

Warm Up  
Sketching Angles WS

\*Sketch the angles.

-Convert Radians to degrees

What are your homework questions?

$$\textcircled{43} \quad \cos + \frac{\pi}{8}$$

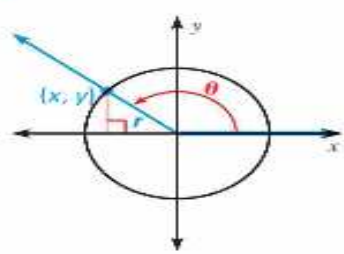
**KEY CONCEPT** *For Your Notebook*

**General Definitions of Trigonometric Functions**

Let  $\theta$  be an angle in standard position, and let  $(x, y)$  be the point where the terminal side of  $\theta$  intersects the circle  $x^2 + y^2 = r^2$ . The six trigonometric functions of  $\theta$  are defined as follows:

$\sin \theta = \frac{y}{r}$	$\csc \theta = \frac{r}{y}, y \neq 0$
$\cos \theta = \frac{x}{r}$	$\sec \theta = \frac{r}{x}, x \neq 0$
$\tan \theta = \frac{y}{x}, x \neq 0$	$\cot \theta = \frac{x}{y}, y \neq 0$

These functions are sometimes called *circular functions*.



Use the given point on the terminal side of an angle  $\theta$  in standard position to evaluate the six trigonometric functions of  $\theta$ .

1)  $(-9, 12)$

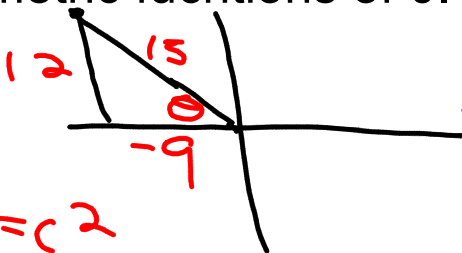
$\times$

$$12^2 + (-9)^2 = r^2$$

$$144 + 81 = r^2$$

$$\sqrt{225} = r$$

$$15 = r$$



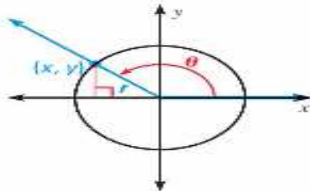
$\sin \theta = \frac{12}{15}$   
 $\cos \theta = \frac{-9}{15}$   
 $\tan \theta = \frac{12}{-9}$   
 $\csc \theta = \frac{15}{12}$   
 $\sec \theta = \frac{15}{-9}$   
 $\cot \theta = \frac{-9}{12}$

**General Definitions of Trigonometric Functions**

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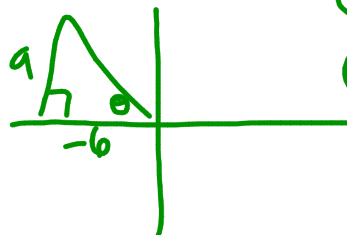
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These functions are sometimes called *circular functions*.



Use the given point on the terminal side of an angle  $\theta$  in standard position to evaluate the six trigonometric functions of  $\theta$ .

2)  $(-6, 9)$



Handwritten calculations for the trigonometric functions of  $\theta$  based on the point  $(-6, 9)$  and the hypotenuse  $r = \sqrt{117}$ :

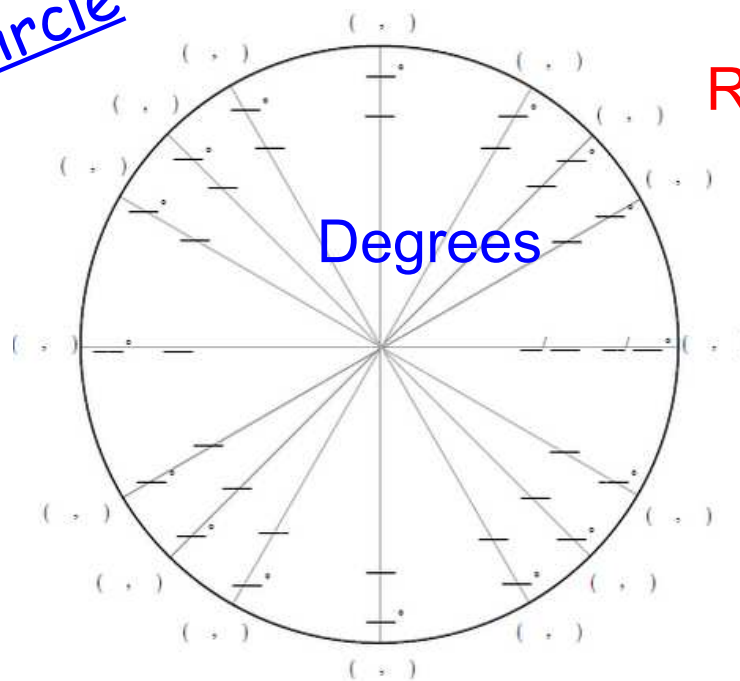
$$\sin \theta = \frac{9}{\sqrt{117}} \quad \csc \theta = \frac{\sqrt{117}}{9}$$

