Ex. A Ferris Wheel rotates 3 times each minute. The passengers sit in seats that are 5 m from the center of the wheel. What is the angular velocity of the wheel in radians per second? What distance do the passengers travel in 6.5 seconds?

a) $V_a = \frac{\theta}{t} = \frac{6\pi \text{ rads}}{1 \text{ min}} = \frac{6\pi \text{ rads}}{60 \text{ sec}} = 0.314 \text{ rads/sec}$.

b (i) $\theta = (V_a)(t)$

$\theta = (0.314)(6.5)$

$\theta = 2.04 \text{ rads}$

(ii) $a = \theta r$

$a = (2.04)(5 \text{ m})$

$a = 10.2 \text{ m}$

Ex. A bicycle wheel has a radius of 36 cm and is turning at 4.8m/s. Determine the ang velocity of this wheel?

$r = 36cm = 0.36m$

$a = 4.8m$ (after 1sec)

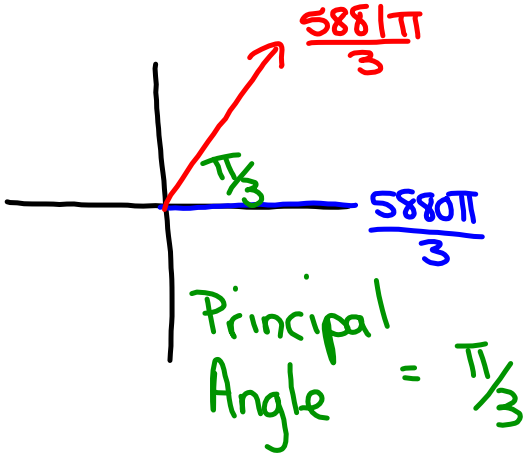
$\theta = \frac{a}{r} = \frac{4.8m}{0.36m} = 13.\overline{3} rads$

$V_a = \frac{\theta}{t} = \frac{13.\overline{3} rads}{1sec}$

Sketch the following and determine a negative angle co-terminal with:

(i) $\frac{5881\pi}{3}$ → $\frac{5880\pi}{3}$, $\frac{5881\pi}{3}$, $\frac{5882\pi}{3}$

1960π



$A_c = \frac{\pi}{3} - \frac{2\pi}{1}$

$= \frac{\pi}{3} - \frac{6\pi}{3}$

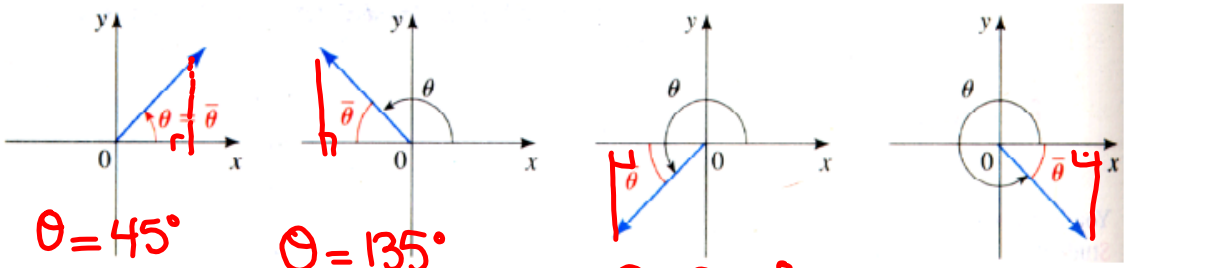
$= -\frac{5\pi}{3}$

Reference Triangles:

Definition 17 *The reference angle $\bar{\theta}$ of an angle θ in standard position is the acute angle (between 0 and 90°) the terminal side makes with the x-axis.*

0 and $\frac{\pi}{2}$

The picture below illustrates this concept.



$\theta = 45°$

$\bar{\theta} = 45° - 0°$

$\bar{\theta} = 45°$

$\theta = 135°$

$\bar{\theta} = 180° - 135°$

$\bar{\theta} = 45°$

$\theta = 232°$

$\bar{\theta} = 232° - 180°$

$\bar{\theta} = 52°$

$\theta = 320°$

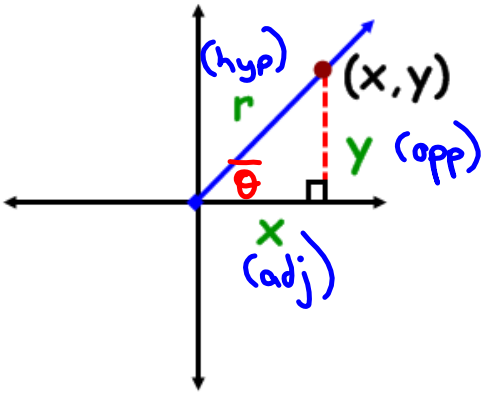
$\bar{\theta} = 360° - 320°$

$\bar{\theta} = 40°$

What is the significance of reference angles?

