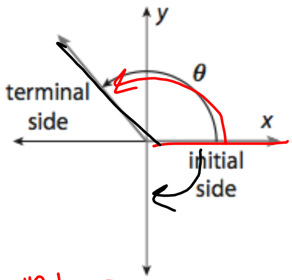
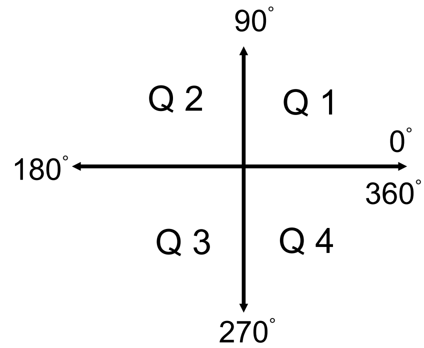
10-1 Radians and Unit Circle





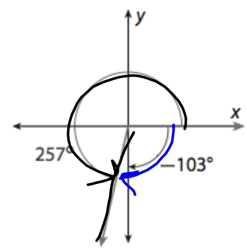
counter

Clockwise rotation: Positive degree

~~Counter~~ **Clockwise rotation**: Negative degree

Coterminal Angles: Angles that share the same terminal side

Ex. 257° and -103°



Definition of a radian

https://en.wikipedia.org/wiki/Radian#mediaviewer/File:Circle_radians.gif

CONVERTING DEGREES TO RADIANS	CONVERTING RADIANS TO DEGREES
Multiply the number of degrees by $\left(\frac{\pi \text{ radians}}{180^\circ}\right)$.	Multiply the number of radians by $\left(\frac{180^\circ}{\pi \text{ radians}}\right)$.

Convert each measure from degrees to radians or from radians to degrees.

$-495^\circ \cdot \frac{\pi}{180^\circ} = \frac{-495\pi}{180}$

$\boxed{\frac{-11\pi}{4}}$

$\frac{5\cancel{\pi}}{\cancel{4}} \cdot \frac{\overset{45}{\cancel{180}}}{\cancel{\pi}} = \boxed{225^\circ}$

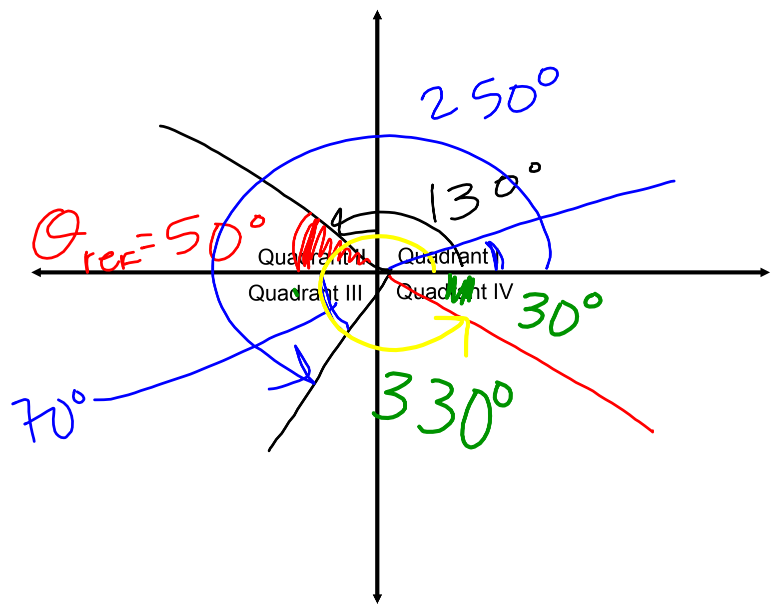
120°

$\boxed{\frac{2\pi}{3}}$

$-\frac{7\pi}{6}$

$\boxed{-210^\circ}$

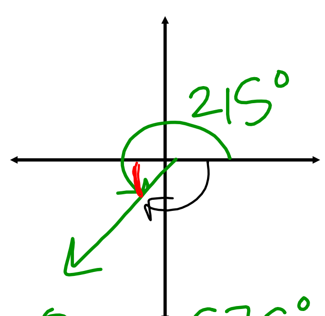
Reference Angles: The acute angle formed by the terminal side and the x-axis.

