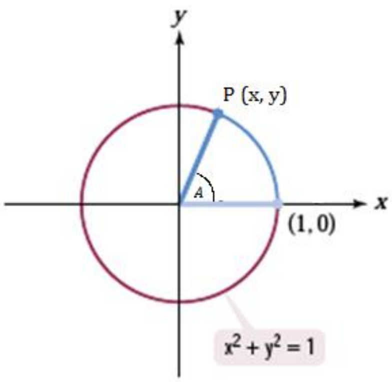
Chapter 4: Trigonometric Functions
Topic 2: The Unit Circle

SOH CAH TOA in the Unit Circle

With a radius of 1, the unit circle allows for easy recognition of sine, cosine, and tangent based on the coordinate point that the terminal ray of an angle makes with the unit circle.



$\sin A =$

$\cos A =$

$\tan A =$

All Six Functions

Recall three additional functions, which are the reciprocals of the three main functions

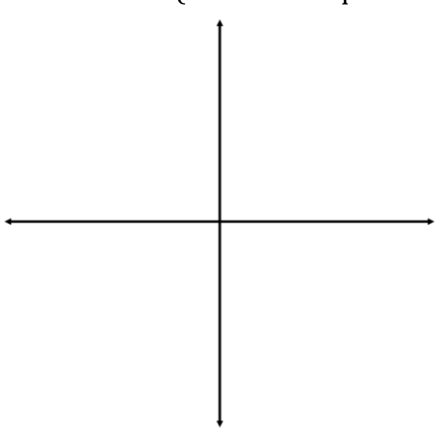
In Words:	**As a reciprocal**:	**On the unit circle**:
Cosecant: The reciprocal identity of Sine	$\csc\theta = \frac{1}{\sin\theta} = \frac{H}{O}$	$\csc\theta =$
Secant: The reciprocal identity of Cosine	$\sec\theta = \frac{1}{\cos\theta} = \frac{H}{A}$	$\sec\theta =$
Cotangent: The reciprocal identity of Tangent	$\cot\theta = \frac{1}{\tan\theta} = \frac{A}{O}$	$\cot\theta =$

Summarize All 6 Functions on the Unit Circle:

$\sin\theta =$ $\quad\cos\theta =$ $\quad\tan\theta =$

$\csc\theta =$ $\quad\sec\theta =$ $\quad\cot\theta =$

Example: The terminal ray of a standard angle intercepts the unit circle at the point $\left(-\frac{3}{5}, -\frac{4}{5}\right)$. Sketch this angle on the unit circle (hint: which quadrant?) and identify all 6 identities.



$\sin\theta =$ $\quad\cos\theta =$ $\quad\tan\theta =$

$\csc\theta =$ $\quad\sec\theta =$ $\quad\cot\theta =$

How good is your memory??

θ	$\sin\theta$	$\csc\theta$	$\cos\theta$	$\sec\theta$	$\tan\theta$	$\cot\theta$
$30°$						
$45°$						
$60°$						

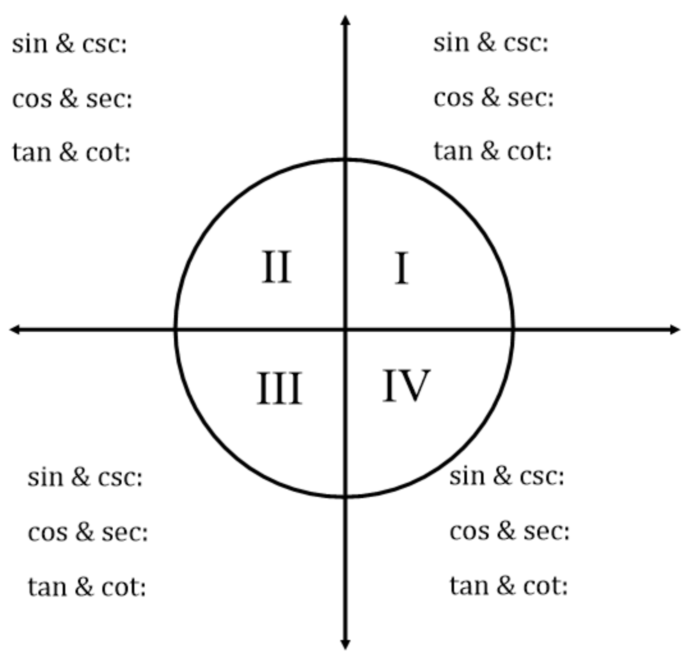
θ	$\sin\theta$	$\csc\theta$	$\cos\theta$	$\sec\theta$	$\tan\theta$	$\cot\theta$
$0°, 360°$						
$90°$						
$180°$						
$270°$						

