

NOTES: SECONDARY 2 HONORS

Unit 9: Trigonometric Functions of **Obtuse Angles**

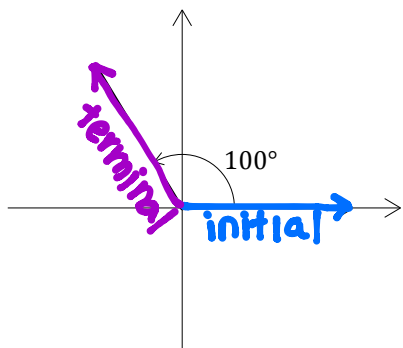
Positive Angles and Negative Angles

When drawing an angle on a coordinate plane, we always start at the 0° . Angles that move **counter-clockwise** are positive and angles that move **clockwise** are negative.

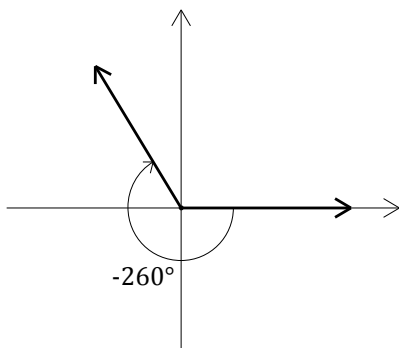
Coterminal Angles: Angles that have the same initial side and terminal side.

starting ending

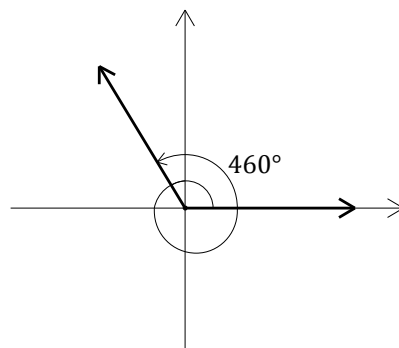
All three angles below are coterminal.



Positive coterminal angle



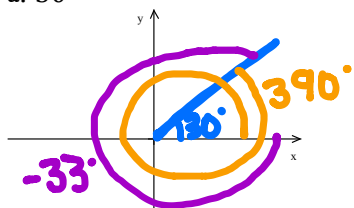
Negative coterminal angle



Positive coterminal angle

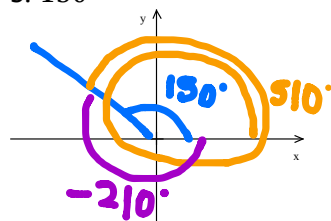
Example 1: Find and draw a positive and a negative angle that are coterminal with the given angle.

a. 30°



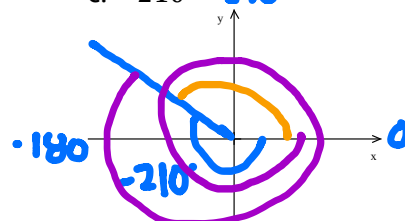
Positive coterminal angle: $30 + 360 = 390^\circ$
 Negative coterminal angle: $30 - 360 = -330^\circ$

b. 150°



Positive coterminal angle: $150 + 360 = 510^\circ$
 Negative coterminal angle: $150 - 360 = -210^\circ$

c. -210°



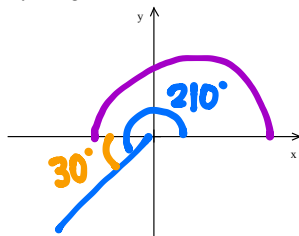
Positive coterminal angle: $-210 + 360 = 150^\circ$
 Negative coterminal angle: $-210 - 360 = -570^\circ$

acute

Reference Angles: The smallest angle that the terminal side of a given angle makes with the **X-axis**.

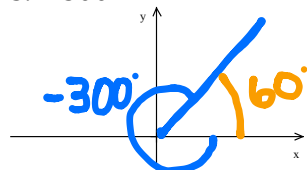
Example 2: Find the reference angle of the given angles.

a. 210°



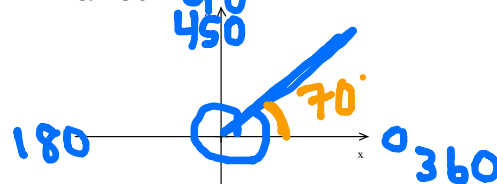
Reference angle: 30°

b. -300°



Reference angle: 60°

c. 430°



Reference angle: 70°

Why do we care about reference angles and coterminal angles? All coterminal angles have the same trig ratios. We can find the trig ratios using reference angles and **ASTC**.

