

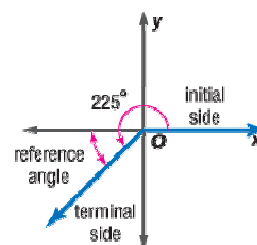
Lesson 14-3

Example 1

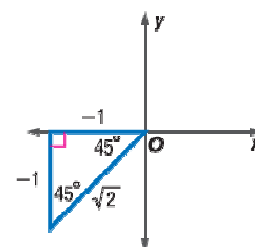
Find $\sin 225^\circ$.

Solution

Sketch the angle on a coordinate plane. Use the positive x -axis as the initial side and the ray resulting from a 225° counterclockwise rotation of the positive x -axis as the terminal side. The reference angle is the acute angle formed by the x -axis and the terminal side.



The reference angle measures $225^\circ - 180^\circ = 45^\circ$. Complete a triangle with the terminal side as hypotenuse by drawing a perpendicular to the x -axis. The triangle is a 45° - 45° - 90° right triangle. In this example, the leg lengths are negative because the legs were drawn by moving negative directions from x - and y -axes. The length of the terminal side is always considered to be positive.



To find $\sin 225^\circ$, find the sine of the reference angle.

$$\sin 225^\circ = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{-1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$$

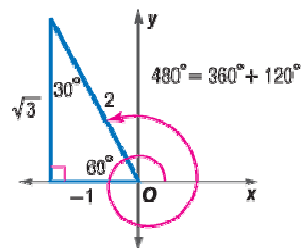
Example 2

Find $\sin 480^\circ$.

Solution

To form an angle of 480° , the initial side must complete a 360° rotation, then continue an additional 120° . The reference angle is $180^\circ - 120^\circ = 60^\circ$. The triangle formed is a 30° - 60° - 90° right triangle. The leg adjacent to the 60° angle measures -1 relative to the x -axis. The leg opposite measures $\sqrt{3}$ relative to the y -axis. The terminal side is always positive.

$$\sin 480^\circ = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{\sqrt{3}}{2}$$



Example 3

COMMUNICATIONS A researcher is developing a new technology to assist airplanes to send urgent communications. Planes will use various tones and patterns to send messages. The electrical impulses produced by the tones are modeled by sine curves. Graph the sine curve $y = \sin x$ for $-360^\circ \leq x \leq 0^\circ$.

Solution

Use your calculator to make a table of ordered pairs.

x	$\sin x$	x	$\sin x$
-360	0	-150	-0.50
-330	0.50	-135	-0.71
-315	0.71	-120	-0.87
-300	0.87	-90	-1.0
-270	1.0	-60	-0.87
-240	0.87	-45	-0.71
-225	0.71	-30	-0.5
-210	0.5	0	0
-180	0		

Graph the points using $\sin x$ as the y -coordinate. Draw a smooth curve through the points.

