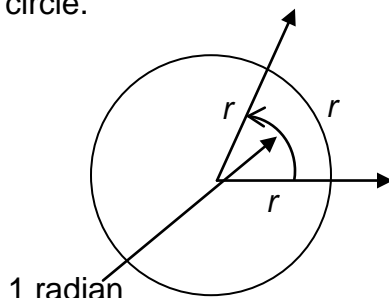


Radian Measures
Module 3, Unit 6, Lesson 3

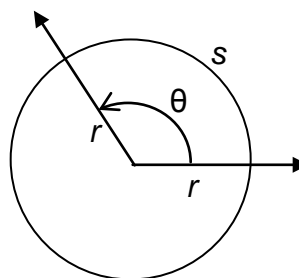
Radian

One radian is the measure of the central angle of a circle that intercepts an arc equal in length to the radius of the circle.

**Radian Measure**

The radian measure of any central angle, θ , is the length of the intercepted arc (s) divided by the circle's radius.

$$\theta = \frac{s}{r}$$

**Conversion between Degrees and Radians**

$$\theta = \frac{s}{r} = \frac{\text{circumference of circle}}{r} = \frac{2\pi r}{r} = 2\pi$$

Therefore, $360^\circ = 2\pi$.

Using the basic relationship π radians = 180° ,

1. To convert degrees to radians, multiply degrees by $\frac{\pi}{180^\circ}$
2. To convert radians to degrees, multiply radians by $\frac{180^\circ}{\pi}$

Example 1: Convert each angle in degrees to radians:

a. 30°

b. 90°

c. -135°

d. 210°

e. 315°

f. -240°

Example 2: Convert each angle in radians to degrees:

