

Class :- 10

Subject :- Opt Maths

Unit :- 2 (Trigonometry)

→ 17 Marks

Important formulae

Compound Angles

$$1. \sin(A+B) = \sin A \cdot \cos B + \cos A \cdot \sin B$$

$$2. \sin(A-B) = \sin A \cdot \cos B - \cos A \sin B$$

$$3. \cos(A+B) = \cos A \cdot \cos B - \sin A \sin B$$

$$4. \cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$5. \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$6. \tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$7. \cot(A+B) = \frac{\cot A \cot B - 1}{\cot B + \cot A}$$

$$8. \cot(A-B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$$

$$9. \tan(A+B+C) \\ = \frac{\tan A + \tan B + \tan C - \tan A \tan B \tan C}{1 - \tan A \tan B - \tan B \tan C - \tan C \tan A}$$

Multiple Angles,

$$1. \sin 2A = 2 \sin A \cos A$$

$$\Rightarrow \frac{2 \tan A}{1 + \tan^2 A}$$

$$2. \cos 2A = \cos^2 A - \sin^2 A$$

$$\Rightarrow 2 \cos^2 A - 1$$

$$\Rightarrow 1 - 2 \sin^2 A$$

$$\Rightarrow \frac{1 - \tan^2 A}{1 + \tan^2 A}$$

$$3. \tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$4. \sin 3A = 3 \sin A - 4 \sin^3 A$$

$$5. \cos 3A = 4 \cos^3 A - 3 \cos A$$

$$6. \tan 3A = \frac{3 \tan A - \tan^3 A}{1 - 3 \tan^2 A}$$

Sub-Multiple Angles

$$1. \sin A = 2 \sin \frac{A}{2} \cos \frac{A}{2}$$

$$\Rightarrow \frac{2 \tan \frac{A}{2}}{1 + \tan^2 \frac{A}{2}}$$

$$2. \cos A = \cos^2 \frac{A}{2} - \sin^2 \frac{A}{2}$$

$$\Rightarrow 2 \cos^2 \frac{A}{2} - 1$$

$$\Rightarrow 1 - 2 \sin^2 \frac{A}{2}$$

$$\Rightarrow \frac{1 - \tan^2 \frac{A}{2}}{1 + \tan^2 \frac{A}{2}}$$

$$3. \tan A = \frac{2 \tan \frac{A}{2}}{1 - \tan^2 \frac{A}{2}}$$

$$4. \sin A = 3 \sin \frac{A}{3} - 4 \sin^3 \frac{A}{3}$$

$$5. \cos A = \frac{4\cos^3 A}{3} - \frac{3\cos A}{3}$$

$$6. \tan A = \frac{3\tan \frac{A}{3} - \tan^3 \frac{A}{3}}{1 - 3\tan^2 \frac{A}{3}}$$

Transformation of Trigonometric Identities

$$1(a) 2\sin A \cos B = \sin(A+B) + \sin(A-B)$$

$$(b) 2\cos A \sin B = \sin(A+B) - \sin(A-B)$$

$$(c) 2\cos A \cos B = \cos(A+B) + \cos(A-B)$$

$$(d) 2\sin A \sin B = \cos(A-B) - \cos(A+B)$$

$$2(a) \sin C + \sin D = 2 \sin \frac{C+D}{2} \cos \frac{C-D}{2}$$

$$(b) \sin C - \sin D = 2 \cos \frac{C+D}{2} \sin \frac{C-D}{2}$$

$$(c) \cos C + \cos D = 2 \cos \frac{C+D}{2} \cos \frac{C-D}{2}$$

$$(d) \cos C - \cos D = 2 \sin \frac{C+D}{2} \sin \frac{D-C}{2}$$

$$\text{OR} \Rightarrow -2 \sin \frac{C+D}{2} \sin \frac{C-D}{2}$$

Values of Trigonometric Ratios

Angles	0°	30°	45°	60°	90°	120°	135°	150°	180°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{\sqrt{3}}{2}$	-1
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞	$-\sqrt{3}$	-1	$-\frac{1}{\sqrt{3}}$	0
cosec	∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞
sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞	-2	$-\sqrt{2}$	$-\frac{2}{\sqrt{3}}$	-1
cot	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	$-\frac{1}{\sqrt{3}}$	-1	$-\sqrt{3}$	∞

Height & Distance

1. Angle of Elevation:- The angle made by upward line of sight with horizontal line is called angle of elevation.

2. Angle of depression:- The angle made by downward line of sight with horizontal line is called angle of depression.