$\theta = 3(2\pi) = 6\pi$ rads

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?

radius

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

b) (i) Find θ:

$\theta = 0.314 \frac{\text{rads}}{\text{sec}} \times 6.5 \text{ sec}$

$\theta = 2.041 \text{ rads}$

(ii) Find a:

$a = \theta r$

$a = (2.041)(5)$

$a = 10.25 \text{m}$

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

Given:

$r = 36cm = 0.36m$

arc length after 1sec:

$a = 4.8m$

(i) Find θ:

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

(ii) Find V_a:

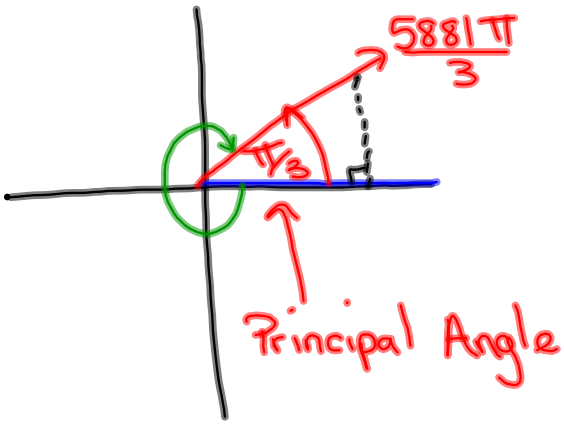
$V_a = \frac{\theta}{t} = \frac{13.3rads}{sec}$

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

$(i)\ \dfrac{5881\pi}{3}$

$\dfrac{5880\pi}{3}$, $\dfrac{5881\pi}{3}$, $\dfrac{5882\pi}{3}$

1960π



Negative co-terminal angle:

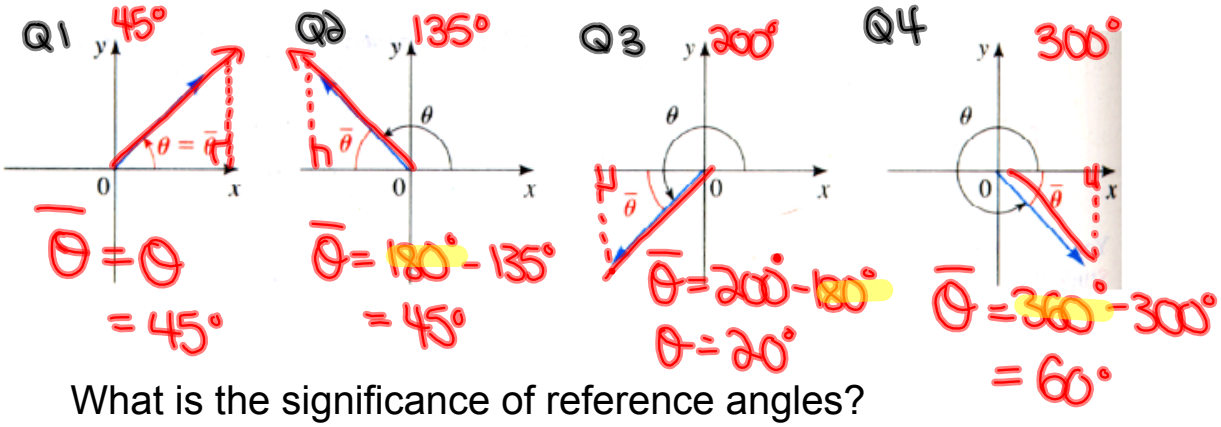
$\dfrac{\pi}{3} - \dfrac{2\pi}{1} = \dfrac{\pi}{3} - \dfrac{6\pi}{3} = \boxed{-\dfrac{5\pi}{3}}$

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

The picture below illustrates this concept.

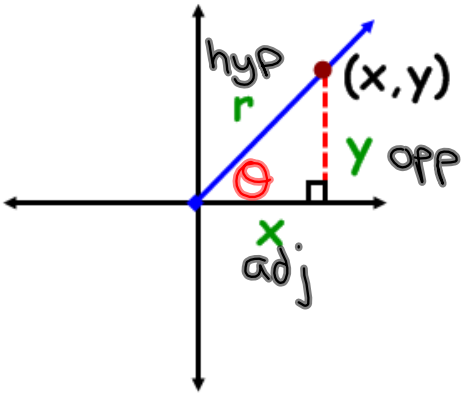


What is the significance of reference angles?

