

Lesson 13-2

Angles and the Unit Circle

Lesson Objectives

- 1 Working with angles in standard position
- 2 Finding coordinates of points on the unit circle

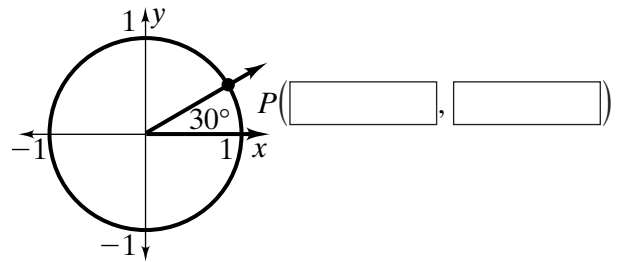
Local Standards: _____

Vocabulary and Key Concepts

Cosine and Sine of an Angle

Suppose an angle in standard position has measure θ .

The cosine of θ ($\cos \theta$) is the -coordinate of the point at which the terminal side of the angle intersects the unit circle. The sine of θ ($\sin \theta$) is the -coordinate.



An angle is in standard position when _____

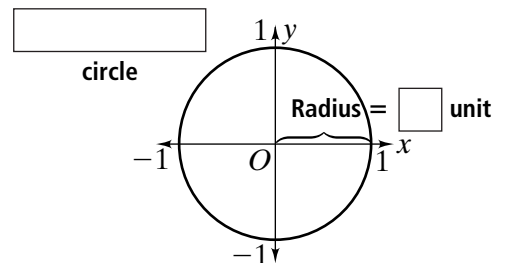
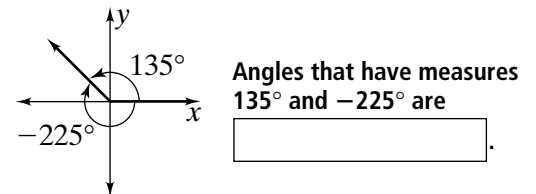
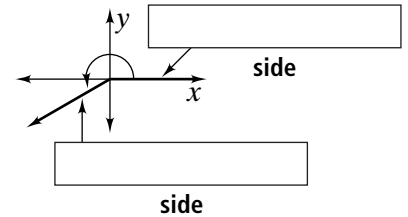
The initial side of the angle is _____

The terminal side of the angle is _____

Two angles in standard position are coterminal angles if _____

The unit circle is a circle that _____

Position



Examples

1 History The Aztec calendar stone has 20 divisions for the 20 days in each month of the Aztec year. An angle on the Aztec calendar shows the passage of 16 days. Find the measures of the two coterminal angles that coincide with the angle.

The terminal side of the angle is of a full rotation from the initial side.

$$\boxed{} \cdot \boxed{}^\circ = \boxed{}^\circ$$

To find a coterminal angle, subtract one full rotation.

$$\boxed{}^\circ - \boxed{}^\circ = \boxed{}^\circ$$

Two coterminal angle measures for an angle on the Aztec calendar that shows the passage of 16 days are [°] and [°].

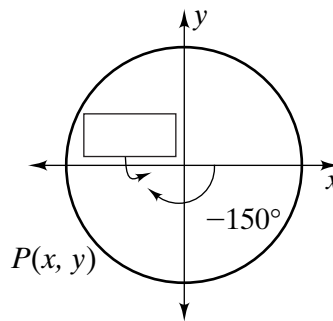
2 Finding Exact Values of Cosine and Sine Find the exact values of $\cos(-150^\circ)$ and $\sin(-150^\circ)$.

Step 1 Sketch an angle of -150° in standard position.

Sketch a unit circle.

$$x\text{-coordinate} = \cos(-150^\circ)$$

$$y\text{-coordinate} = \sin(-150^\circ)$$



Step 2 Sketch a right triangle. Place the hypotenuse on the terminal side of the angle. Place one leg on the x -axis. (The other leg will be parallel to the y -axis.)

The triangle contains angles of [°], [°], and [°].

Step 3 Find the length of each side of the triangle.

$$\text{hypotenuse} = \boxed{}$$

The hypotenuse is a of the unit circle.

$$\text{shorter leg} = \frac{\boxed{}}{\boxed{}}$$

The shorter leg is the hypotenuse.

$$\text{longer leg} = \frac{\boxed{}}{\boxed{}} \boxed{} = \frac{\boxed{}}{\boxed{}}$$

The longer leg is times the shorter leg.

Since the point lies in Quadrant , both coordinates are

. The leg lies

along the x -axis, so $\cos(-150^\circ) = \boxed{}$, and $\sin(-150^\circ) = \boxed{}$.

Quick Check

1. a. Find an angle coterminal with 198° by adding one full rotation.

b. **Reasoning** Are angles with measures of 40° and 680° coterminal? Explain.

c. **Make a Conjecture** Generalize how the measures of two coterminal angles are related.

2. a. Find the decimal values of $-\frac{1}{2}$ and $-\frac{\sqrt{3}}{2}$. Then use a calculator to find $\cos(-120^\circ)$ and $\sin(-120^\circ)$. How do these values compare to each other? How do they compare to the exact values found in Example 2?

b. Find the exact values of $\cos 135^\circ$ and $\sin 135^\circ$. Use properties of a 45° - 45° - 90° triangle. Use a calculator to find the decimal equivalents.

c. Find the exact values of $\cos 150^\circ$ and $\sin 150^\circ$.

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