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

b. $-\frac{5\pi}{4}$

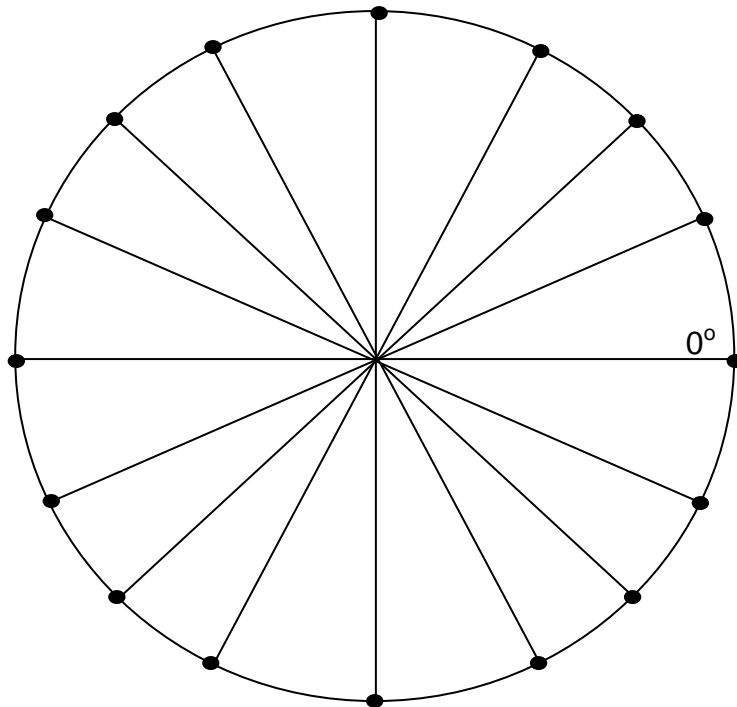
c. 1 radian

d. $\frac{5\pi}{6}$

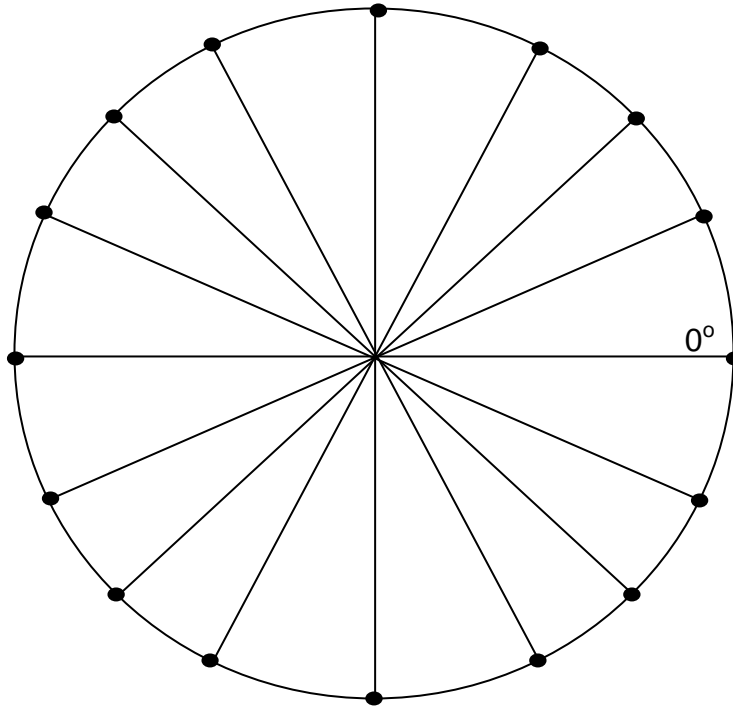
e. $\frac{3\pi}{2}$

f. $\frac{4\pi}{3}$

Positive Angles

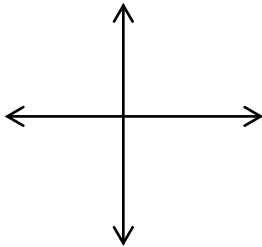


Negative Angles

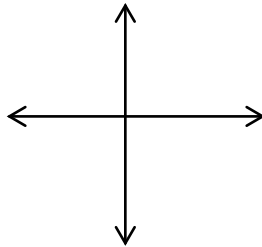


Example 3: Draw and label each angle in standard position.

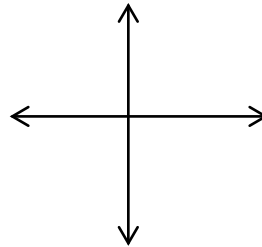
a. $\frac{5\pi}{3}$



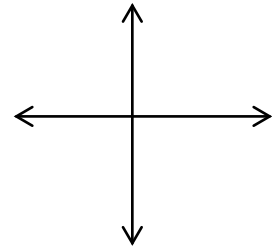
b. $-\frac{3\pi}{4}$



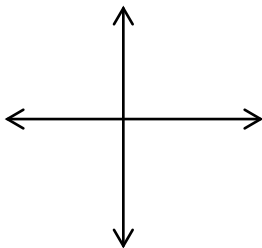
c. $\frac{7\pi}{6}$



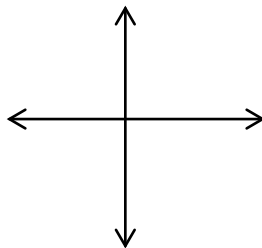
d. $-\frac{2\pi}{3}$



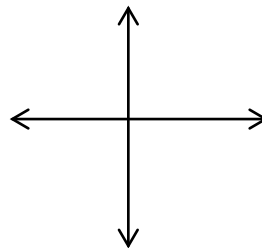
e. $\frac{11\pi}{6}$



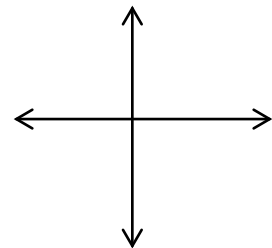
f. $\frac{3\pi}{2}$



g. $\frac{7\pi}{4}$



h. $-\frac{\pi}{2}$



Coterminal Angles

When the measure of an angle in standard position is increased or decreased by multiples of 2π results in **coterminal angles**. This means that an angle θ (radian) is coterminal with angles $\theta \pm 2\pi k$; where k is an integer.

Example 4: Find a positive angle less than 2π that is coterminal with the given angles:

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

b. $-\frac{3\pi}{4}$

c. $\frac{22\pi}{3}$

d. $-\frac{17\pi}{6}$

Example 5: Find the reference angle, θ' , for each of the following. Sketch the angle and the reference angle.

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

b. $\frac{5\pi}{4}$

c. $-\frac{\pi}{3}$

d. $\frac{13\pi}{3}$

