Trigonometric Formulas

Trigonometry is quite an interesting subject. Some of the basic in trigonometry which need to be remember is

Basic Formula

tan(x) = sin(x)/cos(x)

cot(x) = cos(x)/sin(x)

Reciprocal Identities:

csc(x) = 1/sin(x)

sec(x) = 1/cos(x)

cot(x) = 1/tan(x)

sin(x) = 1/csc(x)

cos(x) = 1/sec(x)

tan(x) = 1/cot(x)

Pythagorean Identities:

$\sin^2(x) + \cos^2(x) = 1$

$\cot^2 A + 1 = \csc^2 A$

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

Trigonometric Ratios 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

Sum and Difference Formulas/Identities

Sin and cos function

1. cos(A+B) =cos(A)cos(B)-sin(A)sin(B)
2. cos(A-B) =cos(A)cos(B)+sin(A)sin(B)
3. cos (π/2π/2 -A) =sin(A)
4. sin (π/2π/2 -A) =cos(A)
5. sin(A+B) =sin(A)cos(B)+sin(B)cos(A)
6. sin(A-B) =sin(A)cos(B)-sin(B)cos(A)

Tan and cot functions

If none of the angles x, y and (x + y) is an odd multiple of π/2π/2

$$tan(A+B) = \frac{tan(A)+tan(B)}{1-tan(A)tan(B)}$$

$$tan(A-B) = \frac{tan(A)-tan(B)}{1+tan(A)tan(B)}$$

If none of the angles x, y and (x + y) is a multiple of π/2π/2

$$cot(A+B) = \frac{cot(A)cot(B)-1}{cot(A)+cot(B)}$$

$$cot(A-B) = \frac{cot(A)cot(B)+1}{cot(B)-cot(A)}$$

Some more Trigonometric Functions

Double of x

$$cos2x = cos^2x - sin^2x = 2cos^2x - 1 = 1 - 2sin^2x = \frac{1-tan^2x}{1+tan^2x}$$

$$sin2x = 2cos(x)sin(x) = \frac{2tan(x)}{1+tan^2x}$$

$$tan2x = \frac{2tan(x)}{1-tan^2x}$$

Triple of x

$$sin3x = 3sin(x) - 4sin^3x$$

$$cos3x = 4cos^3x - 3cos(x)$$

$$tan(3x) = \frac{3tanx - tan^3x}{1-3tan^2x}$$

Some other Important functions

$$cos(A) + cos(B) = 2cos\frac{A+B}{2}cos\frac{A-B}{2}$$

$$cos(A) - cos(B) = -2sin\frac{A+B}{2}sin\frac{A-B}{2}$$

$$sin(A) + sin(B) = 2sin\frac{A+B}{2}cos\frac{A-B}{2}$$

$$sin(A) - sin(B) = 2cos\frac{A+B}{2}sin\frac{A-B}{2}$$

Half Angle Formula

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}}$$

$$\cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A}$$

$$\tan\frac{A}{2} = \frac{\sin A}{1+\cos A}$$

Pythagoras Identities in Radical form

$$\sin x = \pm\sqrt{1-\cos^2 x}$$

$$\tan x = \pm\sqrt{\sec^2 x - 1}$$

$$\cos x = \pm\sqrt{1-\sin^2 x}$$

Power Reducing Functions

$$\sin^2 u = \frac{1-\cos 2u}{2}$$

$$\cos^2 u = \frac{1+\cos 2u}{2}$$

$$\tan^2 u = \frac{1-\cos 2u}{1+\cos 2u}$$

Some basics Tips to solve the trigonometry questions

1) Always try to bring the multiple angles to single angles using basic formula and make sure all your angles are the same. Using sin(2X) and sin X is difficult, but if you use sin2X = 2sin(x)cos(x), that leaves sin(x) and cos(x), and now all your functions match. The same goes for addition and subtraction: don't try working with sin(X+Y) and sin X. Instead, use sin(X+Y) = sin(x)cos(y)+cos(x)sin(y) so that all the angles match

2) Converting to sin and cos all the items in the problem using basic formula. I have mentioned sin and cos as they are easy to solve. You can use any other also.

3)Check all the angles for sums and differences and use the appropriate identities to remove them.

4) Use Pythagorean identifies to simplify the equations

5) Practice and Practice. You will soon start figuring out the equation and their symmetry to resolve them fast