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

$$\sin\theta = \frac{y}{r} \qquad \csc\theta = \frac{r}{y}$$

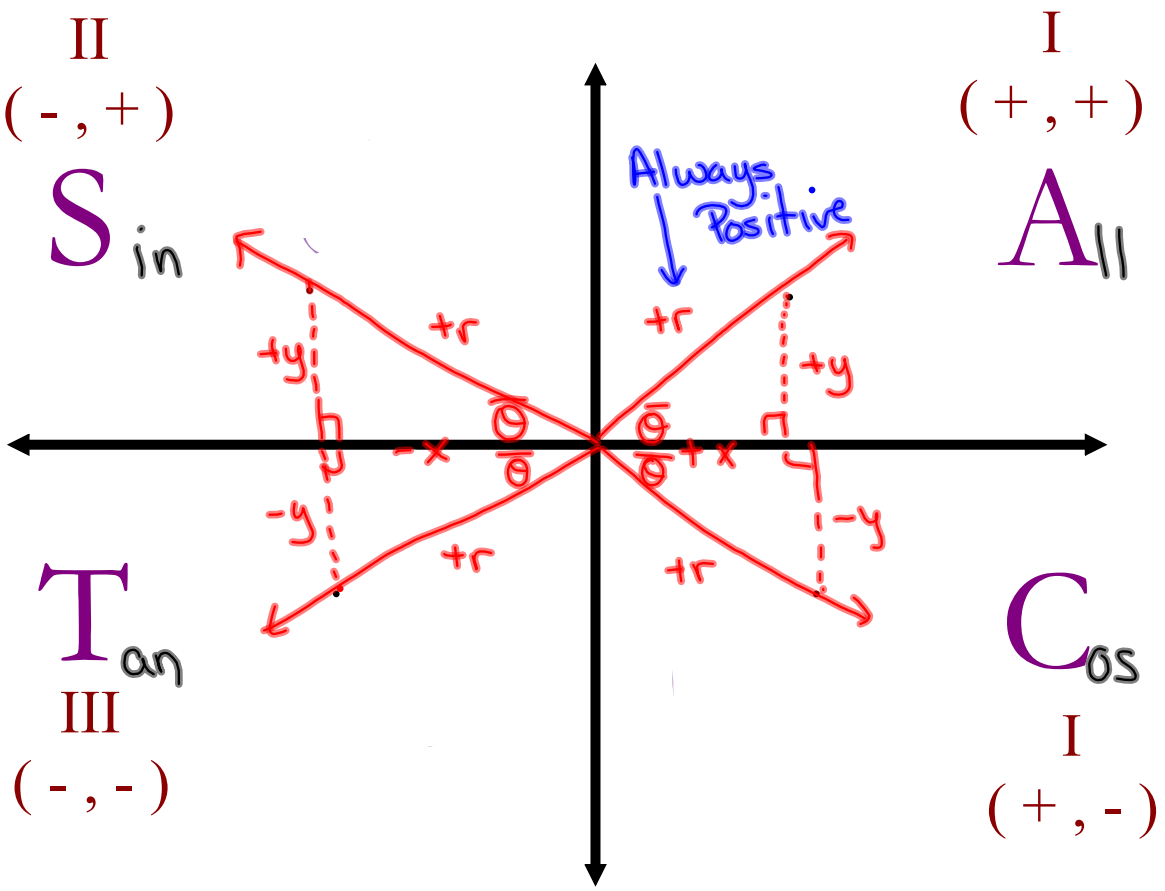
$$\cos\theta = \frac{x}{r} \qquad \sec\theta = \frac{r}{x}$$

$$\tan\theta = \frac{y}{x} \qquad \cot\theta = \frac{x}{y}$$

"Primary" "Reciprocal"

TRIG RATIOS IN ALL 4 QUADRANTS

What primary trig ratios are POSITIVE in...