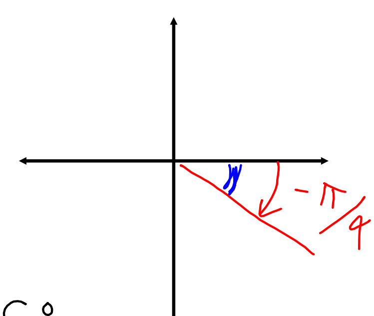


Draw the given angle. Find a coterminal angle and state the reference angle.

215°

$-\dfrac{\pi}{4}$





$\theta_{co} = 575°, -145°$

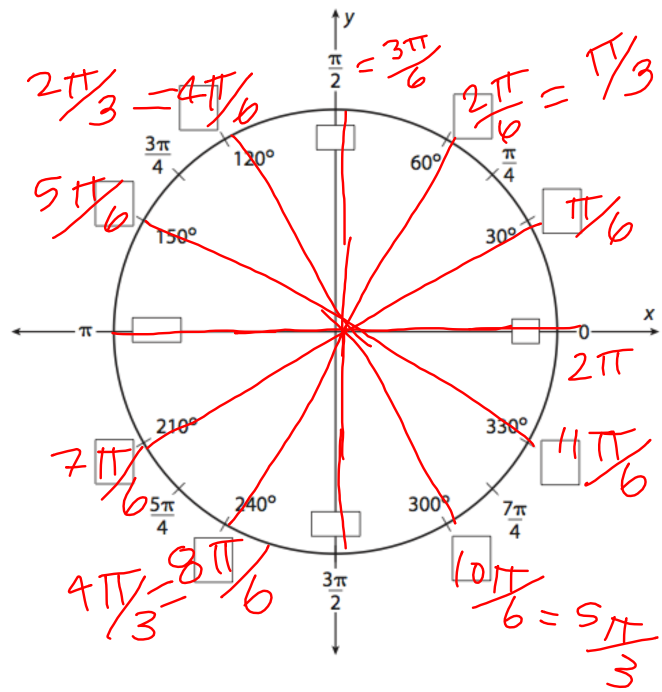
$\theta_{ref}: 35°$

$\theta_{co} =$

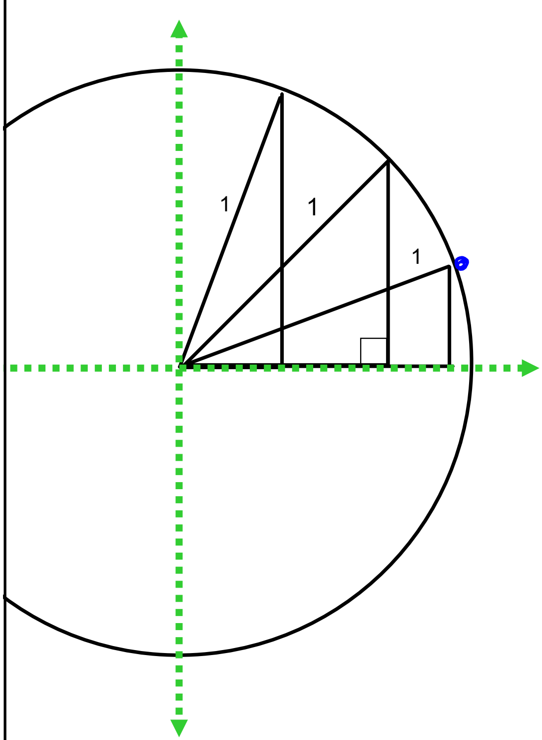
$-\frac{\pi}{4} + \frac{8\pi}{4} = \boxed{7\pi/4}$

$\theta_{ref} = \pi/4$

7. The unit circle below shows the measures of angles of rotation that are commonly used in trigonometry, with radian measures outside the circle and degree measures inside the circle. Provide the missing measures.