$$\cos \theta = \frac{-6}{\sqrt{117}} \quad \sec \theta = \frac{\sqrt{117}}{-6}$$

$$\tan \theta = \frac{9}{-6} \quad \cot \theta = \frac{-6}{9}$$

\*Fill in the degrees and radian measures (purple ws).

The Unit Circle



## Diagram

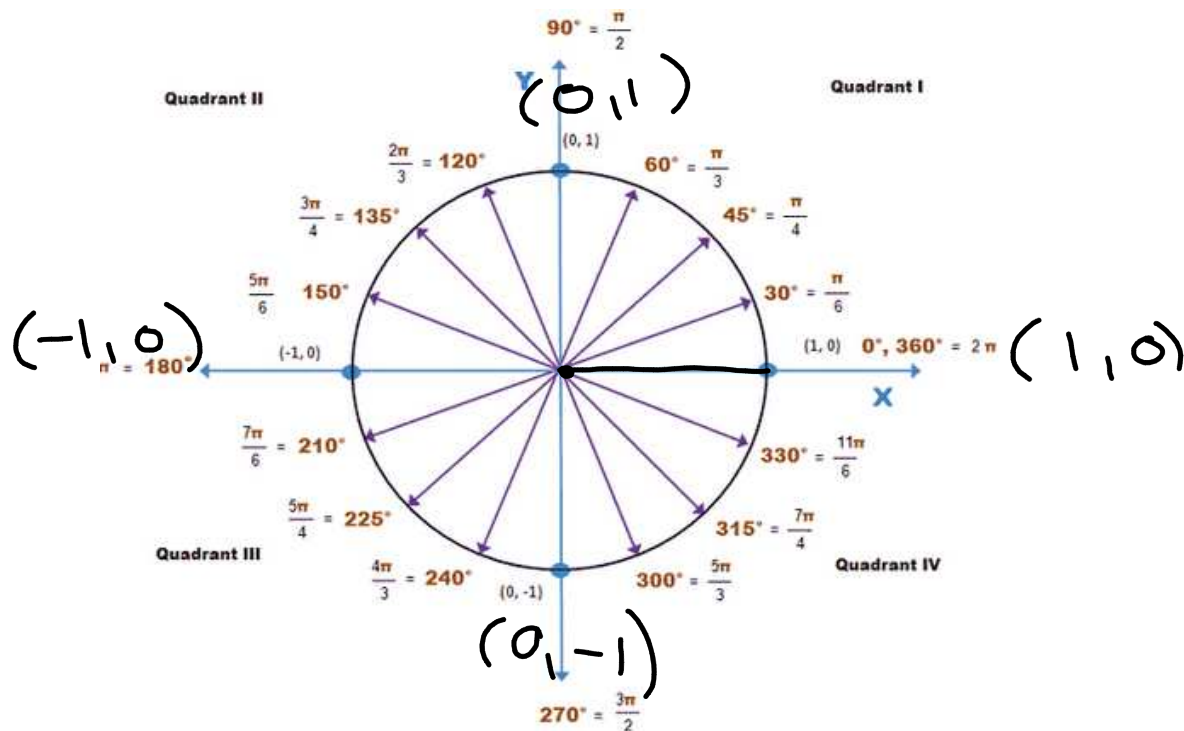
<http://www.mathsisfun.com/geometry/unit-circle.html>