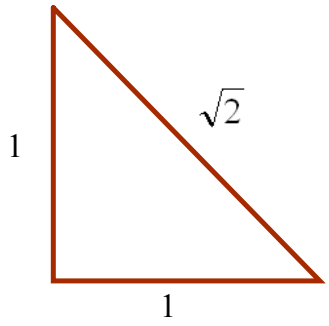
If $\sec\theta = -\sqrt{10}$ and $\sin\theta > 0$, determine the value of $\csc\theta$

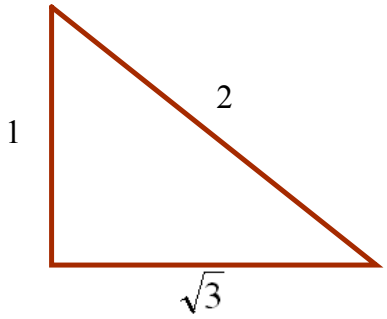
Example

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

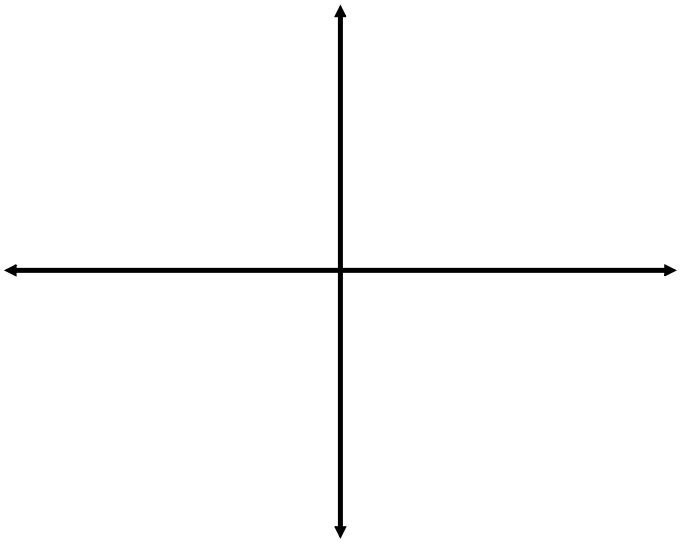
Homework

Special Angles (in radians)