Recall: Which functions are positive in which quadrants? Let the fact that cosine relates to x and sine relates to y drive your answers.

Where is x positive or negative? Then so is cosine.

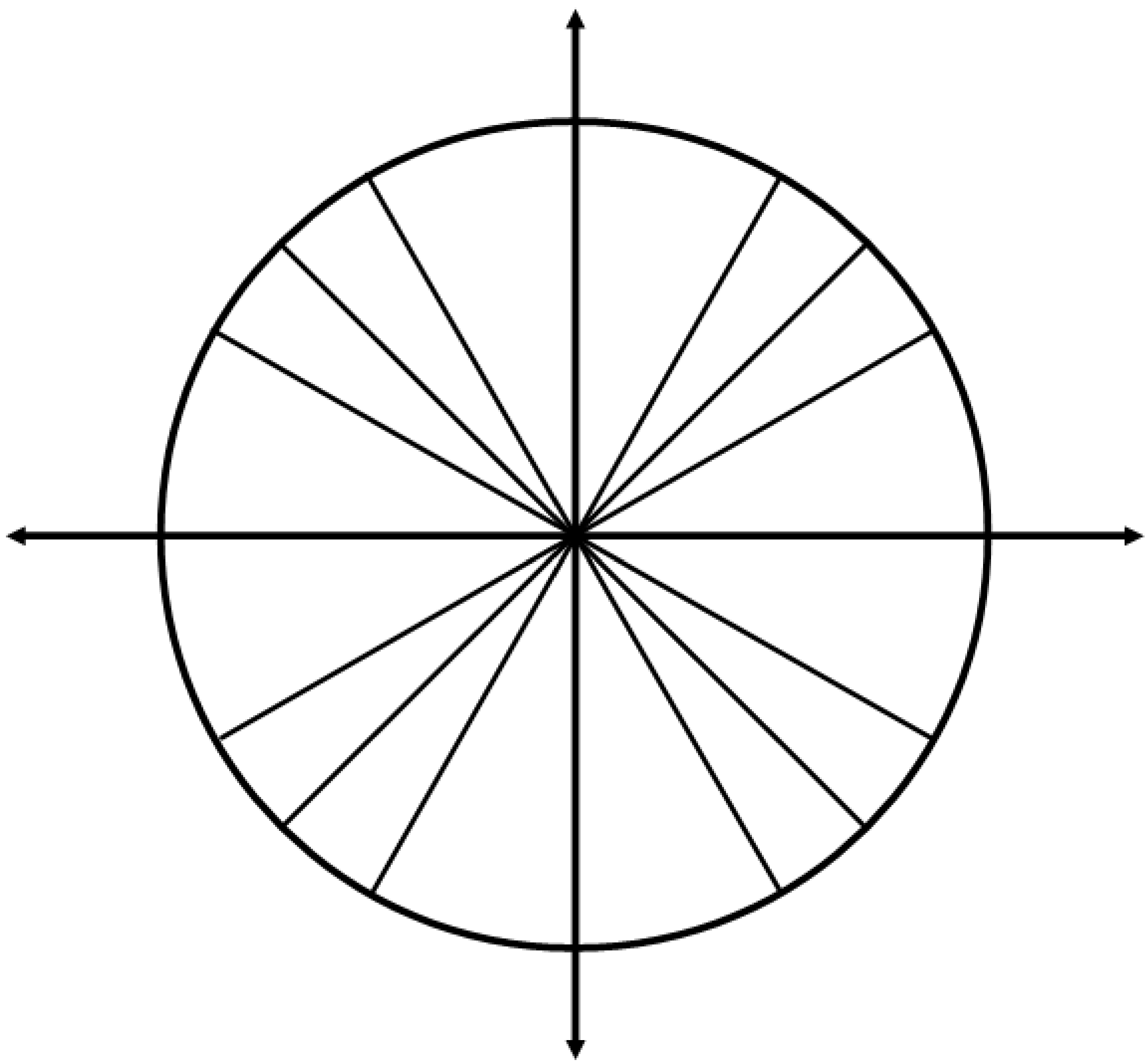
Where is y positive or negative? Then so is sine.

