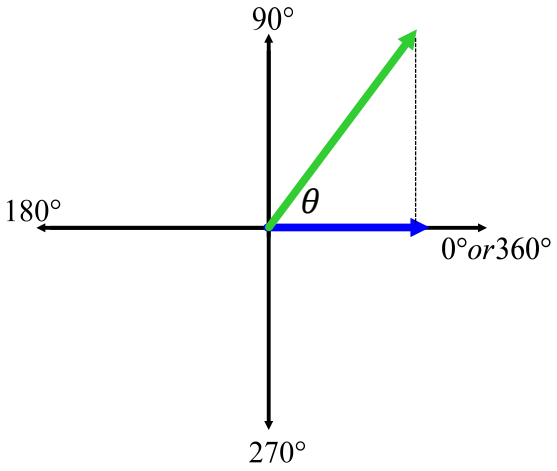
L2 – Trig Ratios for Angles Greater than 90°
MCR3U
Jensen

Part 1: Reference Angles

_____: Always lies on the positive x-axis at 0°. Meets the terminal arm at the origin.

_____: The arm that rotates around the origin counter clockwise to form a positive angle or clockwise for a negative angle.

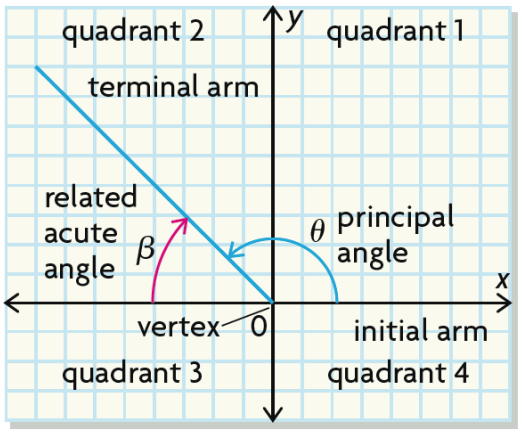
_____is measured from the initial arm to the terminal arm.



_____: The counter clockwise angle between the initial arm and the terminal arm of an angle in standard position. It's value is between 0° and 360°.

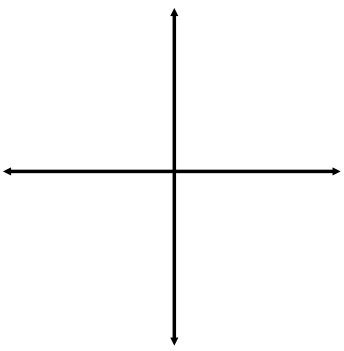
_____: The acute angle between the terminal arm of an angle in standard position and the closest x-axis when the terminal arm lies in quadrant 2, 3, or 4.

The reference angle helps us determine the exact trig ratios when we are given obtuse angles.

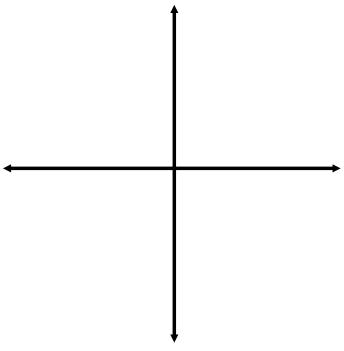


Example 1: Find the reference angle for each of the following principal angles

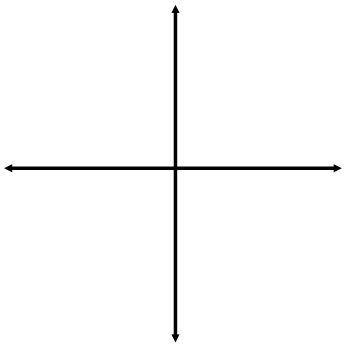
a) $250°$



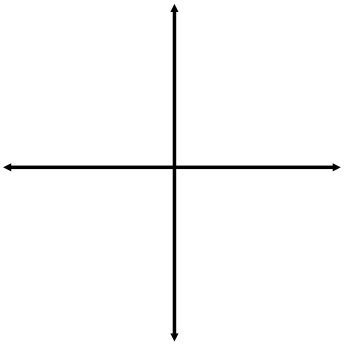
b) $120°$



c) $300°$



d) $225°$



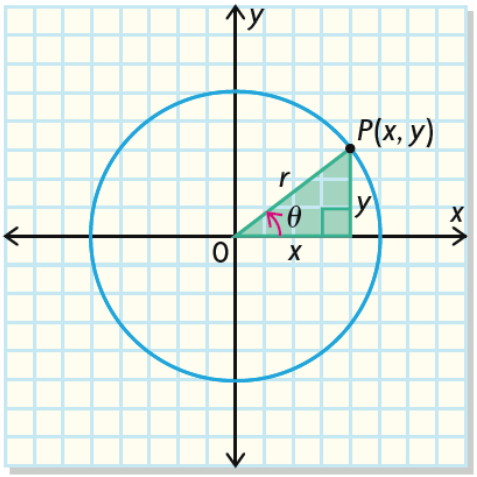
Part 2: Evaluating Trig Ratios for Any Angle

For any point $P(x, y)$ in the Cartesian plane, the trigonometric ratios for angles in standard position can be expressed in terms of x, y, and r.

