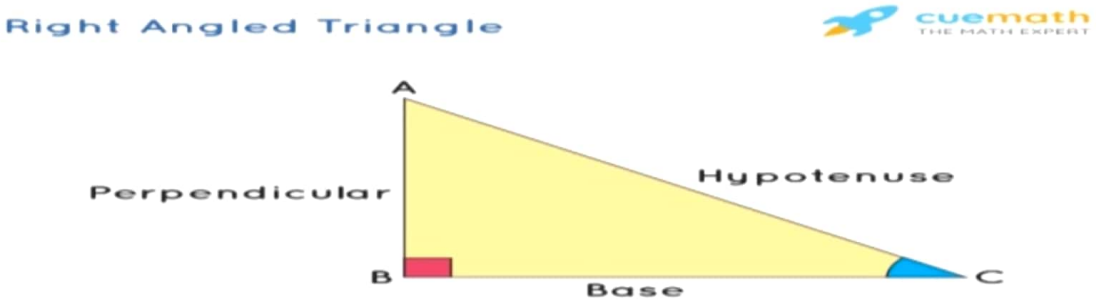

2-2-Trigonometric Functions Formulas

We have certain formulas to find the values of the trig functions using the sides of a right-angled triangle. To write these formulas, we use the abbreviated form of these functions. Sine is written as sin, cosine is written as cos, tangent is denoted by tan, secant is denoted by sec, cosecant is abbreviated as cosec, and cotangent is abbreviated as cot. The basic formulas to find the trigonometric functions are as follows:

$\sin\theta$ = Perpendicular/Hypotenuse=P/H

$\cos\theta$ = Base/Hypotenuse= B/H

$\tan\theta$ = Perpendicular/Base= P/B

$\sec\theta$ = Hypotenuse/Base=1/ $\cos\theta$= H/B

$\text{cosec}\,\theta$ = Hypotenuse/Perpendicular=1/ $\sin\theta$= H/P

$\cot\theta$ = Base/Perpendicular=1/ $\tan\theta$= B/P

Example :

Find the value of the trigonometric functions, for the given value of $12\text{Tan}\theta = 5$.

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Solution:

Given $12\text{Tan}\theta = 5$, and we have $\text{Tan}\theta = 5/12$

$\text{Tan}\theta$ = Perpendicular/Base = 5/12

Applying the Pythagorean theorem we have:

$\text{Hypotenuse}^2 = \text{Perpendicular}^2 + \text{Base}^2$

$\text{Hyp}^2 = 12^2 + 5^2$

$= 144 + 25$

$= 169$

$\text{Hyp} = 13$

Hence the other trigonometric functions are as follows.

$\text{Sin}\theta$ = Perp/Hyp = 5/13

$\text{Cos}\theta$ = Base/Hyp = 12/13

$\text{Cot}\theta$ = Base/Perp = 12/5

$\text{Sec}\theta$ = Hyp/Base = 13/12

$\text{Cosec}\theta$ = Hyp/Perp = 13/5

2-3-Trigonometric Functions Values

The trigonometric functions have a domain θ, which is in degrees or radians. Some of the principal values of θ for the different trigonometric functions are presented below in a table. These principal values are also referred to as standard values of trig functions at specific angles and are frequently used in calculations.

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The principal values of trigonometric functions have been derived from a unit circle. These values also satisfy all the trigonometric formulas.

Trigonometric Table

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θ	0°	30°	45°	60°	90°	180°	270°	360°
sin θ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
tan θ	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined	0	Not Defined	0
cosec θ	Not Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	Not Defined	-1	Not Defined
sec θ	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not Defined	-1	Not Defined	1
cot θ	Not Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	Not Defined	0	Not Defined

2-4-Trig Functions in Four Quadrants

The angle θ is an acute angle ($\theta < 90°$) and is measured with reference to the positive x-axis, in the anticlockwise direction. Further, these trig functions have different numeric signs (+ or -) in the different quadrants, which are based on the positive or negative axis of the quadrant. The trigonometric functions of Sinθ, Cosecθ are positive in quadrants I and II, and are negative in quadrants III and IV. All the trigonometric functions have a positive range in the first quadrant. The trigonometric functions Tanθ, Cotθ are positive only in Quadrants I and III, and the trigonometric ratios of Cosθ, Secθ are positive only in quadrants I and IV.

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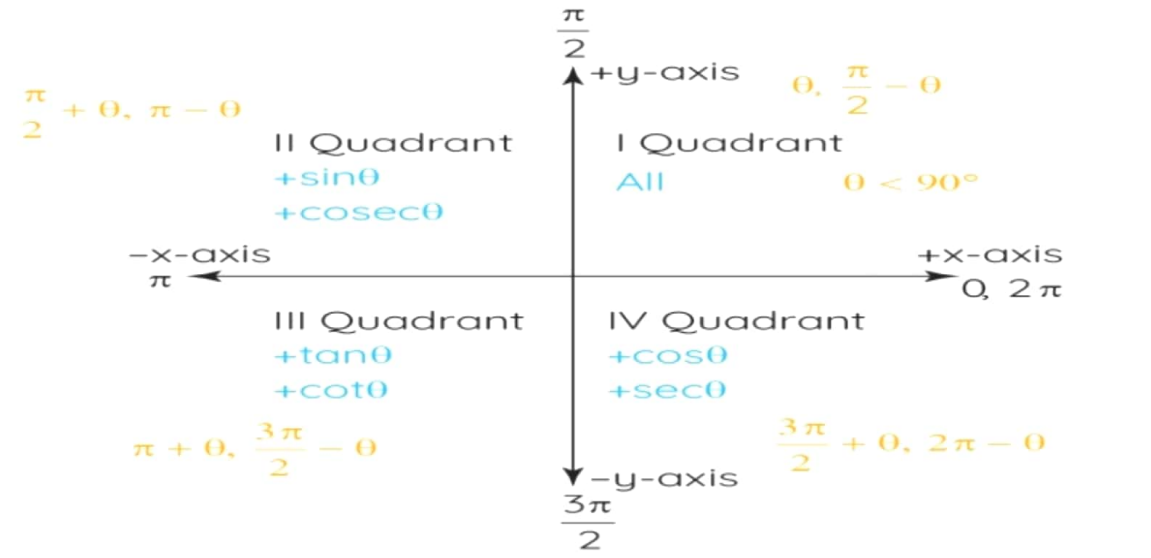

2-5-Trigonometric Functions Identities

The trigonometric functions identities are broadly divided into reciprocal identities, Pythagorean formulas, sum and difference of trig functions identities, formulas for multiple and sub-multiple angles, sum and product of identities. All of these below formulas can be easily derived using the ratio of sides of a right-angled triangle. The higher formulas can be derived by using the basic trigonometric function formulas. Reciprocal identities are used frequently to simplify trigonometric problems.