text{adj}}{\text{opp}} = \frac{1}{\sqrt{3}}$

Looking at the values you calculated using the special right triangles and the coordinates for each angle on the unit circle what do you notice?

$(x, y) \rightarrow (\cos, \sin)$
 $\sin = \frac{y}{r}$
 $\cos = \frac{x}{r}$
 $\tan = \frac{y}{x}$

$\tan \theta = \frac{y}{x}$	$\cot \theta = \frac{x}{y}$
$\cos \theta = \frac{x}{r}$	$\sec \theta = \frac{r}{x}$
$\sin \theta = \frac{y}{r}$	$\csc \theta = \frac{r}{y}$



How can the unit circle be used to find the values of any of the six trigonometric functions.

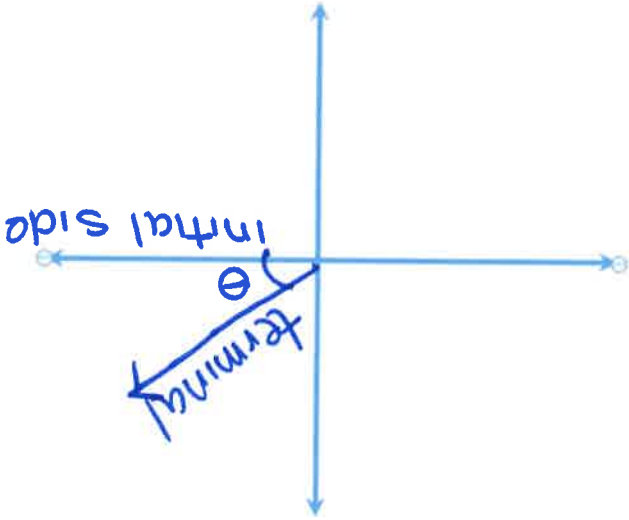
The unit circle can be used to find the values of trigonometric functions for both positive and

negative angles. All angles on the unit circle are referenced from the same place. The place is

referred to as Standard position. All angle measures begin with the initial

side which is always the positive x-axis and end with the terminal side. ~~The vertex is~~

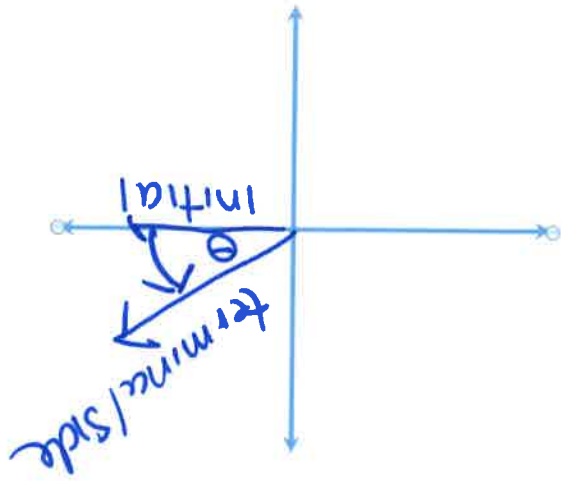
Standard Position



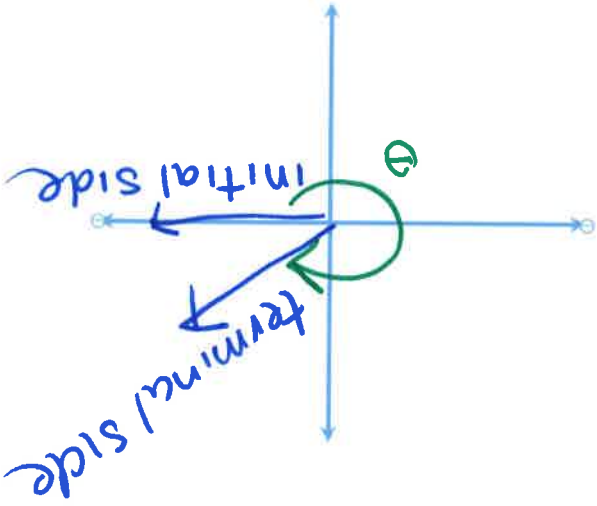
Positive angles will start at the initial side and follow a counter clockwise path to its terminal side.

negative angles will start at the initial side and follow a clockwise path to its terminal side.

positive angle



Negative angle



Find the value of the following trigonometric functions.

a. $\cos -90^\circ = 0$

c. $\tan \frac{-5\pi}{3} = \sqrt{3}$

e. $\sec \frac{\pi}{6} = 2$

$\frac{1}{\cos \frac{\pi}{3}} = 2$
 $\frac{1}{\sin \frac{\pi}{3}} = \frac{2}{\sqrt{3}}$

b. $\sin \frac{4}{-3\pi} = -\frac{1}{2}$

$\frac{1}{\sin \frac{\pi}{6}} = 2$
 $\frac{1}{\cos \frac{\pi}{3}} = 2$

d. $\cot -210 = -\sqrt{3}$

$\frac{1}{\tan \frac{\pi}{3}} = \frac{1}{\sqrt{3}}$
 $\frac{1}{\cot \frac{\pi}{3}} = \sqrt{3}$

f. $\csc -135 = -\sqrt{2}$

$\frac{1}{\sin \frac{\pi}{4}} = \sqrt{2}$
 $\frac{1}{\cos \frac{\pi}{4}} = \sqrt{2}$