$\sin\theta =$

$\cos\theta =$

$\tan\theta =$



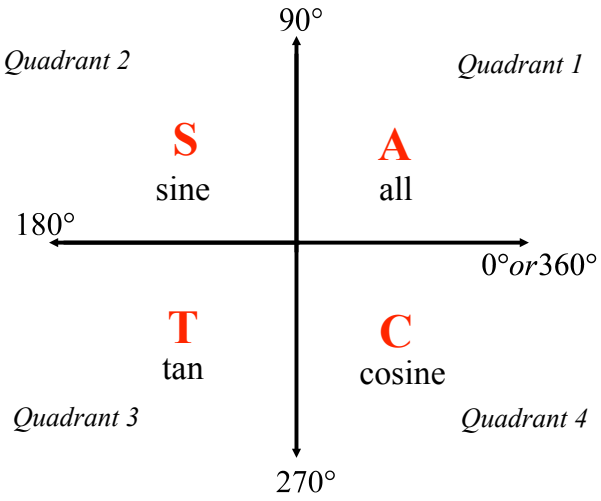
The CAST rule is an easy way to remember which primary trig ratios are positive in which quadrant. Since r is always positive, the sign of each primary ratio depends on the signs of the coordinates of the point (x, y).

In Q1, _____ ratios are positive because both x and y are positive.

In Q2, only _____ is positive, since x is negative and y is positive.

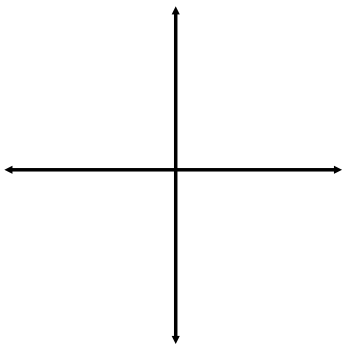
In Q3, only _____ is positive, since both x and y are negative.

In Q4, only _____ is positive, since x is positive but y is negative.

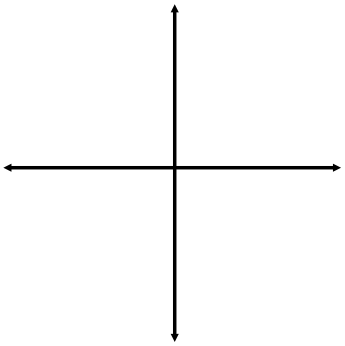


Example 2: Find the EXACT value of each of the following

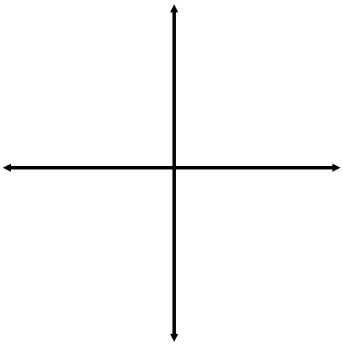
a) $\sin 45°$



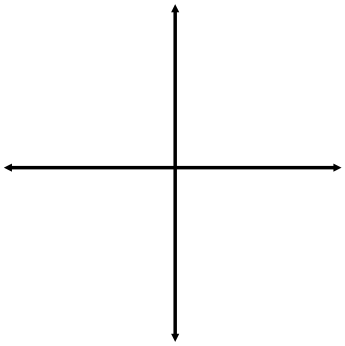
b) $\sin 210°$



c) $\cos 240°$

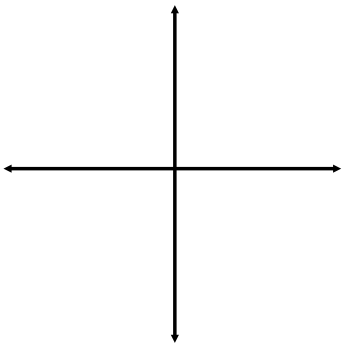


d) $\tan 315°$

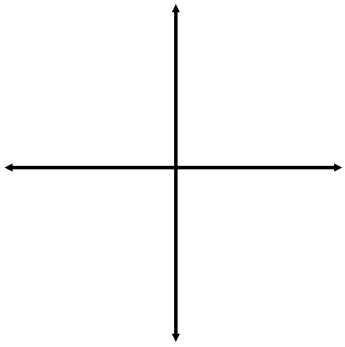


Example 3: Each point lies on the terminal arm of angle θ in standard position. Determine each of the primary trig ratios for angle θ.