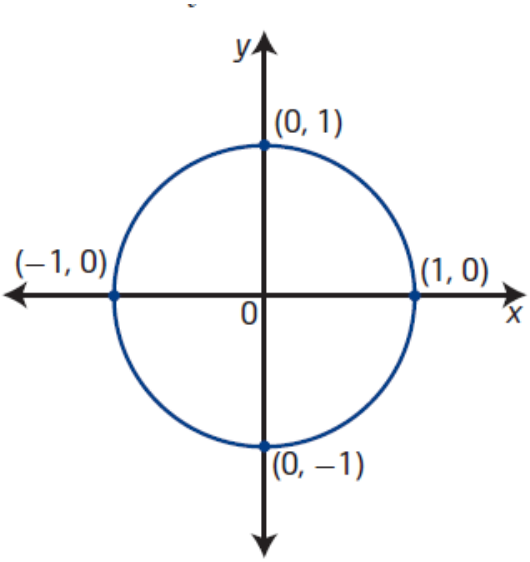




Quadrantal Angles

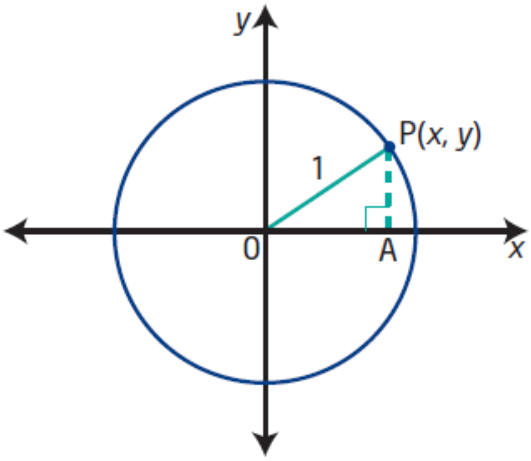


Unit Circle



unit circle

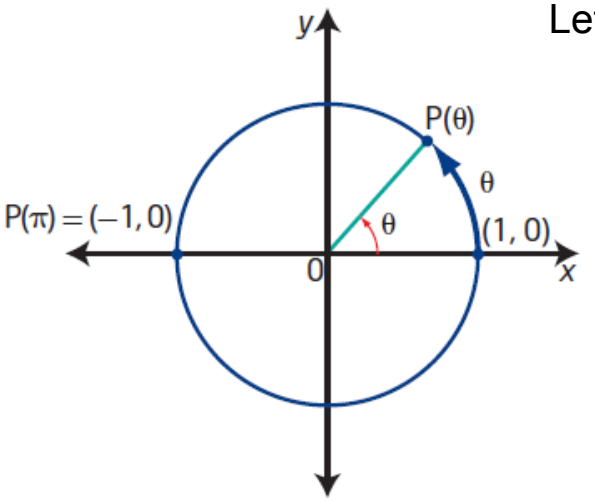
- a circle with radius 1 unit
- a circle of radius 1 unit with centre at the origin on the Cartesian plane is known as *the* unit circle



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

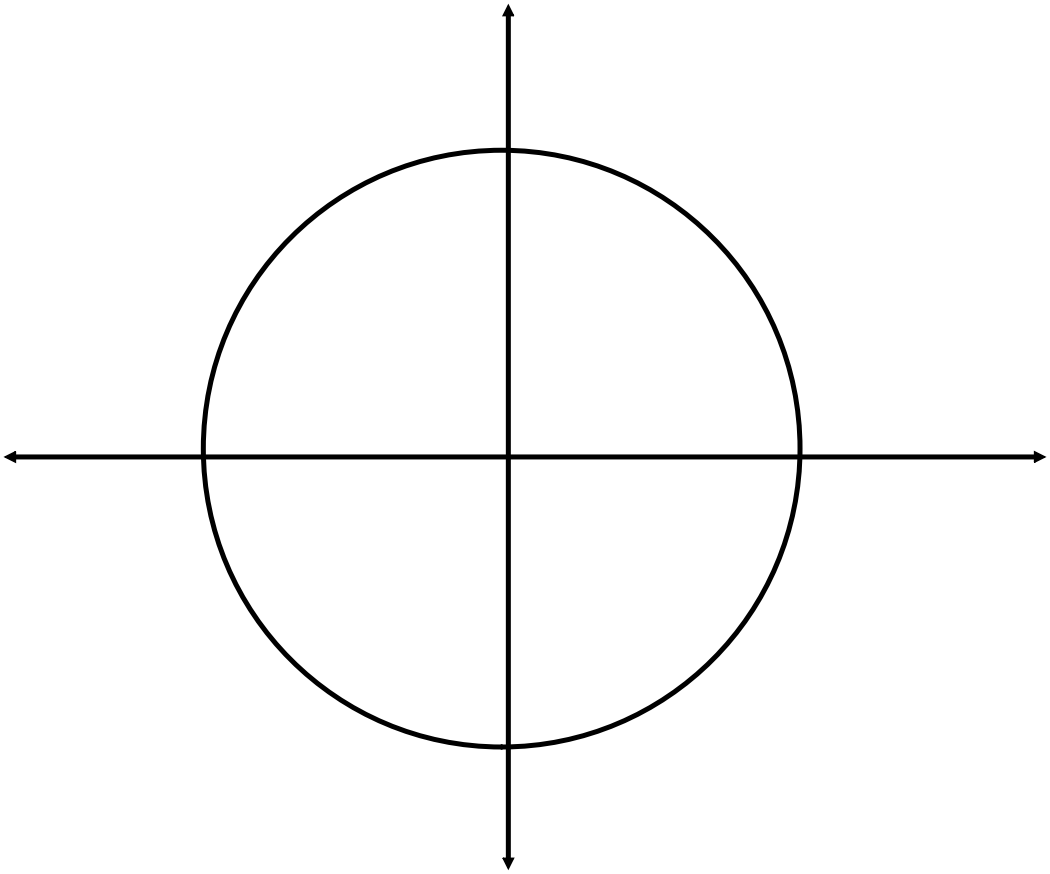
Determine the equation of a circle with centre at the origin and radius 6.

