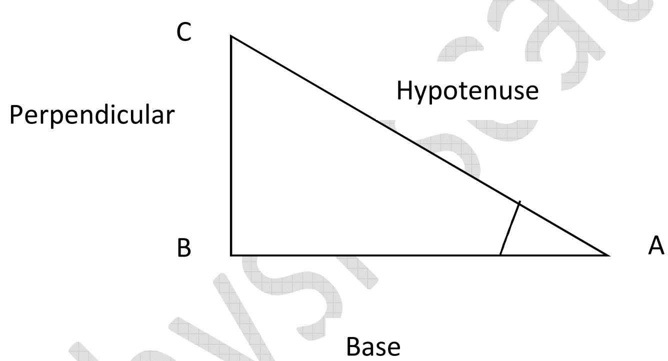
Introduction to Trigonometry (revision sheet)

Trigonometry (from Greek *trigõnon*, "triangle" and metron, "measure") is a branch of mathematics that studies relationships involving lengths and angles of triangles. The field emerged during the 3^{rd} century BC from applications of geometry to astronomical studies.

Trigonometry is most simply associated with planar right angle triangles (each of which is a two-dimensional triangle with one angle equal to 90 degrees). The applicability to non-right-angle triangles exists, but, since any non-right-angle triangle (on a flat plane) can be bisected to create two right-angle triangles, most problems can be reduced to calculations on right-angle triangles. Thus the majority of applications relate to right-angle triangles

Trigonometric Ratio's

In a right angle triangle ABC where B=90°,



We can define following term for angle A

Base: Side adjacent to angle

Perpendicular: Side Opposite of angle

Hypotenuse: Side opposite to right angle

We can define the trigonometric ratios for angle A as sin A= Perpendicular/Hypotenuse =BC/AC

cosec A= Hypotenuse/Perpendicular =AC/BC

cos A= Base/Hypotenuse =AB/AC

sec A= Hypotenuse/Base=AC/AB

tan A= Perpendicular/Base =BC/AB

cot A= Base/Perpendicular=AB/BC

Notice that each ratio in the right-hand column is the inverse, or the reciprocal, of the ratio in the left-hand column.

The reciprocal of sin A is cosec A; and vice-versa.

The reciprocal of cos A is sec A

And the reciprocal of tan A is cot A

These are valid for acute angles.

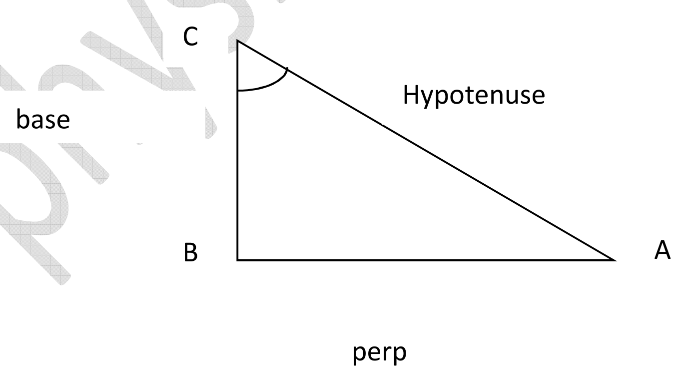
We can define tan A =sin A/cos A

And Cot A =cos A/ Sin A

Important Note

Since the hypotenuse is the longest side in a right triangle, the value of sin A or cos A is always less than 1 (or, in particular, equal to 1).

Similarly we can have define these for angle C



We can define the trigonometric ratios for angle C as sin C= Perpendicular/Hypotenuse =AB/AC

cosec C= Hypotenuse/Perpendicular =AC/ABB

cos C= Base/Hypotenuse =BC/AC

sec C= Hypotenuse/Base=AC/BC

tan A= Perpendicular/Base =AB/BC

cot A= Base/Perpendicular=BC/AB

Trigonometric Ratio's of Common angles

We can find the values of trigonometric ratio's various angle

Angles(A)	SinA	Cos A	TanA	Cosec A	Sec A	Cot A
0^0	0	1	0	Not defined	1	Not defined
30^0	1/2	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$	2	$\frac{2}{\sqrt{3}}$	$\sqrt{3}$
45^0	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1	$\sqrt{2}$	$\sqrt{2}$	1
60^0	$\frac{\sqrt{3}}{2}$	1/2	$\sqrt{3}$	$\frac{2}{\sqrt{3}}$	2	$\frac{1}{\sqrt{3}}$
90^0	1	0	Not defined	1	Not defined	0

Trigonometric ratio's of complimentary angles

We know that for Angle A, the complementary angle is 90 – A

In a right angle triangle ABC

A+B+C=180

Now B=90

So A +C =90

Or C=90-A

We have see in Previous section the value for trigonometric ratio's for angle C

sin C= Perpendicular/Hypotenuse =AB/AC
cosec C= Hypotenuse/Perpendicular =AC/ABB
cos C= Base/Hypotenuse =BC/AC
sec C= Hypotenuse/Base=AC/BC
tan C= Perpendicular/Base =AB/BC
cot C= Base/Perpendicular=BC/AB

This can be rewritten as

sin (90-A) =AB/AC
cosec (90-A) =AC/AB
cos (90-A) =BC/AC
sec (90-A)=AC/BC
tan (90-A)=AB/BC
cot(90-A) =BC/AB

Also we know that

sin A=BC/AC
cosec A= AC/BC
cos A= AB/AC
sec A =AC/AB
tan A =BC/AB
cot A =AB/BC

From both of these, we can easily make it out

Sin (90-A) =cos(A)

Cos(90-A) = sin A

Tan(90-A) =cot A

Sec(90-A)= cosec A

Cosec (90-A) =sec A

Cot(90- A) =tan A

Trigonometric identities

$\text{Sin}^2 A + \cos^2 A = 0$

$1 + \tan^2 A = \sec^2 A$

$1 + \cot^2 A = \text{cosec}^2 A$