Recall that Tangent divides the two.



Full Unit Circle

- Write each angle in degree and radian form
- Identify the coordinate point where each angle intercepts the circle



Pythagorean Identities

The equation of the unit circle is represented as $x^2 + y^2 = 1$

Knowing what we do about sine and cosine, this can be written as the Pythagorean Identity:

$$\cos^2\theta + \sin^2\theta = 1$$

With further manipulation, we can write this exact same identity in two other ways:

- Staring from the main pythagorean identity, divide each term by $\cos^2\theta$.

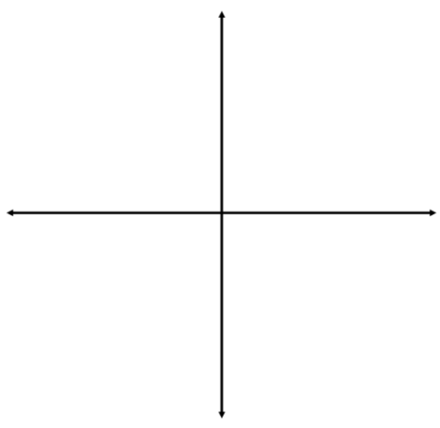
- Starting from the main pytahtroean identity, divide each term by $\sin^2\theta$.

These identities help us to find the missing trig ratios for an angle. Pick which of the pythagorean identities to use based on what you already know.

Example: Given that θ terminates in quadrant I, and $\sin\theta = \frac{3}{5}$, find $\cos\theta$ using a pythagorean identity.

This type of question can also be done as a 'bowtie' question:
Given that θ terminates in quadrant I, and $\sin\theta = \frac{3}{5}$, find all 6 trig functions.

- *Pick a quadrant*
- *Sketch & label*
- *Finish the triangle*



<u>Topic 2 Homework:</u>

Textbook page 450-451: #1-4. #25-32.

1. If the value of $sin\theta = -\frac{12}{13}$ and $cos\theta > 0$, what is the value of $tan\theta$?

2. If the value of $tan\theta = -\frac{10}{9}$ and $sin\theta > 0$, find the value of all 5 remaining trig functions.

3. The value of $cos\theta = -\frac{6}{7}$ and $tan\theta < 0$, find the value of $(sin\theta)(tan\theta)$

4. If $cos\theta = -\frac{4}{5}$ and θ lies in Quadrant II, what is the value of the 5 remaining trig functions?

5. If $cos\theta = \frac{9}{41}$ and θ lies in Quadrant IV, what is the value of $(\sin\theta)(\tan\theta)$?

6. If $\sin\theta = -\frac{2}{5}$ and θ lies in Quadrant III, what is the value of the 5 remaining trig functions

7. If $\tan\theta = \frac{4}{3}$ and θ lies in Quadrant III, what is the value of $(\sin\theta) + (\cos\theta)$?

DON'T FORGET YOU HAVE TEXTBOOK QUESTIONS TOO!