

## 12-2B Radian Angle Measures

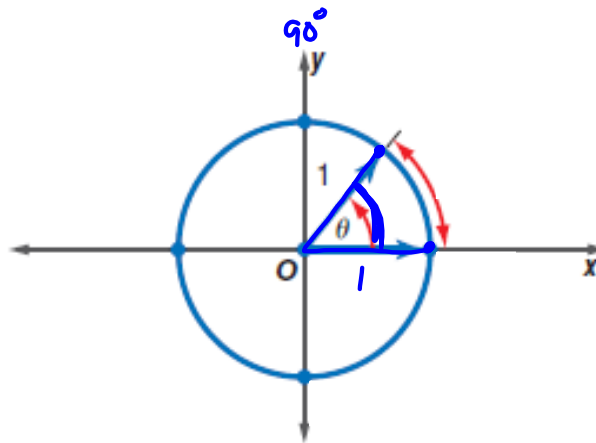
Unit Circle:

- 
- 

• 1 radian =

$$\text{Circumference} = 2\pi(1) = 2\pi$$

1



$$\text{Circumference} = 2\pi r$$

unit circle, radius = 1 unit and radian length = 1 unit

$$\frac{2\pi \text{ radians}}{2\pi} = \frac{360 \text{ degrees}}{2\pi}$$

$$1 \text{ radian} = \frac{180}{\pi} \text{ degrees}$$

$$1 \text{ radian} \approx 57.3^\circ$$

$$\frac{2\pi \text{ radians}}{360} = \frac{360 \text{ degrees}}{360}$$

$$\frac{\pi}{180} = 1 \text{ degree}$$

$$.017 \text{ radians} = 1 \text{ deg.}$$

### Key Concept

### Radian and Degree Measure

- To rewrite the radian measure of an angle in degrees, multiply the number of radians by  $\frac{180^\circ}{\pi \text{ radians}}$ .
- To rewrite the degree measure of an angle in radians, multiply the number of degrees by  $\frac{\pi \text{ radians}}{180^\circ}$ .

Examples  $\frac{60}{180} = \frac{1\pi}{3}$

Change the degree measures to radians.

1.  $\frac{60}{180} \cdot \frac{\pi \text{ radians}}{1}$     2.  $\frac{-160}{180} \cdot \frac{\pi}{1}$     3.  $\frac{415}{180} \cdot \frac{\pi}{1}$

$\frac{\pi \text{ radians}}{3}$      $-\frac{8\pi}{9}$      $\frac{83\pi}{36}$

Change the radian measures to degree measures.

4.  $\frac{\pi}{12} \cdot \frac{180}{\pi}$     5.  $\frac{9\pi}{5} \cdot \frac{180}{\pi}$     6.  $\frac{-3\pi}{2} \cdot \frac{180}{\pi}$

$15^\circ$      $324^\circ$      $-270^\circ$

Find one positive and one negative angle measure that is coterminal with each of the following angles.

$360^\circ \leftrightarrow 2\pi$

7.  $\frac{7\pi}{3}$      $\frac{6}{3}\pi$

$\frac{7}{3}\pi + 2\pi = \frac{13}{3}\pi$

$\frac{7}{3}\pi - 2\pi = -\frac{5}{3}\pi$

8.  $-\frac{\pi}{2} + 2\pi = \frac{3}{2}\pi$

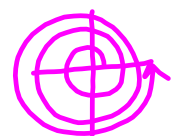
$-\frac{\pi}{2} - 2\pi = -\frac{5}{2}\pi$

9.  $6\pi$

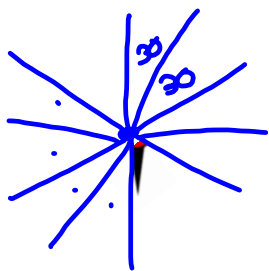
$6\pi - 2\pi = 4\pi$

$4\pi - 2\pi = 2\pi$

$2\pi - 4\pi = -2\pi$



10. Find both the degrees and radian measure of the angle through which the hour hand on a clock rotates from 6 PM to 10 PM.



$$\frac{360^\circ}{12} = 30^\circ$$

x 4

$$120^\circ$$

$$\frac{120^\circ}{1} \cdot \frac{\pi}{180^\circ} = \frac{2\pi}{3}$$

### Lesson Summary

How many degrees is 1 radian?

### Practice Problem

Find the radian measure equivalent to  $-200^\circ$ .