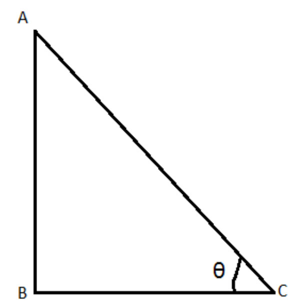
CHAPTER-8
TRIGONOMETRY
DAY 1

INTRODUCTION

The word 'Trigonometry' has been derived from two Greek words –'trigon' meaning triangle and 'metron' means measurement. Thus the word trigonometry means 'measurement of triangles. So the object of trigonometry is to solve problems connecting the sides to the angles of a triangle. It has very wider scope. It has its application in astronomy, geography, engineering, navigation etc. At the beginning, we shall take only right angled triangles.

TRIGONOMETRIC RATIOS (T-RATIOS) OF ANGLES



Consider a right triangle ΔABC, right angled at B

Let ∠ACB = θ **(Theta)** be an acute angle of ΔABC. It is noted that in ΔABC, BC is the **side opposite angle θ (Called perpendicular)**,

AC no doubt, is the hypotenuse of the triangle.

Define the Trigonometric ratios:

i) sine θ (or briefly $\mathbf{\sin\theta = \sin C}$) $= \dfrac{\textbf{Perpendicular}}{\textbf{Hypotenuse}} = \dfrac{\textbf{Side opposite to } \boldsymbol{\theta}}{\textbf{Hypotenuse}} = \dfrac{\mathbf{AB}}{\mathbf{AC}}$

ii) Cosine θ (or briefly $\mathbf{\cos\theta = \cos C}$) $= \dfrac{\textbf{Base}}{\textbf{Hypotenuse}} = \dfrac{\textbf{Side adjacent to } \boldsymbol{\theta}}{\textbf{Hypotenuse}} = \dfrac{\mathbf{BC}}{\mathbf{AC}}$

iii) Tangent θ (or briefly $\mathbf{\tan\theta = \tan C}$) $= \dfrac{\textbf{Perpendicular}}{\textbf{Base}} = \dfrac{\textbf{Side opposite to } \boldsymbol{\theta}}{\textbf{Side adjacent to } \boldsymbol{\theta}} = \dfrac{\mathbf{AB}}{\mathbf{BC}}$

iv) Cotangent θ (or briefly $\mathbf{\cot\theta = \cot C}$) $= \dfrac{\mathbf{1}}{\mathbf{\tan\theta}} = \dfrac{\textbf{Base}}{\textbf{Perpendicular}} = \dfrac{\mathbf{BC}}{\mathbf{AB}}$

v) Secant θ (or briefly $\mathbf{\sec\theta = \sec C}$) $= \dfrac{\mathbf{1}}{\mathbf{\cos\theta}} = \dfrac{\textbf{Hypotenuse}}{\textbf{Base}} = \dfrac{\mathbf{AC}}{\mathbf{BC}}$

vi) Cosecant θ (or briefly $\mathbf{cosec\,\theta = cosec\,C}$) $= \dfrac{\mathbf{1}}{\mathbf{\sin\theta}} = \dfrac{\textbf{Hypotenuse}}{\textbf{Perpendicular}} = \dfrac{\mathbf{AC}}{\mathbf{AB}}$

Some Key Points:

- $\frac{\sin\theta}{\cos\theta} = \frac{AB/_{AC}}{BC/_{AC}} = \frac{AB}{BC} = \tan\theta \qquad i.e.\ \tan\theta = \frac{\sin\theta}{\cos\theta}$
- $\cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$
- $\sin\theta$ is one term, sin and θ cannot be separated, $\sin\theta \neq \sin \times \theta$.
- $(\sin\theta)^2 = \sin^2\theta \neq \sin\theta^2$
- $\tan\theta \neq \frac{\sin}{\cos}\theta$
- Side opposite to the given angle in T Ratio is always considered as Perpendicular.

SUMMARY

In a right angled triangle, let '**P**' stands for **perpendicular**, '**B**' stands for **Base** and '**H**' stands for **'Hypotenuse'**. Then Six t-ratios are defined as

i) $\sin\theta = \frac{P}{H}$	ii) $\cos\theta = \frac{B}{H}$	iii) $\tan\theta = \frac{P}{B}$
iv) $\mathrm{cosec}\,\theta = \frac{H}{p}$	v) $\sec\theta = \frac{H}{B}$	vi) $\cot\theta = \frac{B}{P}$

The above T-ratios can be remembered as

sinθ	**cosθ**	**tanθ**
P andit	**B adri**	**P rasad**
H ar	**H ar**	**B ole**
cosecθ	**secθ**	**cotθ**