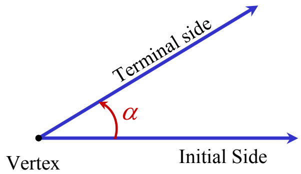
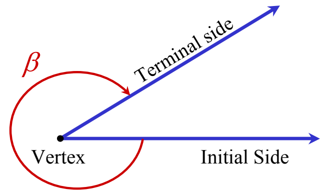
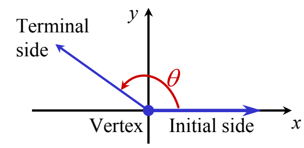


Counterclockwise rotation
Positive Angle

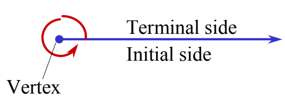


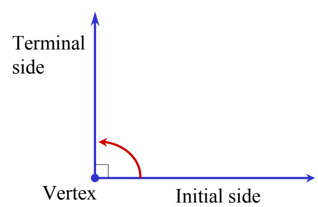
Clockwise rotation
Negative Angle

An angle θ is said to be in **standard position** if its vertex is at the origin of a rectangular coordinate system and its initial side coincides with with positive x-axis.



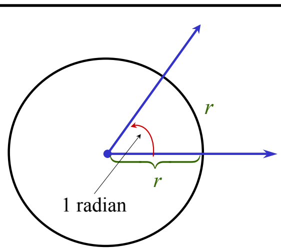
The angle formed by rotating the initial side exactly once in the counterclockwise direction until it coincides with itself (1 revolution) is said to measure 360 degrees, abbreviated 360°.





90° angle; $\frac{1}{4}$ revolution

Consider a circle of radius r. Construct an angle whose vertex is at the center of this circle, called the **central angle**, and whose rays subtend an arc on the circle whose length is r. The measure of such an angle is **1 radian**.

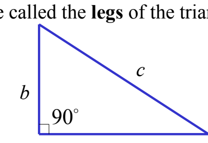


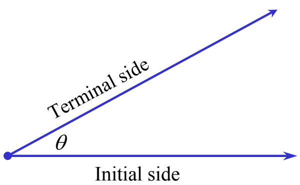
Theorem Arc Length

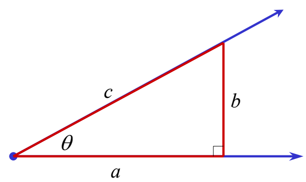
For a circle of radius r, a central angle of θ radians subtends an arc whose length s is

$$s = r\theta$$

A triangle in which one angle is a right angle is called a **right triangle**. The side opposite the right angle is called the **hypotenuse**, and the remaining two sides are called the **legs** of the triangle.



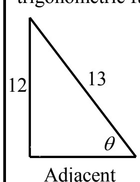




The six ratios of a right triangle are called **trigonometric functions of acute angles** and are defined as follows:

Function name	Abbreviation	Value
sine of θ	$\sin\theta$	b/c
cosine of θ	$\cos\theta$	a/c
tangent of θ	$\tan\theta$	b/a
cosecant of θ	$\csc\theta$	c/b
secant of θ	$\sec\theta$	c/a
cotangent of θ	$\cot\theta$	a/b

Find the value of each of the six trigonometric functions of the angle θ.



c = Hypotenuse = 13

b = Opposite = 12

$a^2+b^2=c^2$

$a^2+12^2=13^2$

$a^2=169-144=25$

$a=5$

$a = \text{Adjacent} = 5$

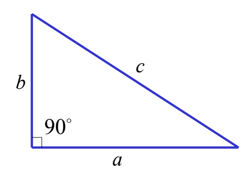
$b = \text{Opposite} = 12$

$c = \text{Hypotenuse} = 13$

$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{12}{13}$ $\quad \csc\theta = \frac{\text{Hypotenuse}}{\text{Opposite}} = \frac{13}{12}$

$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{5}{13}$ $\quad \sec\theta = \frac{\text{Hypotenuse}}{\text{Adacent}} = \frac{13}{5}$

$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{12}{5}$ $\quad \cot\theta = \frac{\text{Adjacent}}{\text{Opposite}} = \frac{5}{12}$



$$b^2+a^2=c^2$$

$$\frac{b^2}{c^2}+\frac{a^2}{c^2}=\frac{c^2}{c^2}$$

$$\left(\frac{b}{c}\right)^2+\left(\frac{a}{c}\right)^2=1$$

$$\sin^2\theta+\cos^2\theta=1$$

Theorem Complementary Angles Theorem

Cofunctions of complementary angles are equal.