Special Triangles with a Hypotenuses of 1



The side opposite the:

$$30^0 = \frac{1}{2} Hypotenuse$$

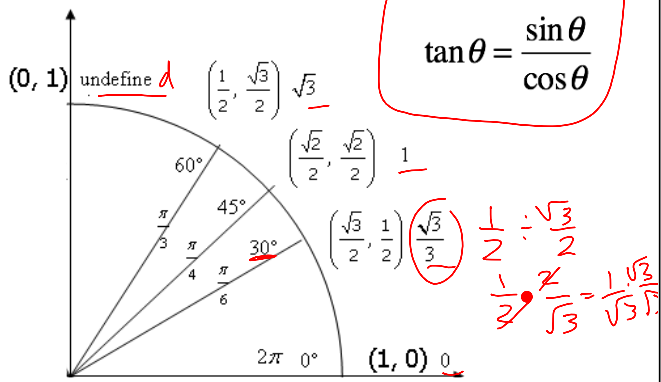
$$45^0 = \frac{1}{2} Hypotenuse\sqrt{2}$$

$$60^0 = \frac{1}{2} Hypotenuse\sqrt{3}$$

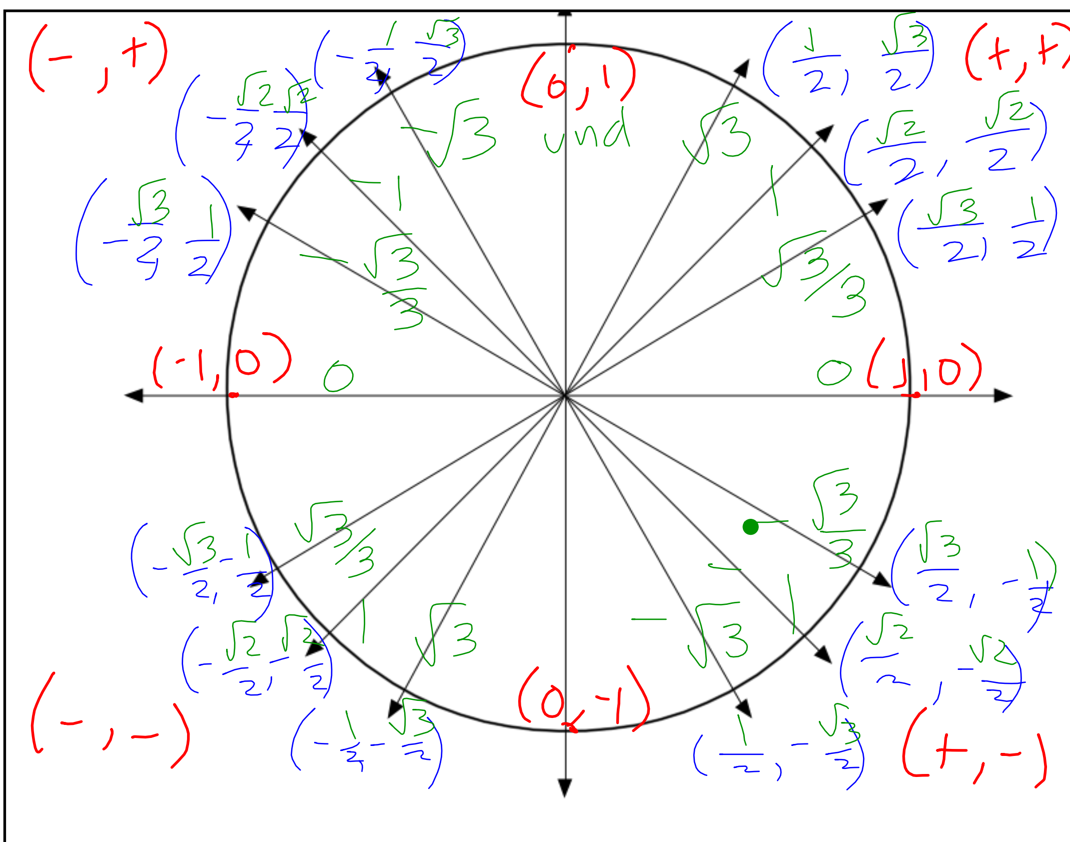
UNIT CIRCLE

$(\cos\theta, \sin\theta)$

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$



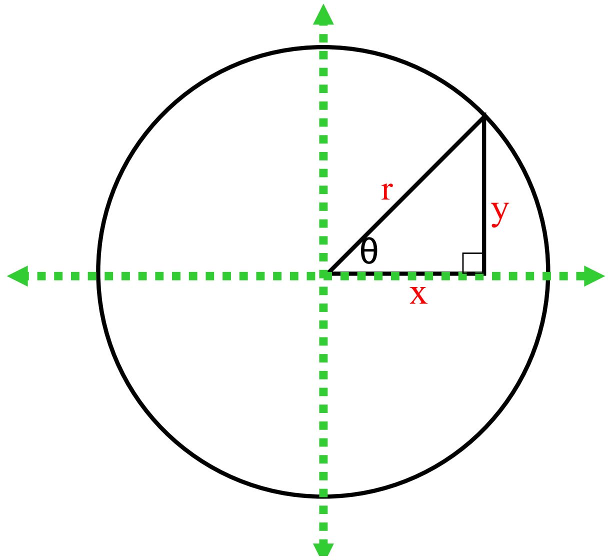
~~Create your own unit circle on a paper plate~~



$$\sin\theta = \frac{opp}{hyp} = \frac{y}{r}$$

$$\cos\theta = \frac{adj}{hyp} = \frac{x}{r}$$

$$\tan\theta = \frac{opp}{adj} = \frac{y}{x}$$



$$\sec\theta = \frac{hyp}{adj} = \frac{r}{x} \quad \csc\theta = \frac{hyp}{opp} = \frac{r}{y} \quad \cot\theta = \frac{adj}{opp} = \frac{x}{y}$$

Evaluate the following

$$\sin\pi = 0$$

$$\csc\frac{5\pi}{4} = -\frac{2}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}} = -\frac{\cancel{2}\sqrt{2}}{\cancel{2}} = \boxed{-\sqrt{2}}$$

$$\cos\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$$

$$\sec\frac{\pi}{6} = \frac{2}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{2\sqrt{3}}{3}}$$

$$\tan\frac{11\pi}{6} = -\frac{\sqrt{3}}{3}$$

$$\cot\frac{\pi}{3} = \frac{1}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{3}}{3}}$$

Evaluate the following

