

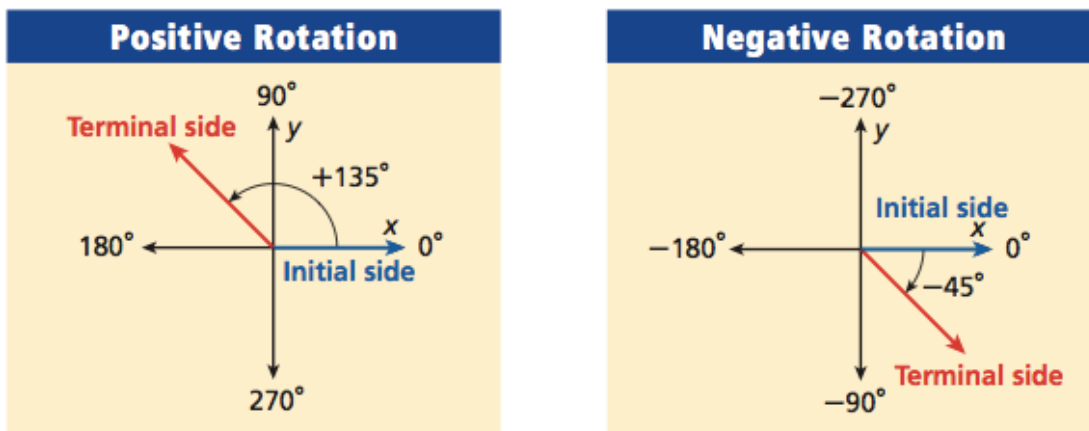
Springboard 32.1

4.27.17

Coterminal and Reference Angles

The ***Initial Side*** of the angle is when the ray is on the x-axis.

The ***Terminal Side*** is the other ray.



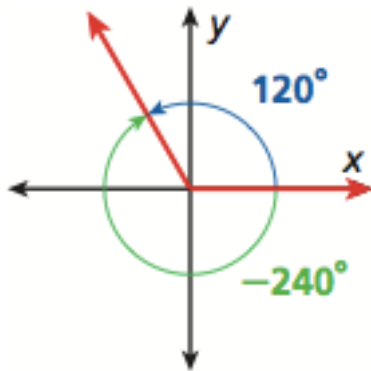
An angle is in ***Standard Position*** when its vertex is at the origin and one ray is on the positive x-axis.

Angle of rotation is formed by rotating the terminal side and keeping the initial side in place. It can be rotated more than 360° . If the terminal side is rotated counter-clockwise the angle of

rotation is positive. If the terminal side is rotated clockwise, the angle of rotation is negative.

Coterminal angles are angles in standard position with the same terminal side.

120° and -240° are coterminal angles.



I do:

Find two Coterminal angles of 120°

Starting Angle	120°
To find a positive coterminal angle, add 360° until the angle is positive.	$120^\circ + 360^\circ = 480^\circ$
To find a negative	$120^\circ - 360^\circ = -240^\circ.$

coterminal angle, subtract 360° until the angle is negative.	
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We do:

Find a positive and negative coterminal angle of 790°

Starting Angle	790°
To find a positive coterminal angle, add 360° until the angle is positive.	
To find a negative coterminal angle, subtract 360° until the angle is negative.	

You do on your whiteboards with your partner.

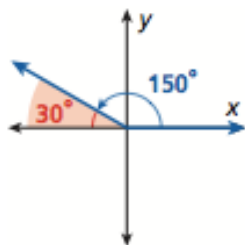
Odd Talk, Even Write

Find a positive and negative coterminal angle of -
390

The ***Reference Angle*** is the positive acute angle formed by the terminal side of θ and the x-axis.

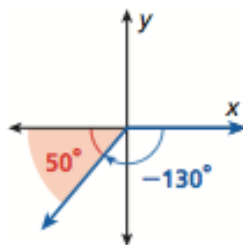
Find the measure of the reference angle for each given angle.

A $\theta = 150^\circ$



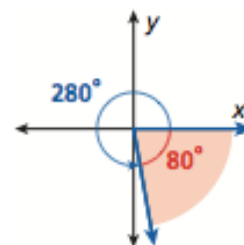
The measure of the reference angle is 30° .

B $\theta = -130^\circ$



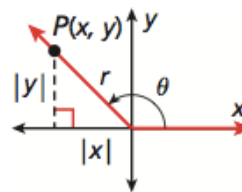
The measure of the reference angle is 50° .

C $\theta = 280^\circ$



The measure of the reference angle is 80° .

To determine the value of the trigonometric functions for an angle θ in standard position, begin by selecting a point P with coordinates (x, y) on the terminal side of the angle. The distance r from point P to the origin is given by $\sqrt{x^2 + y^2}$.



Trigonometric Functions

For a point $P(x, y)$ on the terminal side of θ in standard position and $r = \sqrt{x^2 + y^2}$,

SINE	COSINE	TANGENT
$\sin \theta = \frac{y}{r}$	$\cos \theta = \frac{x}{r}$	$\tan \theta = \frac{y}{x}, x \neq 0$

I Try:

Find the measure of the reference angle.

$$\theta = 150^\circ$$

Given Angle	$\theta = 150^\circ$
Identify the quadrant	Quadrant 2

Find the angle of the ray on the x-axis and the coterminal side.	
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$$\theta = -100^\circ$$

Given Angle	$\theta = -100$
Identify the quadrant	
Find the angle of the ray on the x-axis and the coterminal side.	

We Try:

Find the measure of the reference angle.

$$\theta = 220^\circ$$

Given Angle	$\theta = 220^\circ$
Identify the quadrant	
Find the angle of the ray on the x-axis and the coterminal side.	

$$\theta = -150^\circ$$

Given Angle	$\theta = -150$
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Identify the quadrant	
Find the angle of the ray on the x-axis and the coterminal side.	

**You Try with your partner on the whiteboard.
Even Talk, Odd write.**

Find the measure of the reference angle.

$$\theta = -290^\circ$$

Given Angle	$\theta = -290^\circ$
Identify the quadrant	
Find the angle of the ray on the x-axis and the coterminal side.	

Closure

Explain to your partner

- 1) How would you find a positive and a negative coterminal angle for 100° .**
- 2) Find 3 positive and 3 negative coterminal angles for 100°**
- 3) Explain how you would find the reference angle to 100° .**