Angles on the Cartesian Plane

- **Reference Angle** - an acute angle formed between the terminal arm and the x-axis.
- **Reference Triangle** - a triangle formed by drawing a perpendicular line from a point on the terminal to the x-axis.



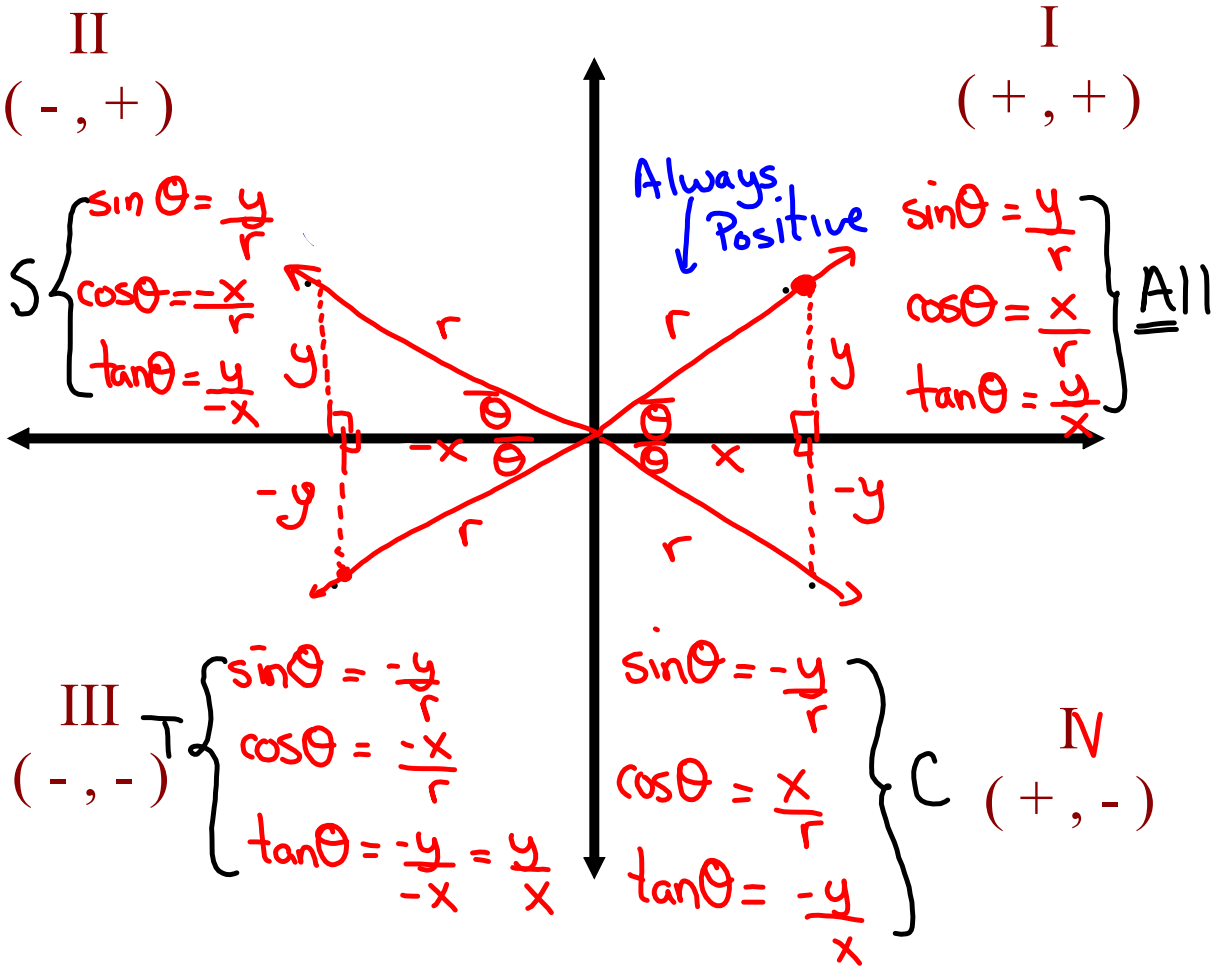
Notice what will happen if the rotation moves into other quadrants?

TRIG RATIOS on the CARTESIAN PLANE

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

TRIG RATIOS IN ALL 4 QUADRANTS

What primary trig ratios are POSITIVE in...



