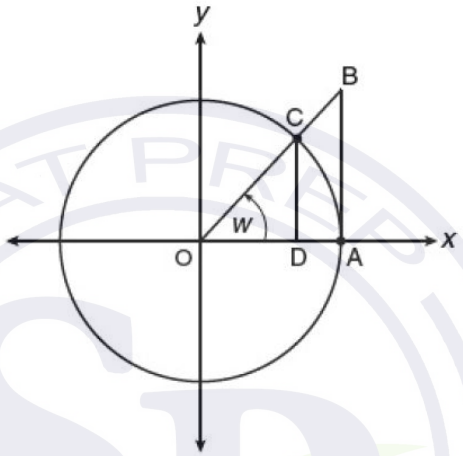
SATPREP

Assignment : *Unit Circle*

1. The path traveled by a roller coaster is modeled by the equation $y = 27 \sin 13x + 30$ where y is measured in meters. What is the number of meters in the maximum altitude of the roller coaster?

   (A) 13
   (B) 27
   (C) 30
   (D) 57

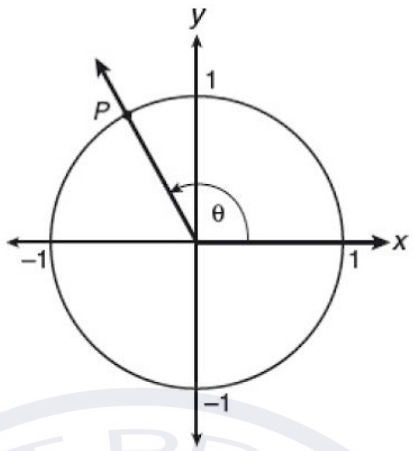


2. The unit circle above has radius $\overline{OC}$, angle AOB measures w radians, $\overline{BA}$ is tangent to circle O at A, and $\overline{CD}$ is perpendicular to the x-axis. The length of which line segment represents $\sin w$?

   (A) $\overline{OD}$
   (B) $\overline{CD}$
   (C) $\overline{AB}$
   (D) $\overline{OB}$

3. If x is an acute angle, which expression is *not* equivalent to $\cos x$?

   (A) $-\cos(-x)$
   (B) $\left(\frac{\pi}{2} - x\right)$
   (C) $-\cos(x + \pi)$
   (D) $\cos(x - 2\pi)$



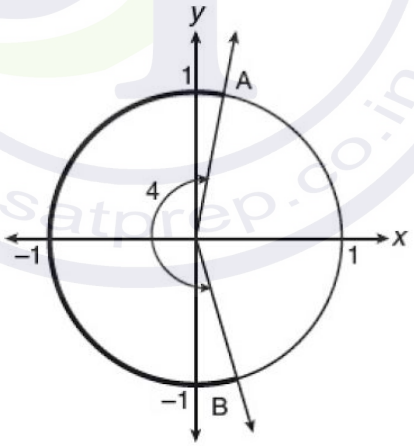
4. In the figure above, θ is an angle in standard position and its terminal side passes through the point $P\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ on the unit circle. What is a possible value of θ?

(A) $\frac{2}{3}\pi$

(B) $\frac{5}{6}\pi$

(C) $\frac{7}{6}\pi$

(D) $\frac{4}{3}\pi$



5. In the unit circle above, an angle that measures 4 radians intercepts arc AB. What is the length of major arc AB?

(A) $\frac{\pi}{2}$

(B) 4

(C) $\frac{\pi + 2}{4}$

(D) $\frac{4}{\pi}$

6. If θ is an angle in standard position and its terminal side passes through the point $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$ on the unit circle, then a possible value of θ is

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(A) $\frac{7\pi}{6}$

(B) $\frac{4\pi}{3}$

(C) $\frac{5\pi}{3}$

(D) $\frac{11\pi}{6}$

7. What are the coordinates of the image of the point (1, 0) on the terminal side of an angle after a clockwise rotation of $\frac{\pi}{6}$ radians?

(A) $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

(B) $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

(C) $\left(-\frac{\sqrt{3}}{2}, 1\right)$

(D) $\left(\frac{1}{2}, -\frac{1}{2}\right)$

8. What are the coordinates of the image of the point (1, 0) on the terminal side of an angle after a counterclockwise rotation of $\frac{3}{4}\pi$ radians?

(A) $\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

(B) $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

(C) $\left(-\sqrt{2}, 1\right)$

(D) $\left(-\frac{1}{2}, \frac{1}{2}\right)$

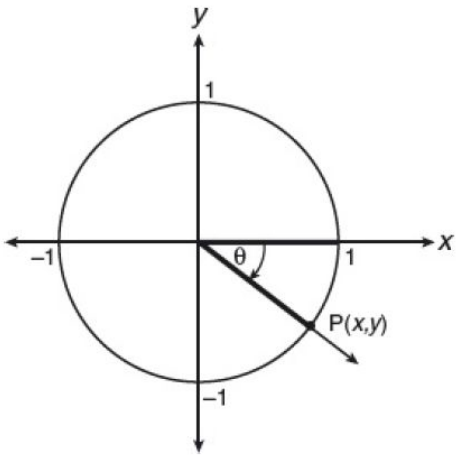
9. Which of the following expressions is equivalent to $\frac{\sin^2 x}{1+\cos x}$?

(A) $1 - \sin x$

(B) $1 - \cos x$

(C) $\sin x + \cos x$

(D) $\sin x - \cos x$



10. In the unit circle above, the ordered pair (x, y) represents a point P where the terminal side intersects the unit circle, as shown in the accompanying figure. If $\theta = -\frac{\pi}{3}$ radians, what is the value of y?

(A) $-\frac{\sqrt{3}}{2}$

(B) $-\frac{\sqrt{2}}{2}$

(C) $-\sqrt{3}$

(D) $-\frac{1}{2}$

11. If x is a positive acute angle and $\cos x = a$, an expression for $\tan x$ in terms of a is

(A) $\frac{1-a}{a}$

(B) $\sqrt{1-a^2}$

(C) $\frac{\sqrt{1-a^2}}{a}$

(D) $\frac{1}{1-a}$