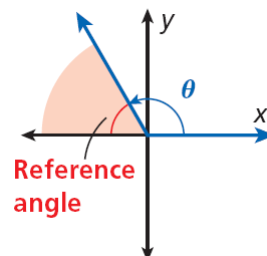
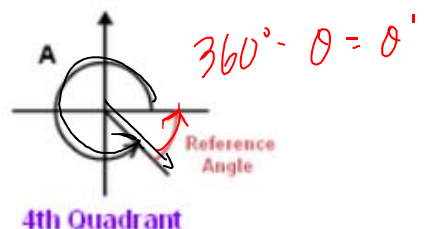
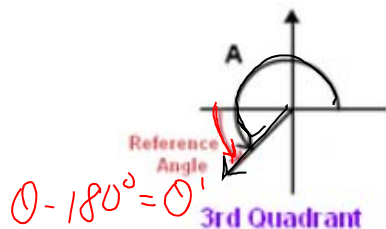
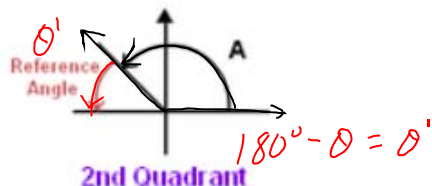
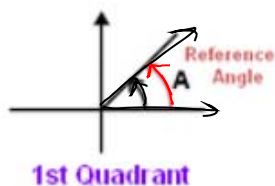


## 10-2 Angles of Rotation

For an angle  $\theta$  in standard position, the **reference angle** is the positive acute angle formed by the terminal side of  $\theta$  and the  $x$ -axis. We will learn how to use reference angles to find trigonometric values of angles measuring greater than  $90^\circ$  or less than  $0^\circ$ .



## 10-2 Angles of Rotation



## 10-2 Angles of Rotation

### Example 3: Finding Reference Angles

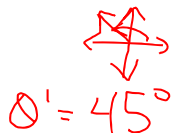
Find the measure of the reference angle for each given angle.

A.  $\theta = 135^\circ$

B.  $\theta = -105^\circ$

C.  $\theta = 325^\circ$

$\theta' = 45^\circ$

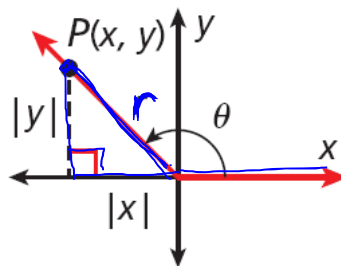


$75^\circ$

$35^\circ$

## 10-2 Angles of Rotation

To determine the value of the trigonometric functions for an angle  $\theta$  in standard position, begin by selecting a point  $P$  with coordinates  $(x, y)$  on the terminal side of the angle. The distance  $r$  from point  $P$  to the origin is given by  $\sqrt{x^2 + y^2}$ .



## 10-2 Angles of Rotation



### Trigonometric Functions

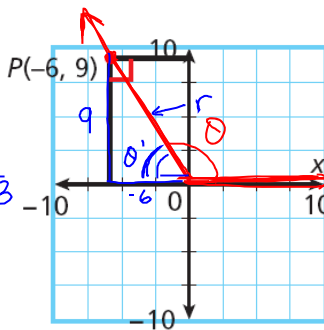
For a point  $P(x, y)$  on the terminal side of  $\theta$  in standard position and  $r = \sqrt{x^2 + y^2}$ ,

SINE	COSINE	TANGENT
$\sin \theta = \frac{y}{r}$	$\cos \theta = \frac{x}{r}$	$\tan \theta = \frac{y}{x}, x \neq 0$

## 10-2 Angles of Rotation

### Example 4: Finding Values of Trigonometric Functions

$P(-6, 9)$  is a point on the terminal side of  $\theta$  in standard position. Find the exact value of the six trigonometric functions for  $\theta$ .



$$r = \sqrt{17} = 3\sqrt{13}$$

$$\begin{aligned} \sin \theta &= \frac{y}{r} = \frac{9}{3\sqrt{13}} = \frac{3}{\sqrt{13}} & \csc \theta &= \frac{\sqrt{13}}{3} \\ \cos \theta &= \frac{x}{r} = \frac{-6}{3\sqrt{13}} = -\frac{2}{\sqrt{13}} & \sec \theta &= -\frac{\sqrt{13}}{2} \\ \tan \theta &= \frac{y}{x} = \frac{9}{-6} = -\frac{3}{2} & \cot \theta &= -\frac{2}{3} \end{aligned}$$

## 10-2 Angles of Rotation

### Helpful Hint

Because  $r$  is a distance, its value is always positive, regardless of the sign of  $x$  and  $y$ .

## 10-2 Angles of Rotation

### Check It Out! Example 4

**$P(-3, 6)$  is a point on the terminal side of  $\theta$  in standard position. Find the exact value of the six trigonometric functions for  $\theta$ .**