4CAST

Homework

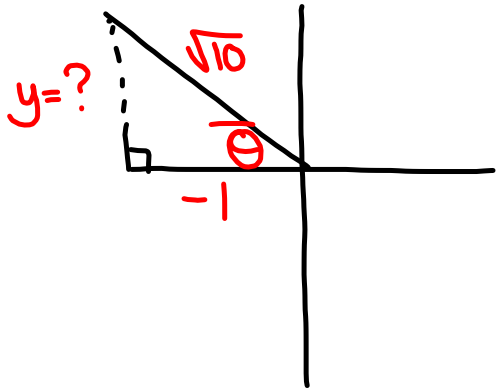
(sine is positive)

If $\sec\theta = -\frac{\sqrt{10}}{1}$ and $\sin\theta > 0$, determine the value of $\csc\theta$

$\sec\theta = \frac{r}{x}$

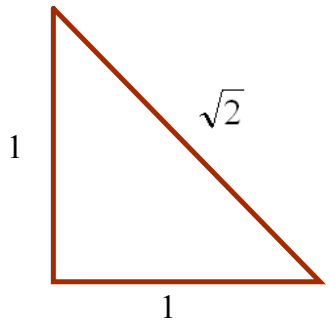
$r = \sqrt{10}$

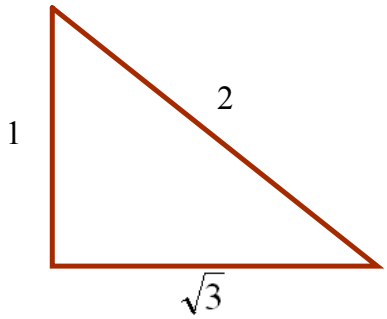
$x = -1$



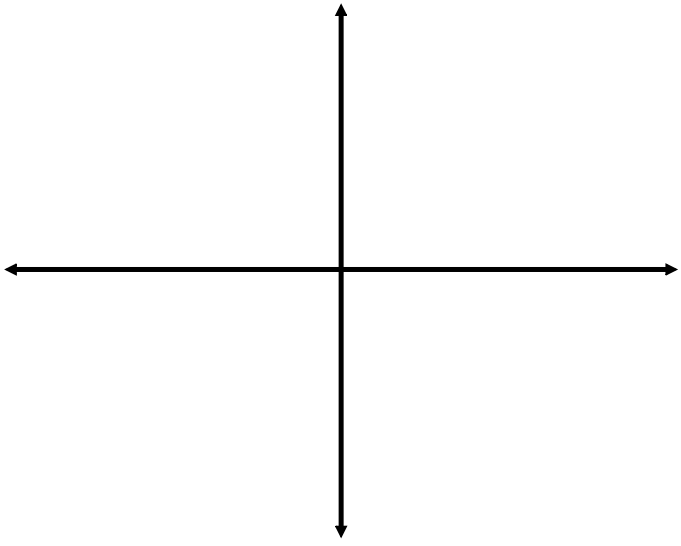
Determine the measure (in radians) of an angle whose terminal arm passes through the ordered pair $(-2\sqrt{3}, -4)$

Special Angles (in radians)