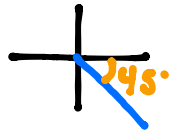
S	A
T	C

STEPS TO FINDING A TRIG RATIO OF AN OBTUSE ANGLE

1. Draw the angle on a coordinate plane.
2. What quadrant is the angle in? Is the trig function in that quadrant positive or negative?
3. Find the reference angle. (REMEMBER: this is from the x-axis).
4. Evaluate the trig ratio of the reference angle applying your analysis of #2.

Example 3: Find the following without using a calculator.

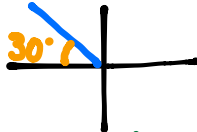
a. $\cos(315^\circ)$



$$\cos(315) = \cos(45)$$

$$= \boxed{\frac{\sqrt{2}}{2}}$$

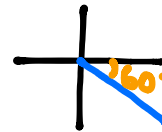
b. $\sin(-210^\circ)$



$$\sin(-210) = \sin(30)$$

$$= \boxed{\frac{1}{2}}$$

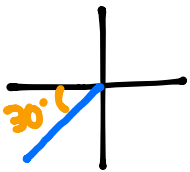
c. $\tan(300^\circ)$



$$\tan(300) = -\tan(60)$$

$$= \boxed{-\sqrt{3}}$$

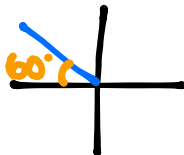
d. $\sin(210^\circ)$



$$\sin(210) = -\sin(30)$$

$$= \boxed{-\frac{1}{2}}$$

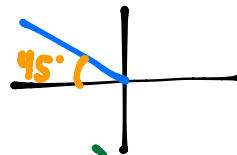
e. $\tan(120^\circ)$



$$\tan(120) = -\tan(60)$$

$$= \boxed{-\sqrt{3}}$$

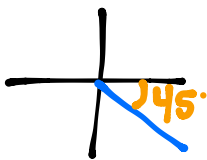
f. $\cos(135^\circ)$



$$\cos(135) = -\cos(45)$$

$$= \boxed{-\frac{\sqrt{2}}{2}}$$

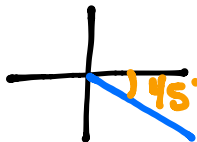
g. $\tan(315^\circ)$



$$\tan(315) = -\tan(45)$$

$$= \boxed{-1}$$

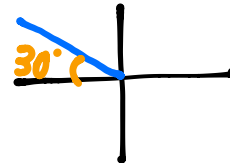
h. $\sin(-45^\circ)$



$$\sin(-45) = -\sin(45)$$

$$= \boxed{-\frac{\sqrt{2}}{2}}$$

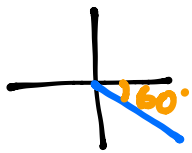
j. $\cos(150^\circ)$



$$\cos(150) = -\cos(30)$$

$$= \boxed{-\frac{\sqrt{3}}{2}}$$

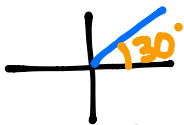
k. $\sec(300^\circ)$
 $\cos(300^\circ)$



$$\cos(300) = \cos(60)$$
$$= \frac{1}{2}$$

$$\boxed{\sec(300) = 2}$$

l. $\tan(-330^\circ)$



$$\tan(-330) = \tan(30)$$
$$= \boxed{\frac{\sqrt{3}}{3}}$$

m. $\csc(390^\circ)$

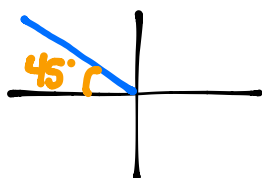
$$\sin(390^\circ)$$



$$\sin(390) = \sin(30)$$
$$= \frac{1}{2}$$

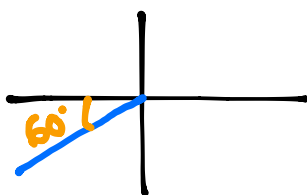
$$\boxed{\csc(390) = 2}$$

n. $\cos(495^\circ)$



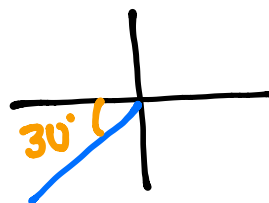
$$\cos(495) = -\cos(45)$$
$$= \boxed{-\frac{\sqrt{2}}{2}}$$

o. $\sin(-480^\circ)$



$$\sin(-480) = -\sin(60)$$
$$= \boxed{-\frac{\sqrt{3}}{2}}$$

p. $\cos(570^\circ)$



$$\cos(570) = -\cos(30)$$
$$= \boxed{-\frac{\sqrt{3}}{2}}$$