## Unit circle song

<https://www.youtube.com/watch?v=YfclauF2JqM>

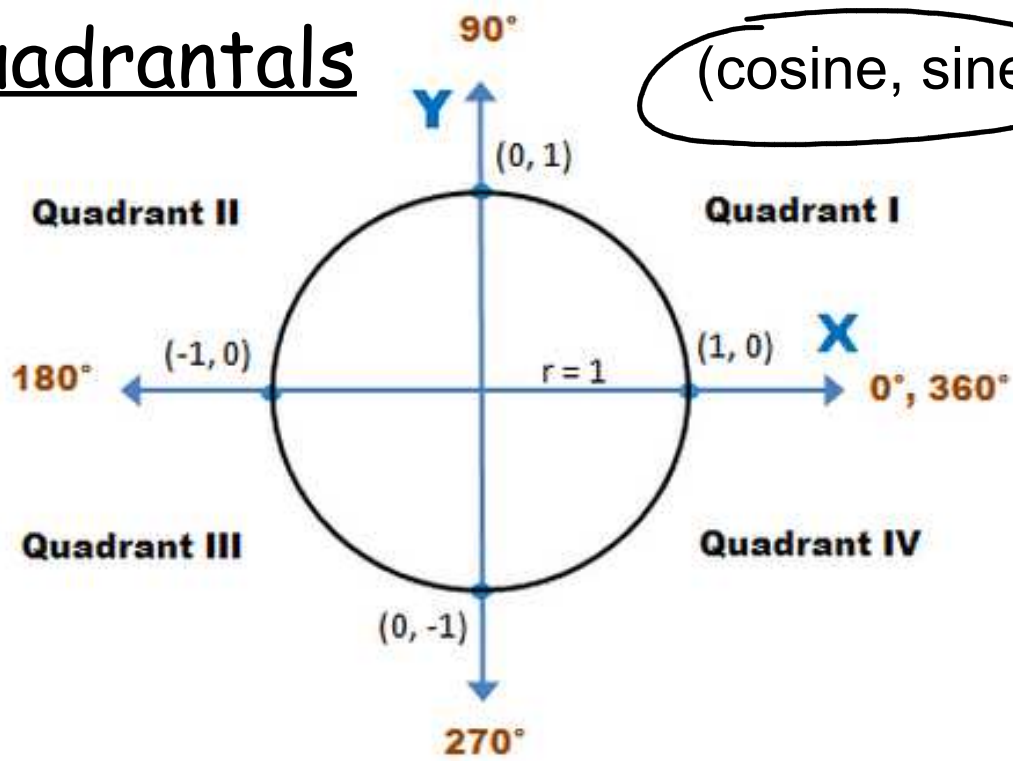
## Help you learn the unit circle!