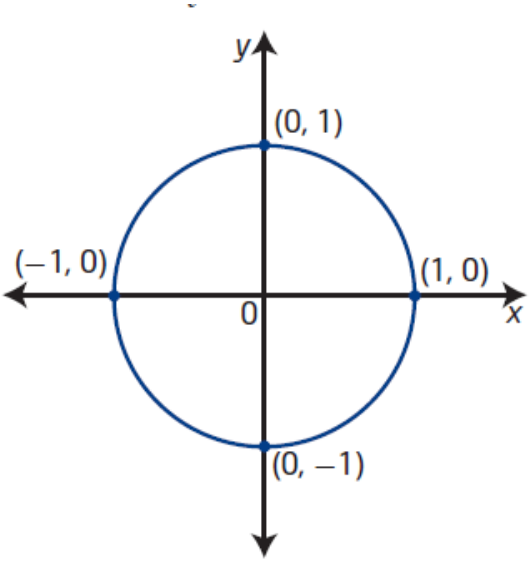




Quadrantal Angles

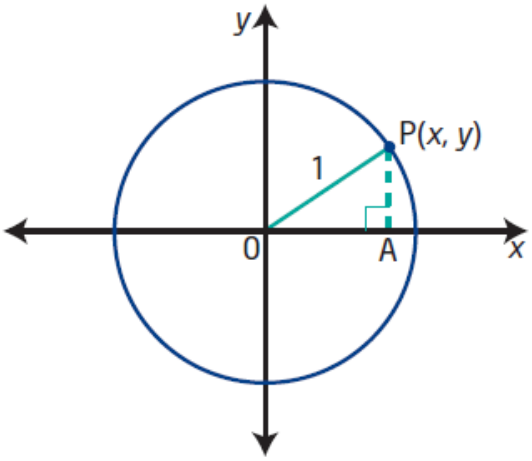


Unit Circle



unit circle

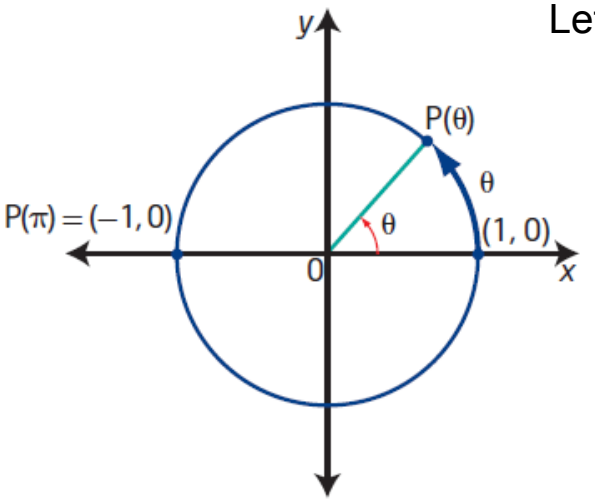
- a circle with radius 1 unit
- a circle of radius 1 unit with centre at the origin on the Cartesian plane is known as *the* unit circle



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

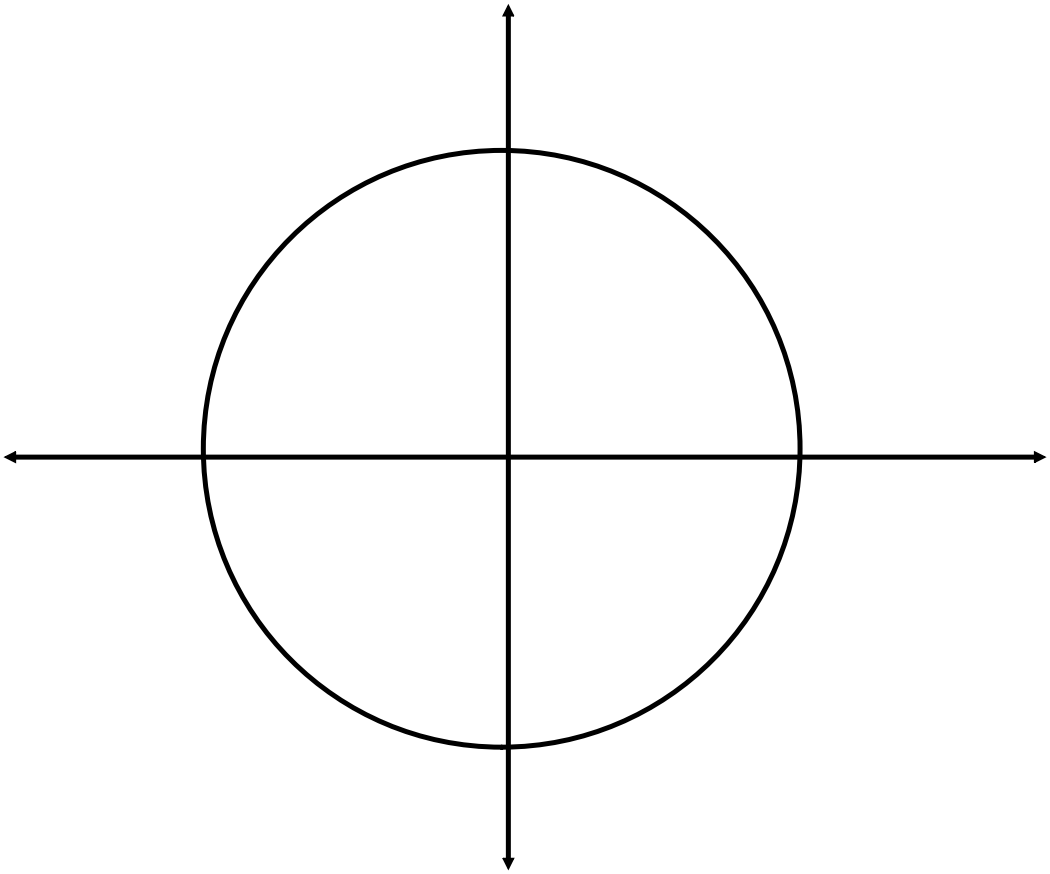
Determine the equation of a circle with centre at the origin and radius 6.

