8.1 INTRODUCTION AND FORMULAS OF TRIGONOMETRY
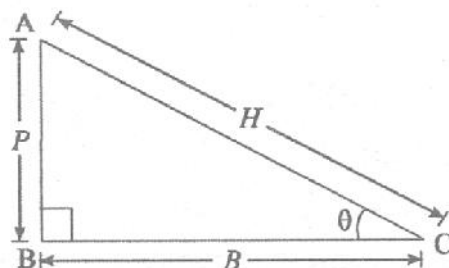
Trigonometry means, the science which deals with the measurement of triangles.

(a) Trigonometric Ratios:

A right angled triangle is shown in **Figure.** $\angle$B Is of **90^0** Side opposite to $\angle$B be called **hypotenuse.** There are two other angles i.e. $\angle$A and $\angle$C . It we consider $\angle$C as θ , then opposite side to this angle is called **perpendicular** and side adjacent to θ is called base.

(i) **Six Trigonometry Ratio are :**

$$\sin\theta = \frac{\text{Perpenicular}}{\text{Hypotenuse}} = \frac{P}{H} = \frac{AB}{AC} \qquad \cos es\theta = \frac{\text{Hypoteuse}}{\text{Perpendicular}} = \frac{H}{P} = \frac{AC}{AB}$$

$$\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{B}{H} = \frac{BC}{AC} \qquad \sec\theta = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{H}{B} = \frac{AC}{BC}$$

$$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{P}{B} = \frac{AB}{BC} \qquad \cot\theta = \frac{\text{Base}}{\text{Parpendicular}} = \frac{B}{P} = \frac{BC}{AB}$$

(ii) Interrelationship is Basic Trigonometric Ratio :

$$\tan\theta = \frac{1}{\cot\theta} \qquad \Rightarrow \qquad \cot\theta = \frac{1}{\tan\theta}$$

$$\cos\theta = \frac{1}{\sec\theta} \qquad \Rightarrow \qquad \sec\theta = \frac{1}{\cos\theta}$$

$$\sin\theta = \frac{1}{\cos ec\theta} \qquad \Rightarrow \qquad \cos ec\theta = \frac{1}{\sin\theta}$$

We also observe that

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \Rightarrow \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

(b) Trigonometric Ratios for some Std. Angles:

$\theta \rightarrow$	0	30^0	45^0	60^0	90^0
Sin	0	$\dfrac{1}{2}$	$\dfrac{1}{\sqrt{2}}$	$\dfrac{\sqrt{3}}{2}$	1
Cos	1	$\dfrac{\sqrt{3}}{2}$	$\dfrac{1}{\sqrt{2}}$	$\dfrac{1}{2}$	0
Tan	0	$\dfrac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
Cot	Not defined	$\sqrt{3}$	1	$\dfrac{1}{\sqrt{3}}$	0
Sec	1	$\dfrac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
Cosec	Not defined	2	$\sqrt{2}$	$\dfrac{2}{\sqrt{3}}$	1

(c) Trigonometric Ratio of Complementary Angles:

$\sin(90 - \theta) = \cos\theta$ $\cos(90 - \theta) = \sin\theta$

$\tan(90 - \theta) = \cot\theta$ $\cot(90 - \theta) = \tan\theta$

$\sec(90 - \theta) = \cos ec\,\theta$ $\cos ec(90 - \theta) = \sec\theta$

(d) Trigonometric Identities:

(i) $\sin^2\theta + \cos^2\theta = 1$ (A) $\sin^2\theta = 1 - \cos^2\theta$

(B) $\cos^2\theta = 1 - \sin 2\theta$

(ii) $1 + \tan^2\theta = \sec^2\theta$ (A) $\sec^2\theta - 1 = \tan^2\theta$

(B) $\sec^2\theta - \tan^2\theta = 1$

(C) $\tan^2\theta - \sec^2\theta = -1$

(iii) $1 + \cot^2\theta = \cos ec^2\theta$ (A) $\cos ec^2\theta - 1 = \cot^2\theta$

(B) $\cos ec^2\theta - \cot^2\theta = 1$

(C) $\cot^2\theta - \cos ec^2\theta = -1$

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