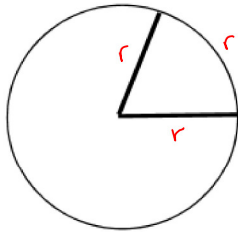


Lesson 8 Radian Measure

One **radian measure** is the measure of the angle formed by rotating the radius of a circle through an arc equal in length to the radius.



1 full revolution = $2\pi = 360^\circ$

$\frac{1}{2}$ revolution = $\pi = 180^\circ$

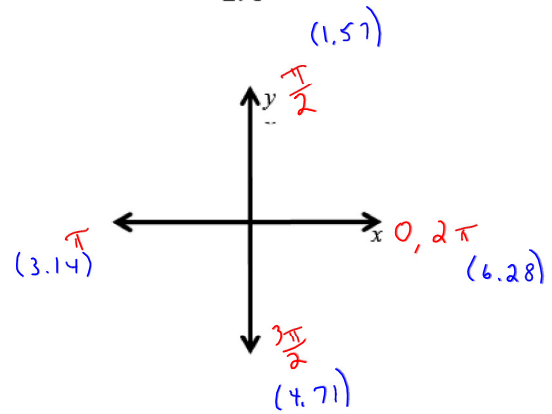
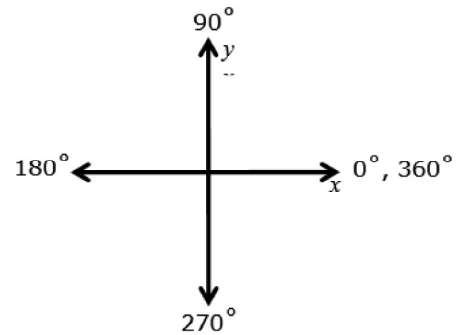
$\frac{1}{4}$ revolution = $\frac{\pi}{2} = 90^\circ$

$\frac{1}{6}$ revolution = $\frac{\pi}{3} = 60^\circ$

$\frac{1}{8}$ revolution = $\frac{\pi}{4} = 45^\circ$

$\frac{1}{12}$ revolution = $\frac{\pi}{6} = 30^\circ$

* Angle measures without units are considered to be in radians



Ex. 1) Convert $\frac{5\pi}{6}$ to degrees.

Multiply by $\frac{180^\circ}{\pi}$

$\frac{5\pi}{6} \cdot \frac{180^\circ}{\pi}$

150°

Radian Measure:	
1 radian = $\frac{180^\circ}{\pi}$	$1^\circ = \frac{\pi}{180}$ radians
π radians = 180°	$360^\circ = 2\pi$ radians

Ex. 2) Convert 72° to radians

Multiply by $\frac{\pi}{180^\circ}$

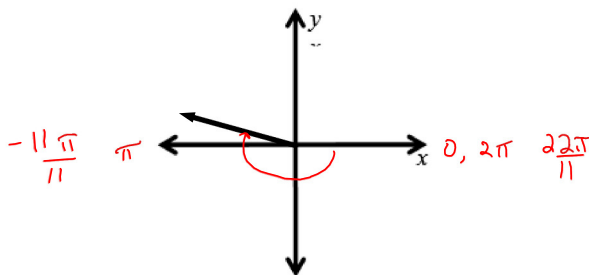
$$72 \left(\frac{\pi}{180} \right)$$

$$\frac{2\pi}{5}$$

$$\frac{2\pi}{5}$$

$$\approx 1.257$$

Ex. 3) Sketch $\theta = \frac{-12\pi}{11}$ in standard position. ← clockwise



Ex. 4) Given $\theta = 7.5$ radians, determine its measure to the nearest tenth of a degree.

$$7.5 \left(\frac{180}{\pi} \right)$$

$$429.7^\circ$$

Complementary Angles: two angles whose sum is 90° or $\frac{\pi}{2}$.

Ex. 5) Calculate the angle complementary to $\frac{\pi}{6}$.

$$\frac{\pi}{6} + x = \frac{\pi}{2}$$

$$x = \frac{\pi}{2} - \frac{\pi}{6}$$

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

$$= \frac{2\pi}{6}$$

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

Supplementary Angles: two angles with a sum of 180° or π .

Ex. 6) Calculate the angle supplementary to $\frac{\pi}{6}$.

$$\begin{aligned} \frac{\pi}{6} + x &= \pi \\ x &= \pi - \frac{\pi}{6} \\ &= \frac{6\pi}{6} - \frac{\pi}{6} \\ &= \frac{5\pi}{6} \end{aligned}$$

Coterminal angles: two angles which share the same terminal arm.

Note: To determine coterminal angles in radians, add/subtract multiples of 2π .
To determine coterminal angles in degrees, add/subtract multiples of 360° .

Ex. 7) State a positive and negative coterminal angle of /

a) $\frac{\pi}{3}$

$$\begin{aligned} \frac{\pi}{3} + 2\pi \\ \frac{\pi}{3} + \frac{6\pi}{3} \\ \frac{7\pi}{3} \end{aligned}$$

$$\begin{aligned} \frac{\pi}{3} - 2\pi \\ \frac{\pi}{3} - \frac{6\pi}{3} \\ -\frac{5\pi}{3} \end{aligned}$$

b) 110°

$$\begin{aligned} 110^\circ + 360^\circ \\ 470^\circ \end{aligned}$$

$$\begin{aligned} 110^\circ - 360^\circ \\ -250^\circ \end{aligned}$$

