

Exact Trig Values & Unit Circle Coordinates

1. Find the reference angle for each angle in standard position.

a) $\theta = \frac{11\pi}{3}$

b) $\theta = \frac{17\pi}{4}$

c) $\theta = -\frac{17\pi}{3}$

d) $\theta = \frac{37\pi}{6}$

2. Determine the exact value without a calculator.

a) $\sin\left(\frac{2\pi}{3}\right)$

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

c) $\tan\left(\frac{5\pi}{6}\right)$

d) $\sin\left(\frac{9\pi}{4}\right)$

e) $\cos\left(-\frac{5\pi}{3}\right)$

f) $\tan\left(-\frac{23\pi}{6}\right)$

3. Determine which quadrant(s) the angle could terminate in if:

a) $\sin \theta > 0$

b) $\cos \theta < 0$

c) $\tan \theta < 0$

d) $\sin \theta < 0$ and $\cos \theta < 0$

4. Determine the coordinates of a coordinate with this angle.

a) $\theta = \frac{5\pi}{3}$

b) $\theta = \frac{3\pi}{4}$

c) $\theta = \frac{7\pi}{6}$

d) $\theta = -\frac{\pi}{3}$

5. Given that $\cos \theta = \frac{4}{5}$ and θ is in Quadrant IV, determine:

a) the coordinates of a point with this angle

b) the value of $\sin \theta$

c) the value of $\tan \theta$

6. Suppose the point P is on a terminal arm that has rotated θ radians in standard position. Given that $\sin \theta = -\frac{4}{13}$, determine in exact form:

a) all possible coordinates of point P on the unit circle

b) the values of $\cos \theta$

c) the values of $\tan \theta$

7. Suppose the point P is on a terminal arm that has rotated θ radians in standard position. Given that $\cos \theta = \frac{3}{\sqrt{11}}$, determine all possible coordinates of point P on the unit circle. Provide your answers in exact form. Draw the angles θ in standard position.

8. Suppose the point P is on a terminal arm that has rotated θ radians in standard position. Given that $\tan \theta = -\frac{7}{\sqrt{6}}$, determine all possible coordinates of point P on the unit circle. Provide your answers in exact form. Draw the angles θ in standard position.

9. Suppose the point P is on a terminal arm that has rotated θ radians in standard position. Given that $\sin \theta = -\frac{5}{\sqrt{34}}$, determine all possible coordinates of point P on the unit circle. Provide your answers in exact form. Draw the angles θ in standard position.
10. Two angles have the same reference angle.
- Must their sine values always be equal? Explain using an example.
 - Must their cosine values always be equal? Explain using an example.
 - Must their tangent values always be equal? Explain using an example.
11. For each statement below, determine whether it is: always true, sometimes true, or never true. Explain your reasoning.
- Two angles with the same reference angle always have the same sine value.
 - Two coterminal angles always have the same cosine value.
 - If $\sin \theta > 0$, then θ must be in Quadrant I.
 - If $\tan \theta < 0$, then $\sin \theta$ and $\cos \theta$ must have opposite signs.
12. Explain why the coordinates on the unit circle are written as $(\cos \theta, \sin \theta)$. How do these coordinates help determine the values of the three trigonometric ratios?
13. Determine the exact value without a calculator.
- $\sin\left(\frac{11\pi}{6}\right)$
 - $\cos\left(-\frac{7\pi}{4}\right)$
 - $\tan\left(\frac{13\pi}{3}\right)$
 - $\sin\left(\frac{5\pi}{4}\right)$
14. Given that $\cos \theta = -\frac{3}{5}$, and θ is in Quadrant II:
- determine the coordinates on the unit circle
 - determine $\sin \theta$
 - determine $\tan \theta$
15. Determine the angle θ on the interval $0 \leq \theta < 2\pi$ for each point on the unit circle.
- $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
 - $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$