Special Angles on the Unit Circle:

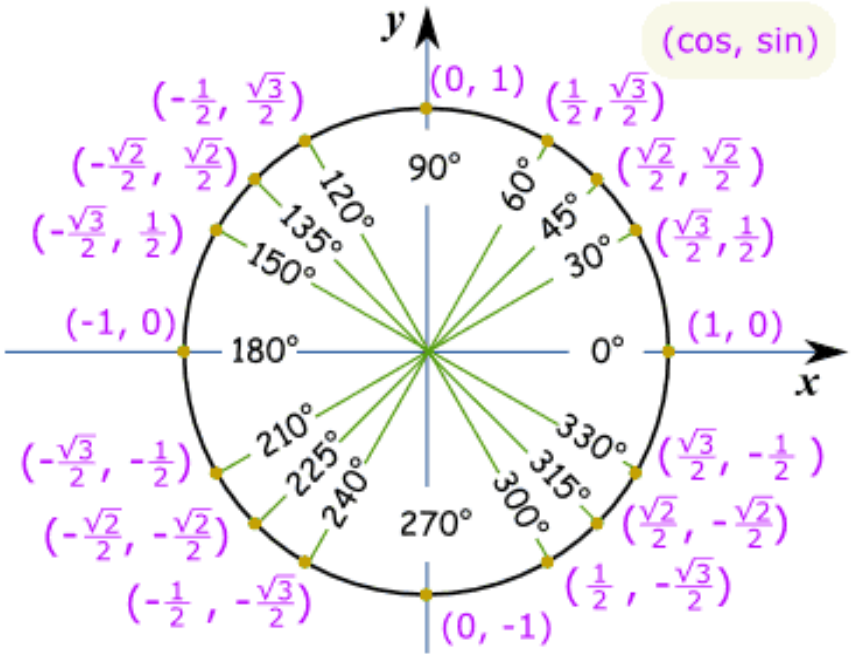


Let's use $\frac{\pi}{4}$ as our reference angle

Construct reference triangles for all multiples of $\pi/4$ between 0 and 2π

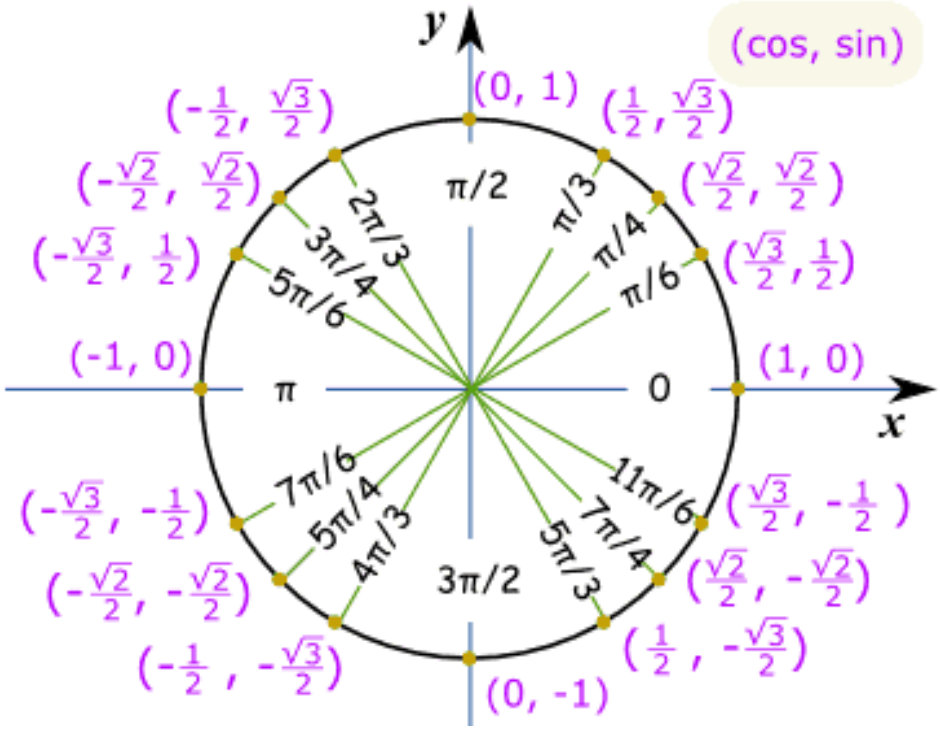


Unit Circle of Special Angles in Degrees



This is lovely...so what is it used for????

Unit Circle of Special Angles in Radians



Attachments

Worksheet - Sketching Angles in Radians.doc