Special Angles on the Unit Circle:

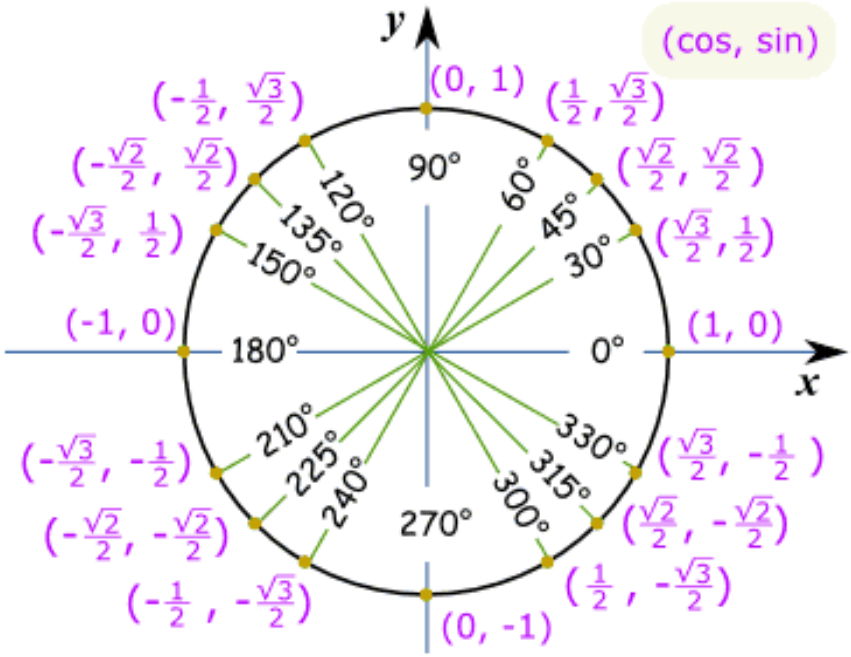


Let's use $\frac{\pi}{4}$ as our reference angle

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

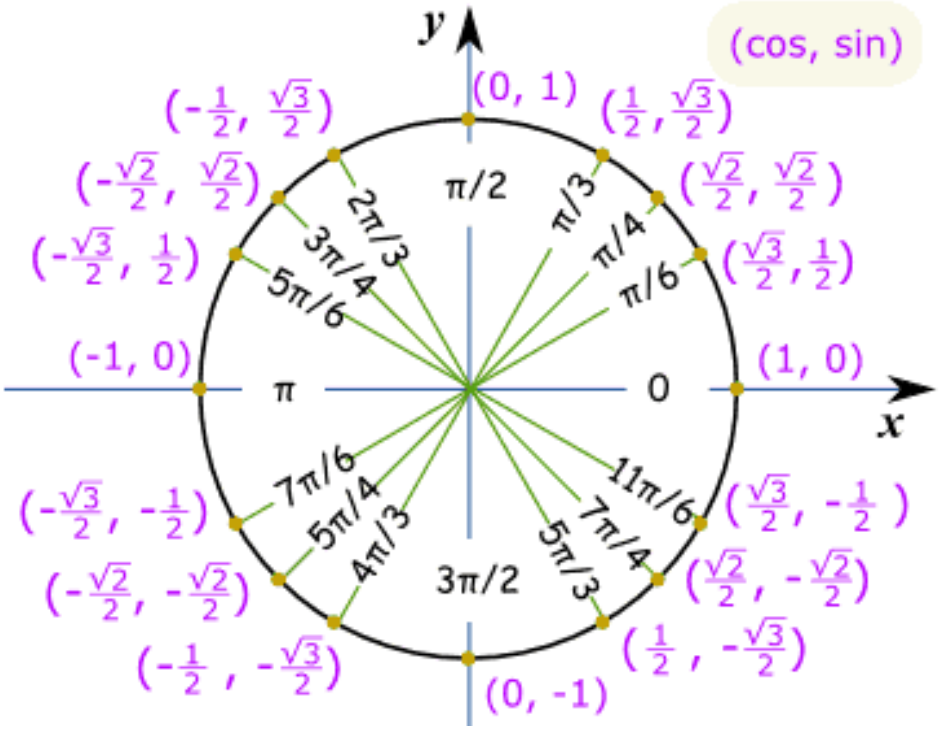


Unit Circle of Special Angles in Degrees



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

Unit Circle of Special Angles in Radians



Attachments

Worksheet - Sketching Angles in Radians.doc