<https://www.youtube.com/watch?v=ZsPyhyo16pg&feature=share>

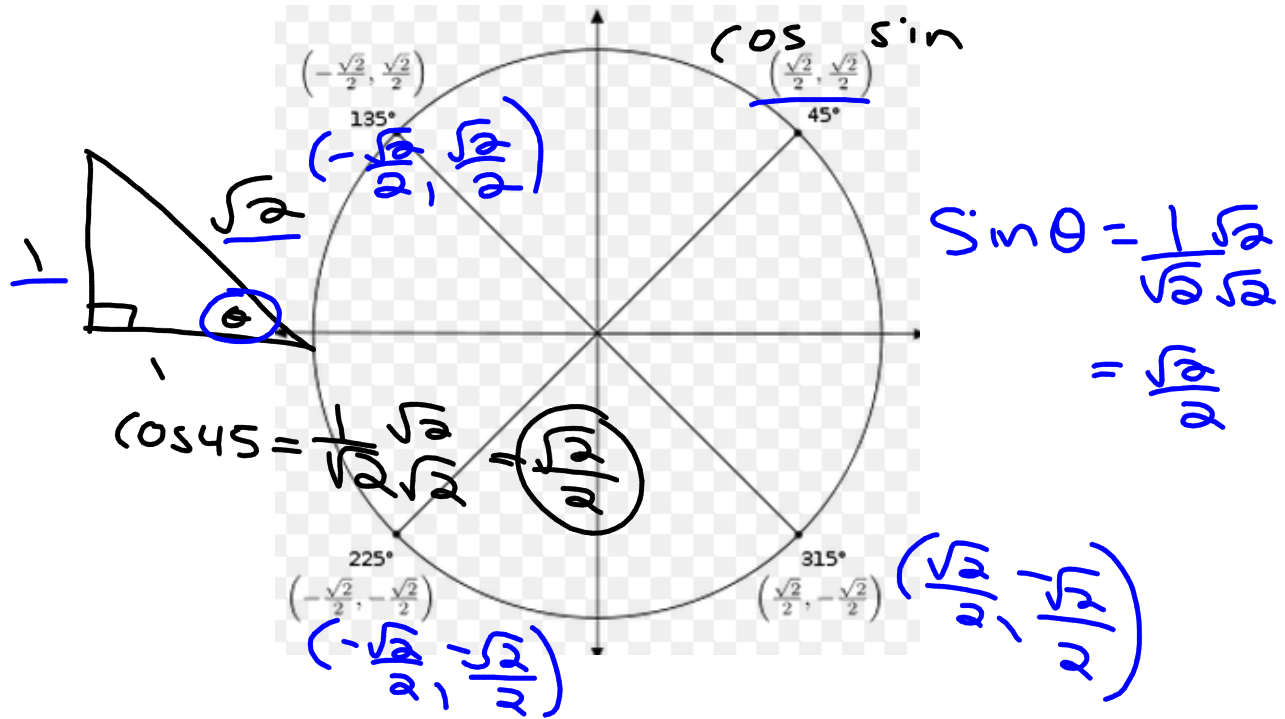


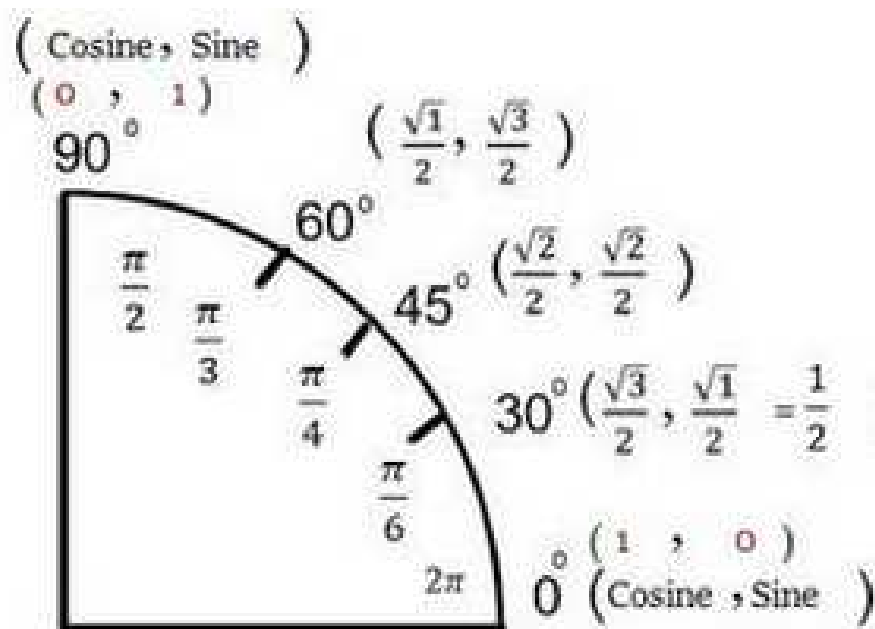
# Quadrants

(cosine, sine)

