

Trigonometric Functions

CBSE Class 11 Maths · Knowledge organiser

KEY DEFINITIONS

Radian measure

An angle in radians is arc length $\div$ radius; π radians = 180° .

Periodic function

A function that repeats: $\sin x$ and $\cos x$ have period 2π .

Compound angle formula

Expands expressions such as $\sin(x + y)$ and $\cos(x + y)$.

YOU SHOULD BE ABLE TO...

- Convert between degrees and radians, use arc length, and find signs and values of trigonometric functions.
- Find all ratios from one, reduce large angles, and use compound-angle and double-angle formulae.
- Prove identities with sum-to-product and multiple-angle formulae and answer applied case studies.
- Find exact values such as $\tan(5\pi/12)$ and handle chains of identities.

COMMON MISTAKES

- ✗ Using degrees in $l = r\theta$: θ must be in radians.
- ✗ Sign of a ratio in quadrants II to IV taken from the acute-angle value only.
- ✗ $\sin(x + y) = \sin x + \sin y$ (false), or $\cos(x + y)$ with a plus sign between the products.
- ✗ $\cos 2x = 2 \cos x - 1$: the cosine is squared.

KEY FORMULAS

Radians; arc $\pi \text{ rad} = 180^\circ$; $l = r\theta$

Pythagorean $\sin^2 x + \cos^2 x = 1$, $1 + \tan^2 x = \sec^2 x$

Compound, $\sin$ $\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$

Compound, $\cos$ $\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$

Compound, $\tan$ $\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$

Double $\sin 2x = 2 \sin x \cos x$,
 $\cos 2x = 1 - 2 \sin^2 x = 2 \cos^2 x - 1$

Double, $\tan$ $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$

Triple $\sin 3x = 3 \sin x - 4 \sin^3 x$,
 $\cos 3x = 4 \cos^3 x - 3 \cos x$

$\sin A + \sin B$ $\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$

$\cos A + \cos B$ $\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$

$\cos A - \cos B$ $\cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$

Signs: All, Sin, Tan, Cos in quadrants I to IV; $\sin, \cos$ period 2π , $\tan$ period π

WORKED EXAMPLE

Convert 225° to radians.

$$225 \times \frac{\pi}{180} = \frac{5\pi}{4}.$$