Precalculus **Name** _____

4.4 Notes: Trigonometric Functions of Any Angle-*Day 2*

Reference Angles

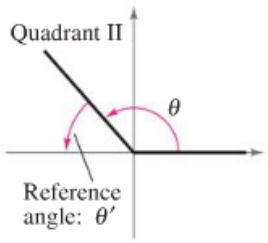
The values of the trigonometric functions of angles greater than 90° (or less than 0°) can be determined from their values at the corresponding acute angles called **reference angles**.

Definition of Reference Angle:

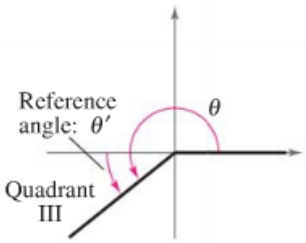
Let θ be an angle in _____ _____. Its **reference angle** is the _____

_____ θ' formed by the _____ _____ of θ and the _____.

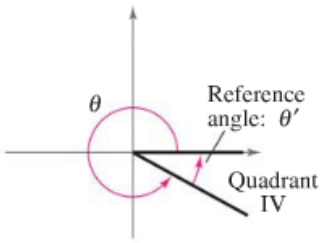
Note: reference angles are always positive.



$\theta' = \pi - \theta$ (radians)
$\theta' = 180° - \theta$ (degrees)



$\theta' = \theta - \pi$ (radians)
$\theta' = \theta - 180°$ (degrees)



$\theta' = 2\pi - \theta$ (radians)
$\theta' = 360° - \theta$ (degrees)

Find the reference angle θ' and sketch θ and θ' in standard position.

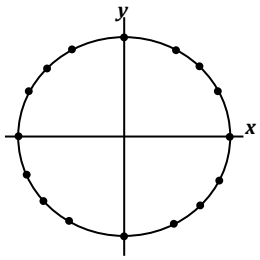
1. $\theta = 300°$	**2.** $\theta = -135°$	**3.** $\theta = -870°$	**4.** $\theta = -292°$
5. $\theta = \frac{51\pi}{7}$	**6.** $\theta = \frac{4\pi}{5}$	**7.** $\theta = -\frac{11\pi}{9}$	**8.** $\theta = 1.7$

To find the value of a trigonometric function of any angle θ:

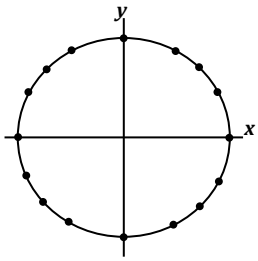
- Determine the function value for the associated reference angle θ'.
- Depending on the quadrant in which θ lies, affix the appropriate sign to the function value.

Evaluate the sine, cosine, and tangent of each angle without using a calculator.

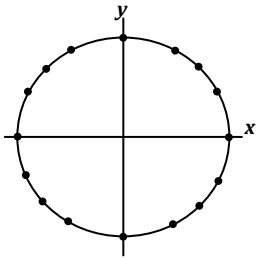
9. $\theta = -330°$



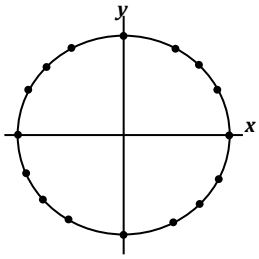
10. $\theta = 225°$



11. $\theta = \dfrac{-17\pi}{6}$

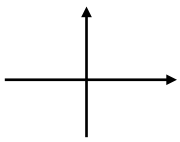


12. $\theta = \dfrac{19\pi}{4}$

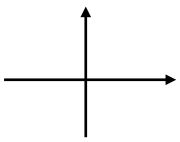


Find the indicated trigonometric value in the specified quadrant.

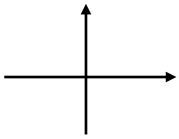
13. If $\sin\theta = -\dfrac{3}{5}$ and the angle is in quadrant IV, then find $\cos\theta$.



14. If $\csc\theta = -2$ and the angle is in quadrant IV, then find $\cot\theta$.



15. If $\sec\theta = -\dfrac{9}{4}$ and the angle is in quadrant III, then find $\tan\theta$.



Find TWO solutions of the equation. Give you answers in degrees $(0° \le \theta < 360°)$ **and radians** $(0 \le \theta < 2\pi)$. **Do not use your calculator.**

16. $\sin\theta = \dfrac{1}{2}$

17. $\sin\theta = -\dfrac{1}{2}$

18. $\csc\theta = \dfrac{2\sqrt{3}}{3}$

19. $\cot\theta = -1$

20. $\sec\theta = -\dfrac{2\sqrt{3}}{3}$

21. $\cos\theta = -\dfrac{1}{2}$