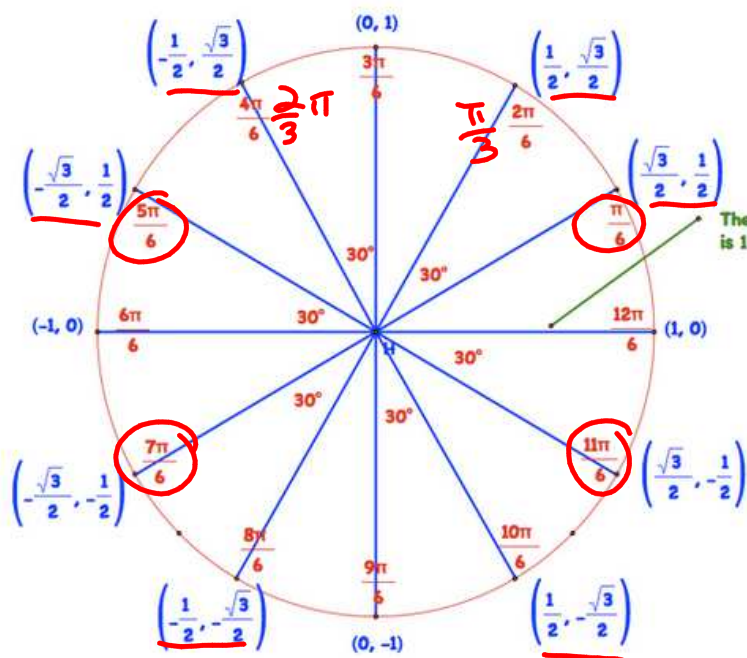




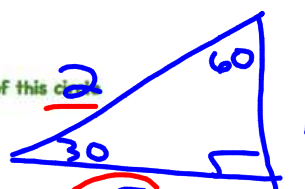




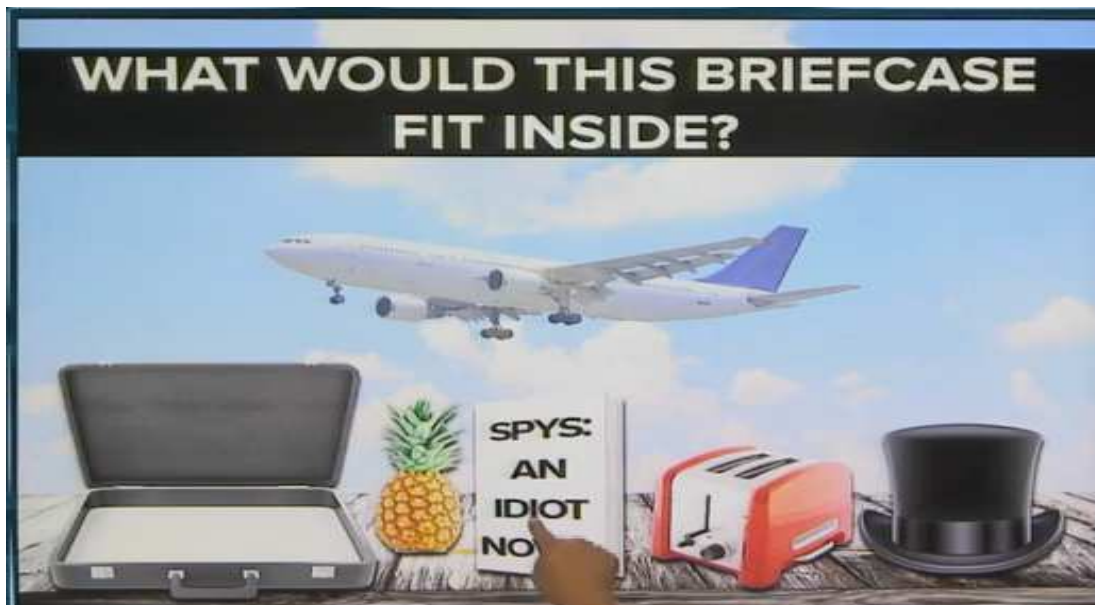
First  
Quadrant



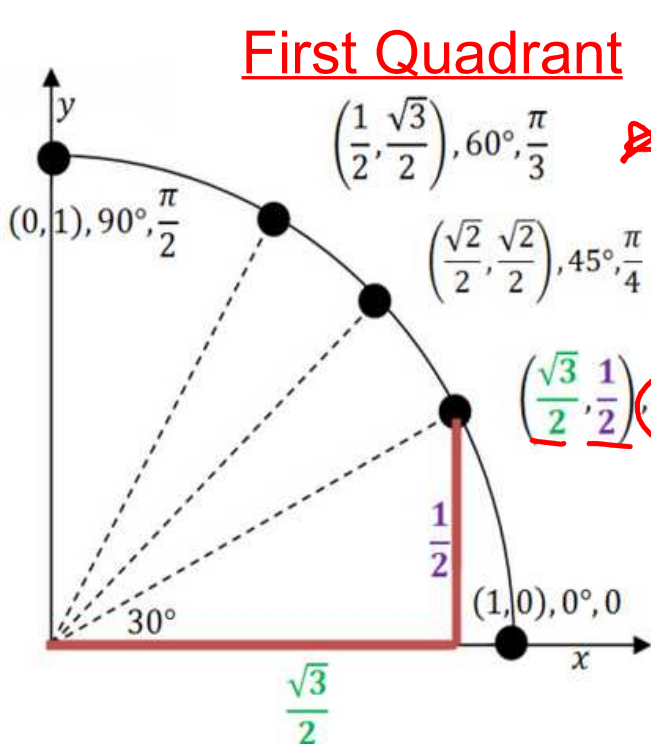
$30^\circ$  &  $60^\circ$



$\cos 30 = \frac{\sqrt{3}}{2}$   
 $\sin 30 = \frac{1}{2}$



First Quadrant



Quotient Identities	
$\tan \theta = \frac{\sin \theta}{\cos \theta}$	$\cot \theta = \frac{\cos \theta}{\sin \theta}$

\*What is  $\cos 30^\circ$ ?

$$\frac{\sqrt{3}}{2}$$

\*What is  $\sin 30^\circ$ ?

