

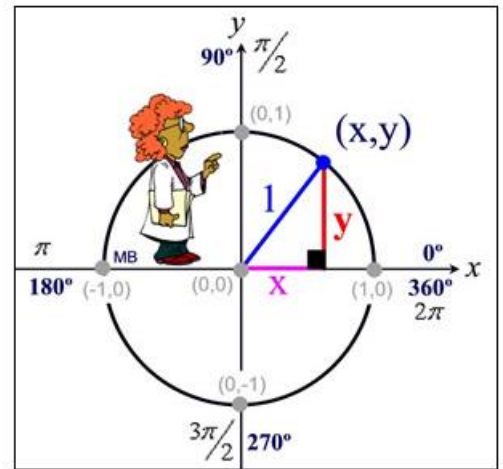
The Unit Circle and the CAST Rule

A **unit circle** is a circle with a radius of **one** (a *unit radius*). In trigonometry, the unit circle is centered at the origin of a coordinate axis system.

For the point (x,y) in Quadrant I, the lengths x and y become the legs of a right triangle whose hypotenuse is 1.

Using the right triangle and the Pythagorean Theorem, we can see that $x^2 + y^2 = 1$.

Thus, the equation of the unit circle is $x^2 + y^2 = 1$.

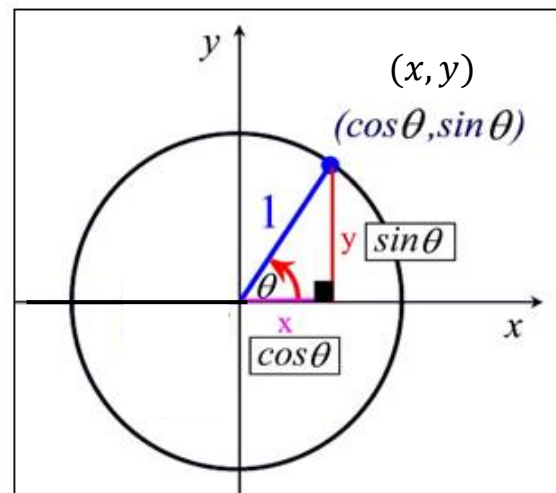


If we examine angle θ (as shown at the left) we see that:

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{x}{1} = x$$

and

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{y}{1} = y$$



Note: A point on the circumference of a circle can be represented by the ordered pair, (x, y) , Since $x = \cos \theta$ and $y = \sin \theta$, we can also represent points on the circumference of the circle as $(\cos \theta, \sin \theta)$.

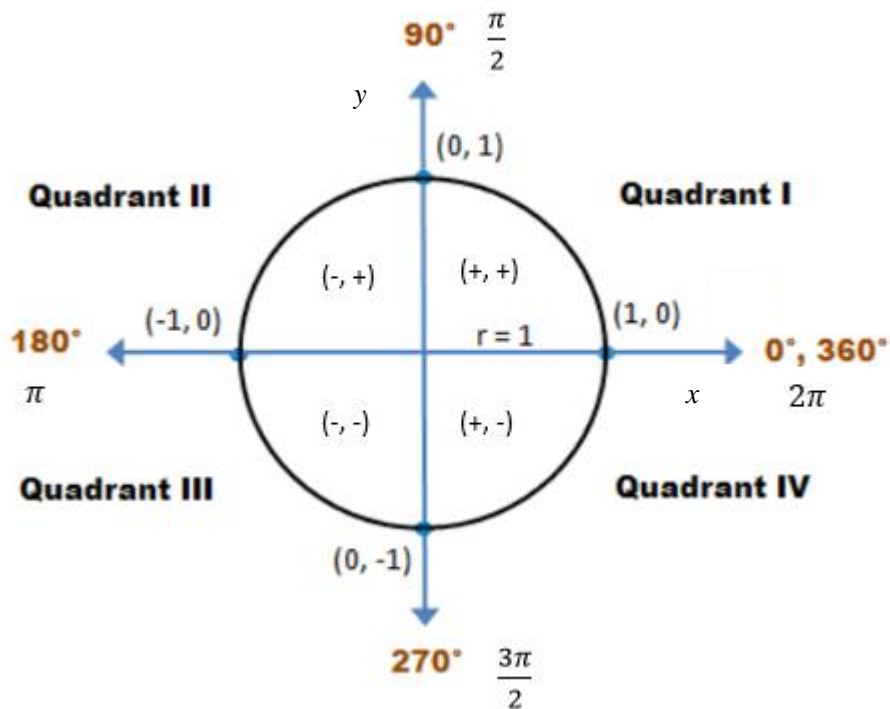
Four Quadrants

In Quadrant I, both x and y are positive. $(+, +)$

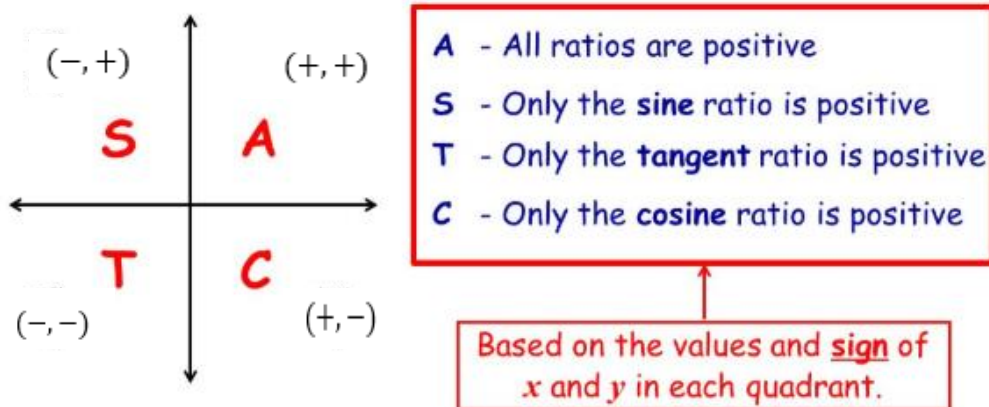
In Quadrant II, x is negative and y is positive. $(-, +)$

In Quadrant III, both x and y are negative. $(-, -)$

In Quadrant IV, x is positive and y is negative. $(+, -)$



CAST Rule



$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

$$\tan \theta = \frac{y}{x}$$