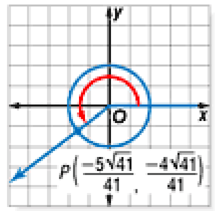
Lesson 13–6

Example 1 Find Sine and Cosine Given Point on the Unit Circle

$P\left(-\frac{5\sqrt{41}}{41}, -\frac{4\sqrt{41}}{41}\right)$ is located on the unit circle. Find sin θ and cos θ.



$P\left(-\frac{5\sqrt{41}}{41}, -\frac{4\sqrt{41}}{41}\right) = P(\cos\theta, \sin\theta)$,

so $\sin\theta = -\frac{4\sqrt{41}}{41}$ and $\cos\theta = -\frac{5\sqrt{41}}{41}$.

Example 2 Find the Value of a Trigonometric Function

Find the exact value of each function.

a. sin (–390°)

sin (–390°) = sin [360° + (–390°)]

= sin (–30°)

= sin (–30° + 360°)

= sin 330°

$= -\frac{1}{2}$

b. $\cos\left(\frac{15\pi}{4}\right)$

$\cos\left(\frac{15\pi}{4}\right) = \cos\left(\frac{15\pi}{4} - 2\pi\right)$

$= \cos\frac{7\pi}{4}$

$= \frac{\sqrt{2}}{2}$

Example 3 **Find the Value of a Trigonometric Function**

MANUFACTURING A particular gear used on an assembly line is perpendicular to a horizontal surface and rotates counterclockwise. A knob is positioned on the gear such that its height varies periodically as a function of time. Consider the height of the center of the gear to be the starting point for the knob. This gear has a diameter of 18 inches and rotates at a rate of 6 revolutions per minute.

a. Identify the period of this function.

Since the gear makes 6 complete counterclockwise rotations every minute, the period is the time it takes to complete one rotation, which is $\frac{1}{6}$ of a minute or 10 seconds.

b. Make a graph in which the horizontal axis represents the time *t* in seconds and the vertical axis represents the height *h* in inches in relation to the starting point.

Since the diameter of the gear is 18 inches, the gear reaches a maximum of $\frac{18}{2}$ of 9 inches above the starting point and a minimum of 9 inches below the starting point.