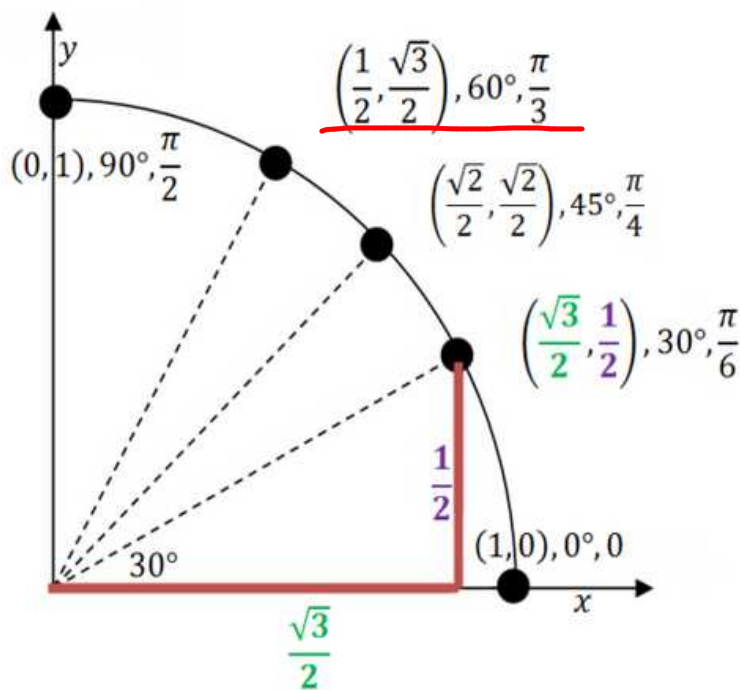
$$\frac{1}{2}$$

\*What is the  $\tan 30^\circ$ ?

$$\frac{\frac{1}{2} \cdot \frac{2}{\sqrt{3}}}{\frac{\sqrt{3}}{2}} = \frac{1\sqrt{3}}{\sqrt{3}\sqrt{3}}$$

$$\frac{\sqrt{3}}{3}$$

First Quadrant



\*What is  $\sin \frac{\pi}{3}$  ?

$\frac{\sqrt{3}}{2}$

\*What is  $\cos \frac{\pi}{3}$  ?

$\frac{1}{2}$

$\tan \frac{\pi}{3} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$

\*Evaluate the six functions for

$\theta = \frac{\pi}{2}$

$$\frac{\pi}{2}$$

$$\begin{pmatrix} 0 & 1 \\ \cos & \sin \end{pmatrix}$$

$$\sin \frac{\pi}{2} = 1 \quad \csc \frac{\pi}{2} = 1$$

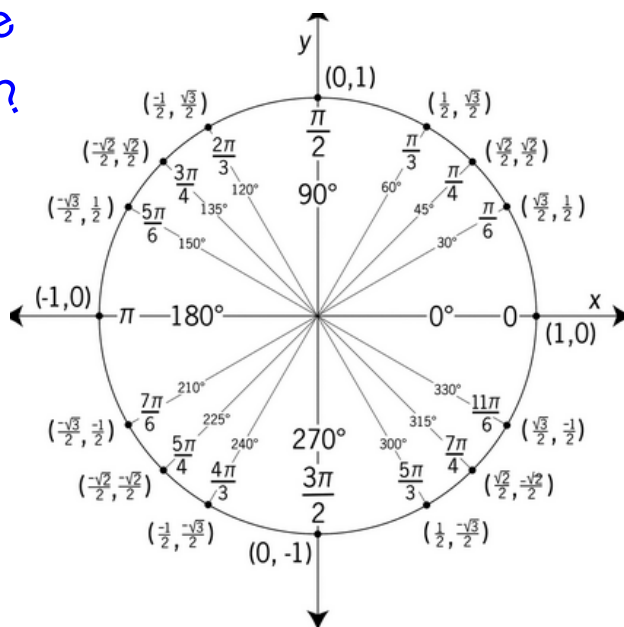
$$\cos \frac{\pi}{2} = 0 \quad \sec \frac{\pi}{2} = \text{und}$$

$$\tan \frac{\pi}{2} = \frac{1}{0} \text{ und} \quad \cot \frac{\pi}{2} = 0$$

What do you notice about the coordinates?

