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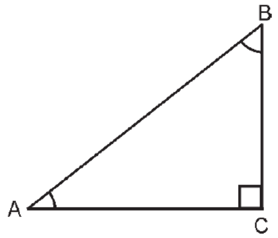
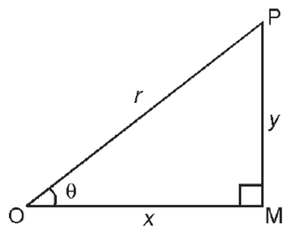
INTRODUCTION TO TRIGONOMETRY
CLASS 10

Basic Concepts

1. In trigonometry, we deal with relations between the sides and the angles of a triangle.
2. Ratios of the sides of a right angled triangle with respect to its acute angles, are called trigonometric ratios of the angle.
3. For ∠A, AC is the base, BC the perpendicular and AB is the hypotenuse. For ∠B, BC is the base, AC the perpendicular and AB is the hypotenuse.



4. **Six trigonometrical ratios**



(i) $sine\ \theta = \frac{Perpendicular}{Hypotenuse} = \frac{y}{r}$, sine θ is written as sin θ.

(ii) $cosine\ \theta = \frac{Base}{Hypotenuse} = \frac{x}{r}$, cosine θ is written as cos θ.

(iii) $tangent\ \theta = \frac{Perpendicular}{Base} = \frac{y}{x}$, tangent θ is written as tan θ.

(iv) $cotangent\ \theta = \frac{Base}{Perpendicular} = \frac{x}{y}$, cotangent θ is written as cot θ.

(v) $secant\ \theta = \frac{Hypotenuse}{Base} = \frac{r}{x}$, secant θ is written as sec θ.

(vi) $cosecant\ \theta = \frac{Hypotenuse}{Perpendicular} = \frac{r}{y}$, cosecant θ is written as cosec θ.

5. Relations between trigonometric ratios

(a) Reciprocal relations

(i) $cosec\ \theta = \frac{1}{\sin\theta}$ or $\sin\theta = \frac{1}{cosec\ \theta}$ or $\sin\theta\ cosec\ \theta = 1$

(ii) $\sec\theta = \frac{1}{\cos\theta}$ or $\cos\theta = \frac{1}{\sec\theta}$ or $\cos\theta\sec\theta = 1$

(iii) $\cot\theta = \frac{1}{\tan\theta}$ or $\tan\theta = \frac{1}{\cot\theta}$ or $\tan\theta\cot\theta = 1$

(b) Quotient relations

(i) $\tan\theta = \frac{\sin\theta}{\cos\theta}$

(ii) $\cot\theta = \frac{\cos\theta}{\sin\theta}$

6. $\sin A$ is a symbol which denotes the ratio $\frac{perpendicular}{hypotenuse}$. It does not mean the product of sin and A i.e. $\sin A \neq \sin\ \times\ A$. In fact sin separated from A has no meaning. Similar interpretations follow for other trigonometric ratios.

7. Table of values of various trigonometric ratios $0^0, 30^0, 45^0, 60^0, 90^0$.

T-ratios ↓ / θ →	0°	30°	45°	60°	90°
sin θ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan θ	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
cot θ	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
sec θ	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
cosec θ	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

Easier way to memorize the first row (values of sine ratio) as

sin	$0°$	$30°$	$45°$	$60°$	$90°$
	$\sqrt{\frac{0}{4}}$	$\sqrt{\frac{1}{4}}$	$\sqrt{\frac{2}{4}}$	$\sqrt{\frac{3}{4}}$	$\sqrt{\frac{4}{4}}$
	$= 0$	$= \frac{1}{2}$	$= \frac{1}{\sqrt{2}}$	$= \frac{\sqrt{3}}{2}$	$= 1$

8. Trigonometric ratios of complementary angles

(i) $\sin(90^0 - \theta) = \cos\theta$

(ii) $\cos(90^0 - \theta) = \sin\theta$

(iii) $\tan(90^0 - \theta) = \cot\theta$

(iv) $\cot(90^0 - \theta) = \tan\theta$

(v) $\sec(90^0 - \theta) = cosec\ \theta$

(vi) $cosec\ (90^0 - \theta) = \sec\theta$

9. Trigonometric Identities

(a) An equation involving trigonometric ratios of an angle θ (say) is said to be a trigonometric identity, if it is satisfied for all values of θ for which the given trigonometric ratios are defined.

(b) Some important trigonometric identities:

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

or $\sin^2\theta - 1 = \cos^2\theta$

or $\cos^2\theta - 1 = \sin^2\theta$

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

or $1 + \tan^2\theta = \sec^2\theta$

or $\tan^2\theta = \sec^2\theta - 1$

(iii) $cosec^2\theta - \cot^2\theta = 1$

or $cosec^2\theta = 1 + \cot^2\theta$

or $\cot^2\theta = cosec^2\theta - 1$

(c) The following steps should be kept in mind while proving trigonometric identities:

(i) Start with more complicated side of the identity and prove it equal to the other side.

(ii) If the identity contains sine, cosine and other trigonometric ratios, then express all the ratios in terms of sine and cosine.

(iii) If one side of an identity cannot be easily reduced to the other side value, then simplify both sides and prove them identically equal.

(iv) While proving identities, never transfer terms from one side to another.