$\sin\frac{13\pi}{4}$

$\frac{13\pi}{4}-\frac{8\pi}{4}=\frac{5\pi}{4}$

$\sin\left(\frac{5\pi}{4}\right)=\boxed{-\frac{\sqrt{2}}{2}}$

$\csc\frac{19\pi}{6}$

$\tan\left(-\frac{\pi}{4}\right)$

$-\frac{\pi}{4}+\frac{8\pi}{4}=\frac{7\pi}{4}$

$\tan\left(\frac{7\pi}{4}\right)=\boxed{-1}$

$\sec\left(-\frac{3\pi}{2}\right)$

Find the angle or value

$0\le\theta\le 2\pi$

$\sin\theta=\frac{\sqrt{3}}{2}$

$\pi/3,\ 2\pi/3$

$60°,\ 120°$

$\csc\theta=-2$

$\sin\theta=-\frac{1}{2}$

$7\pi/6,\ 11\pi/6$

$\cos\theta=-\frac{1}{2}$

$2\pi/3,\ 4\pi/3$

$\sec\theta=\frac{2}{\sqrt{3}}$

$\cos\theta=\frac{\sqrt{3}}{2}$

$\theta=\pi/6,\ \frac{11\pi}{6}$

$\tan\theta=und$

$\pi/2,\ 3\pi/2$

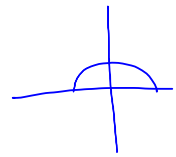
$\cot\theta=\frac{1}{\sqrt{3}}$

$\tan\theta=\sqrt{3}$

$\theta=\pi/3,\ 4\pi/3$

Find the angle that satisfies the following equations:

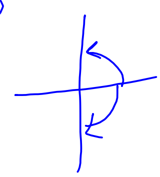
$$\cos\theta = -\frac{\sqrt{3}}{2};\ 0 \le \theta \le \pi$$



$\frac{5\pi}{6}$ or $150°$

$-90° \le \theta \le 90°$

$$\tan\theta = -\frac{\sqrt{3}}{3};\ -\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$$



$\frac{11\pi}{6}$ $\quad -\pi/6$

$330°$ $\quad -30°$

$$\sin\theta = -\frac{\sqrt{3}}{2};\ -\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$$