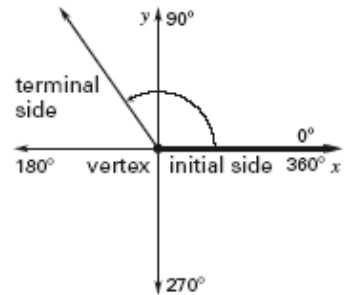


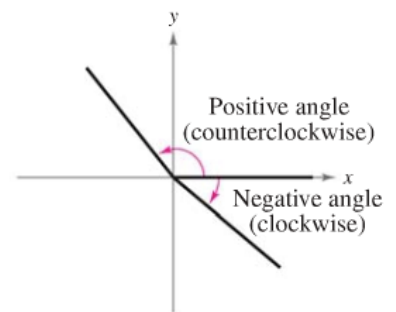
4.1 Notes: Radian and Degree Measure-Day 1 (Radians & Reference Angles)

TRIGONOMETRY is the study of angles & triangles. We begin this unit with the basics of angles.

An _____ is determined by rotating a ray about its endpoint. The starting position of the ray is the _____ of the angle, and the position after rotation is the _____. The endpoint of the ray is called the _____ of the angle. When the vertex of the angle is fixed at the origin of the coordinate plane with the initial side sitting on the _____ x-axis, the angle is said to be in _____.



_____ are generated by **counterclockwise** rotation and negative angles are generated by _____. Angles that have the same initial and terminal sides are called _____. If the terminal side of an angle falls on the x-axis or the y-axis, then that angle is called a _____.

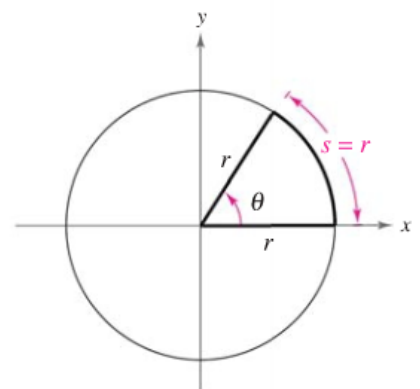
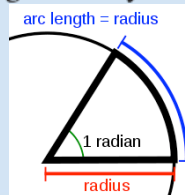


Definition of Radian

One **radian** (rad) is the measure of a central angle θ that intercepts an arc s equal in length to the radius r of the circle. See Figure 4.5. Algebraically this means that

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

where θ is measured in radians.



Arc length = radius when $\theta = 1$ radian.

In other words... Radians are a way to measure angles in terms of the length of the radius. An angle of 1 radian results in an arc with a length equal to the radius of the circle.

The circumference of a circle is found using the formula: _____

If $r = 1$ then the circumference is: _____

1 revolution = _____ radians = _____ °

$\frac{1}{2}$ revolution = _____ radians = _____ °

$\frac{1}{4}$ revolution = _____ radians = _____ °

$\frac{1}{6}$ revolution = _____ radians = _____ °

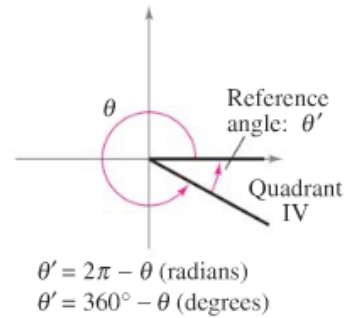
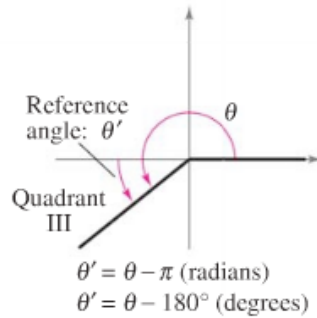
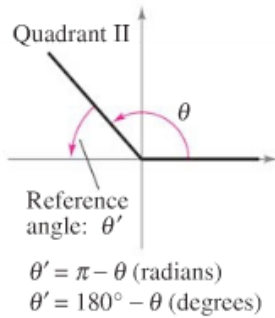
$\frac{1}{8}$ revolution = _____ radians = _____ °

$\frac{1}{12}$ revolution = _____ radians = _____ °

Reference Angles

The values of the trigonometric functions of angles greater than 90° (or less than 0°) can be determined from their values at the corresponding acute angles called **reference angles**.

Let θ be an angle in _____. Its **reference angle** is the _____
 _____ θ' formed by the _____ of θ and the _____.

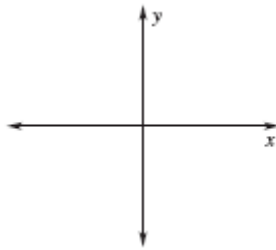


EXAMPLE 1 - Draw angles in standard position and finding reference angles

Draw each angle in standard position. Then determine the reference angle (if it's not quadrantal).

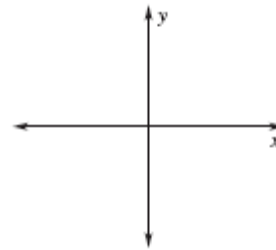
a. 405°

Because 405° is _____ more than 360° , the terminal side makes one whole revolution _____, plus _____ more.

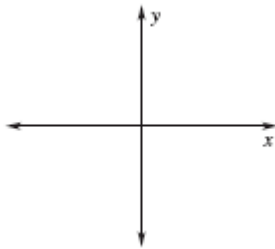


b. -65°

Because -65° is negative, the terminal side is _____ from the positive x-axis.

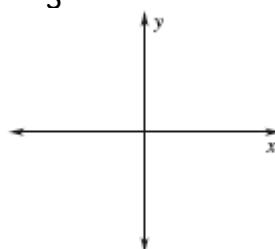


c. 150°



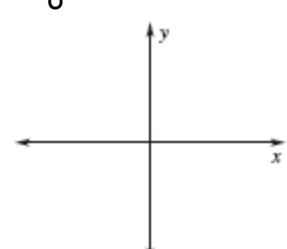
Reference Angle: _____

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



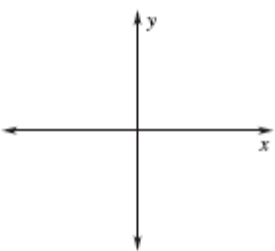
Reference Angle: _____

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



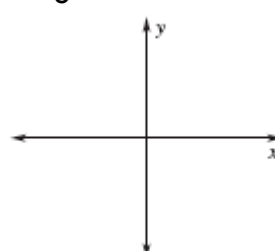
Reference Angle: _____

f. 3π



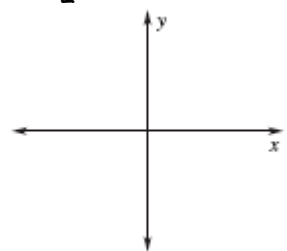
Reference Angle: _____

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



Reference Angle: _____

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



Reference Angle: _____