a) (5, -12)



b) (-8, 3)



Part 3: Unit Circle

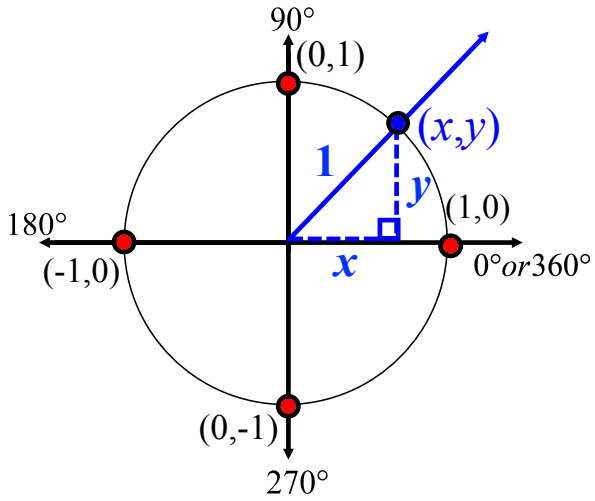
The unit circle, a circle with a radius of **1 unit**, is very useful since the x and y coordinates of where the terminal intersects it tell us the Cosine and Sine ratios respectively.

For any point $P(x, y)$ in the Cartesian plane that intersects the ***unit circle***, the trigonometric ratios for angles can be expressed in terms of x, y, and r.

$\sin\theta =$

$\cos\theta =$

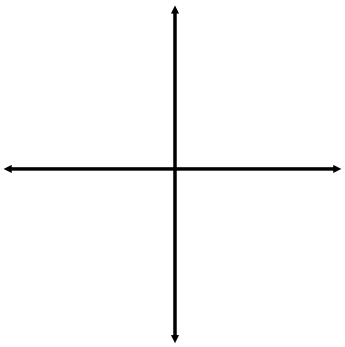
$\tan\theta =$



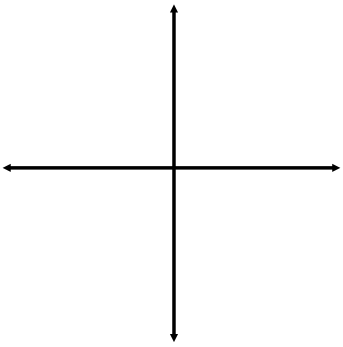
http://www.mathsisfun.com/geometry/unit-circle.html

Example 4: Find the EXACT value of each of the following

a) $\sin 270°$



b) $\cos 360°$



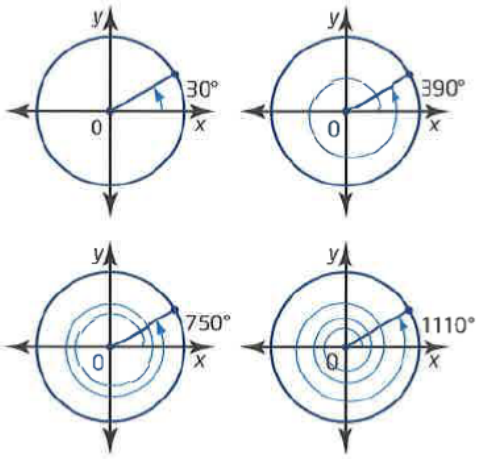
Part 4: Negative and Co-terminal Angles

Co-terminal angles are angles in standard position that have the _____.

Starting at $30°$ and rotating $360°$ counter clockwise will bring you back to the same terminal arm.

$$30° + 360° = 390°$$

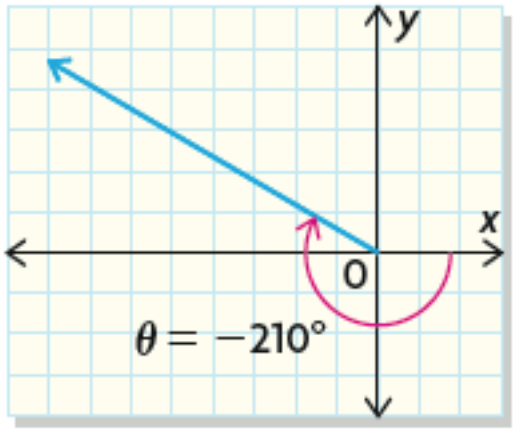
Therefore, $30°$ and $390°$ are co-terminal.



A negative angle is an angle measured _____ from the positive x-axis.

You can find an equivalent (co-terminal) positive angle by adding $360°$ to the negative angle.

$-210°$ and $150°$ have the same terminal arm (co-terminal) and therefore have the same trigonometric ratios.



Example 5: Find three co-terminal angles of $60°$

Example 6: Find the EXACT value of each of the following

a) $\sin(-45°)$

b) $\cos(-60°)$