

# Concepts and Formulas

## Trigonometric Functions

### Trigonometric Equations

Trigonometric equations are equations using trigonometric functions with unknown angles.

e.g.,  $\cos \theta = 0$ ,  $\cos^2 \theta - 4 \cos \theta = 1$ .

The value of the unknown angle that satisfies a trigonometric equation is called a solution.

### Principal Solution

If the equation has a variable  $0 \leq x < 2\pi$ , then the solutions will be termed as principal solutions.

### General solution

A general solution is one that involves the integer 'n' and yields all trigonometric equation solutions. Also, the character 'Z' is used to denote the set of integers.

### Important Results:

- $\sin \theta = 0 \Leftrightarrow \theta = n\pi$
- $\cos \theta = 0 \Leftrightarrow \theta = (2n + 1)\frac{\pi}{2}$
- $\tan \theta = 0 \Leftrightarrow \theta = n\pi$
- $\sin \theta = \sin \alpha \Leftrightarrow \theta = n\pi + (-1)^n \alpha$ , where  $\alpha \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
- $\cos \theta = \cos \alpha \Leftrightarrow \theta = 2n\pi \pm \alpha$ , where  $\alpha \in [0, \pi]$
- $\tan \theta = \tan \alpha \Leftrightarrow \theta = n\pi + \alpha$ , where  $\alpha \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
- $\sin^2 \theta = \sin^2 \alpha \Leftrightarrow \theta = n\pi \pm \alpha$ .
- $\cos^2 \theta = \cos^2 \alpha \Leftrightarrow \theta = n\pi \pm \alpha$ .
- $\tan^2 \theta = \tan^2 \alpha \Leftrightarrow \theta = n\pi \pm \alpha$ .
- $\sin \theta = 1 \Leftrightarrow \theta = (4n + 1)\frac{\pi}{2}$
- $\cos \theta = 1 \Leftrightarrow \theta = 2n\pi$
- $\cos \theta = -1 \Leftrightarrow \theta = (2n + 1)\pi$ .
- $\sin \theta = \sin \alpha$  and  $\cos \theta = \cos \alpha \Leftrightarrow \theta = 2n\pi + \alpha$