### The Unit Circle

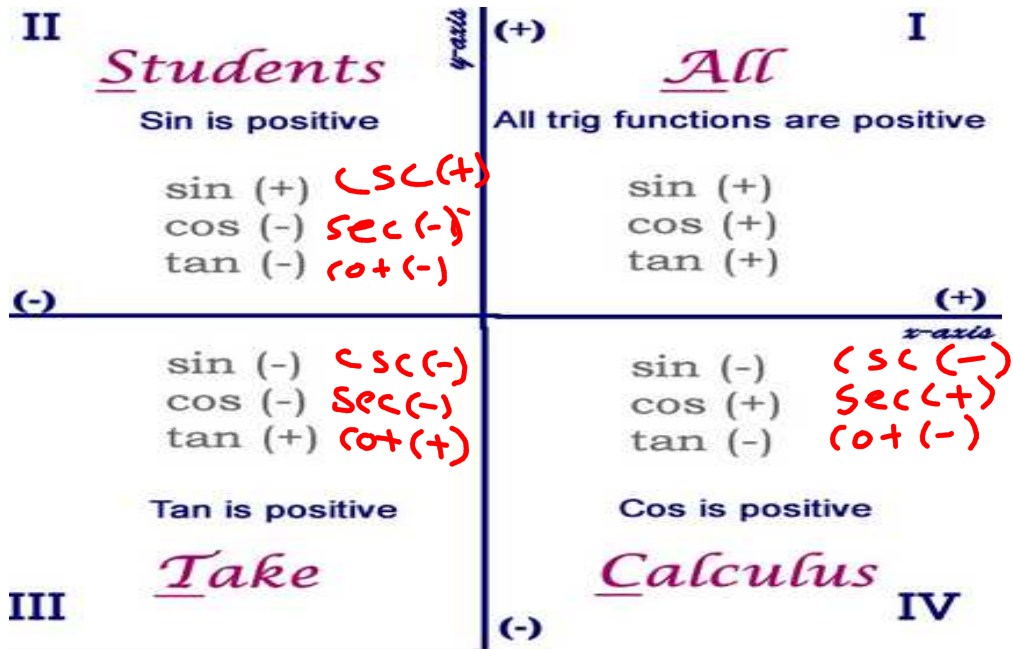
Check your unit circle!





$$\begin{aligned} & \cancel{30}^\circ \cdot \frac{\pi}{\cancel{180}} \rightarrow \pi \\ & \frac{3\pi}{18} \\ & \frac{\pi}{6} \end{aligned}$$

$$\begin{aligned} & \frac{\cancel{7}\pi}{\cancel{4}} \cdot \frac{\cancel{180}^\circ}{\cancel{\pi}} \rightarrow 0 \\ & \frac{3 \cdot 45}{3 \cdot 5} \\ & 315^\circ \end{aligned}$$



Reciprocal Identities		
$\sin \theta = \frac{1}{\csc \theta}$	$\cos \theta = \frac{1}{\sec \theta}$	$\tan \theta = \frac{1}{\cot \theta}$
$\csc \theta = \frac{1}{\sin \theta}$	$\sec \theta = \frac{1}{\cos \theta}$	$\cot \theta = \frac{1}{\tan \theta}$

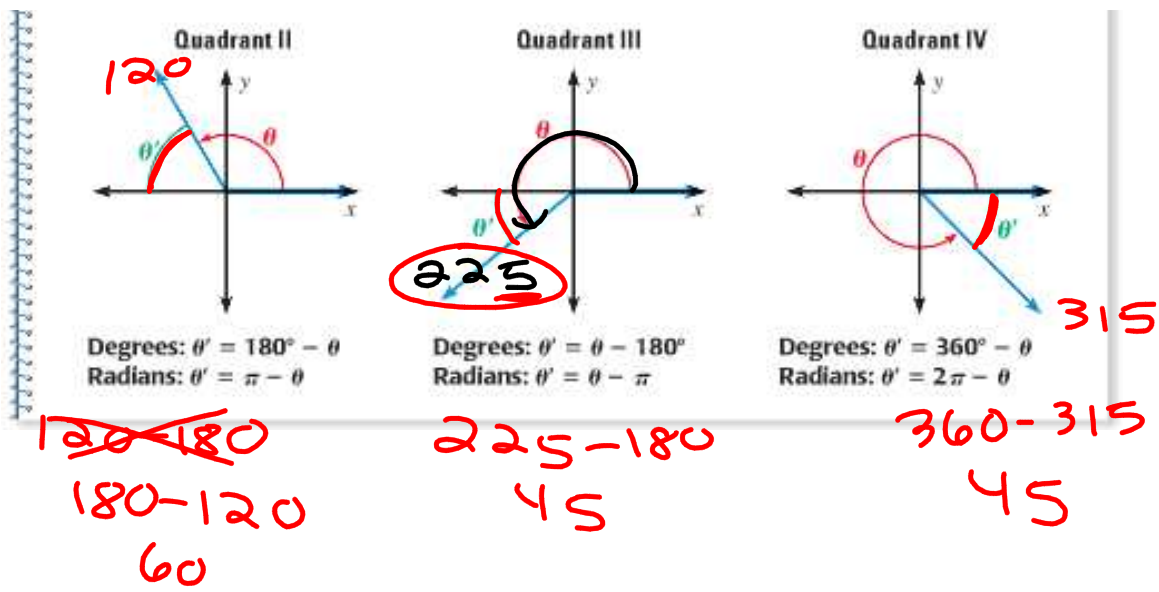
Quotient Identities	
$\tan \theta = \frac{\sin \theta}{\cos \theta}$	$\cot \theta = \frac{\cos \theta}{\sin \theta}$

\*What is the  $\cot 30^\circ$ ?

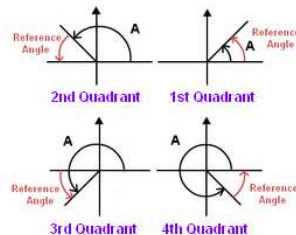
\*What is  $\tan 30^\circ$ ?

\*What is  $\csc 30^\circ$ ?

\*What is  $\sec 30^\circ$ ?



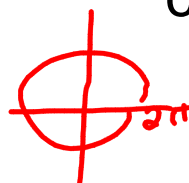
# Reference angles



\*Find the reference angle:

a) 210 degrees

$||| \theta - 180$   
 $210 - 180 = 30^\circ$

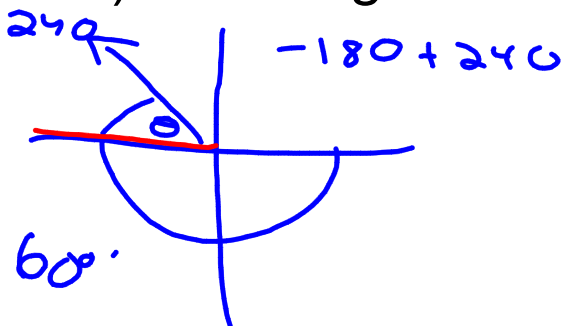


c)  $\frac{11\pi}{6}$  **IV**  $360 - \theta$   
 $2\pi - \theta$

$\frac{11\pi}{6}$   
 $2\pi - \frac{11\pi}{6}$

$\frac{11\pi}{6}$   
 $\frac{11\pi}{6}$   
 K/m

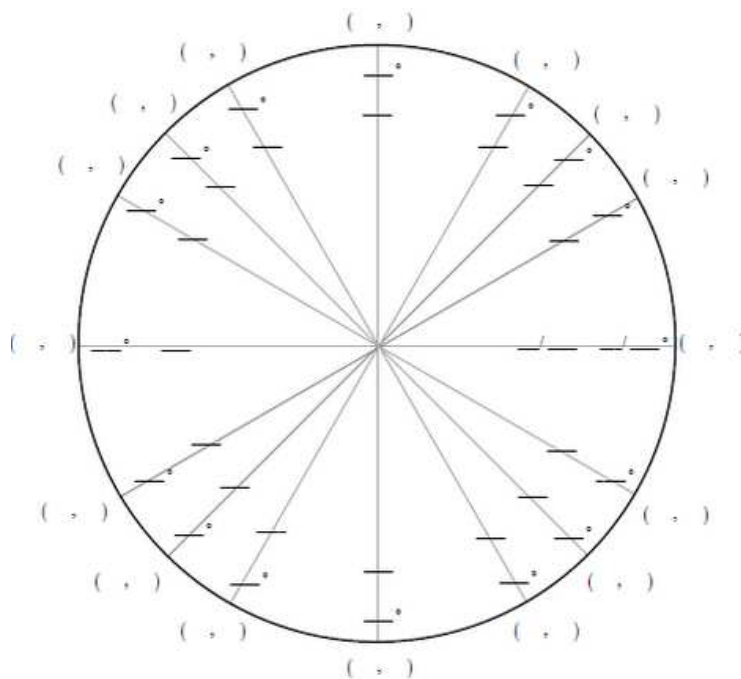
b) -240 degrees



d)  $\frac{2\pi}{3}$

## Sketching Angles WS

- \*Sketch the angles.
  - Convert Radians to degrees
  - Find the reference angles.



Before next class, ask yourself:

\*Can I evaluate the six trig functions for any angle in the first quadrant and the quadrantals?

\*Can I find reference angles?

\*Can you recreate the unit circle?

(hint...hint..)



## Homework

- ★ Page 870 #5-11 odd, 12-15, 17-23 odd
- ★ Find the reference angles for all the problems on the Sketching Angles worksheet.
- ★ Start filling in the chart on the back of the Unit circle (purple ws).