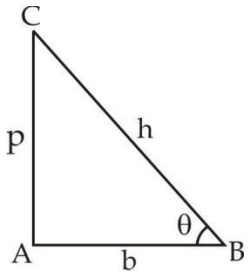
# Important Trigonometric Ratio Identities

## Trigonometric Ratios

To study different trigonometric ratio fucntions , we will use a right angled triangle . Suppose ABC is a right angled triangle with angle A = 90°




$$\sin\theta = \frac{AC}{BC} = \frac{p}{h} = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$$

$$\cos\theta = \frac{AB}{BC} = \frac{b}{h} = \frac{\text{Base}}{\text{Hypotenuse}}$$

$$\tan\theta = \frac{AC}{AB} = \frac{p}{b} = \frac{\text{Perpendicular}}{\text{Base}}$$



## Relations between Trigonometric Ratios

(i) $\mathbf{cosec\ \theta = \frac{1}{\sin\theta}}$ **Or** $\mathbf{cosec\ \theta \times \sin\theta = 1}$

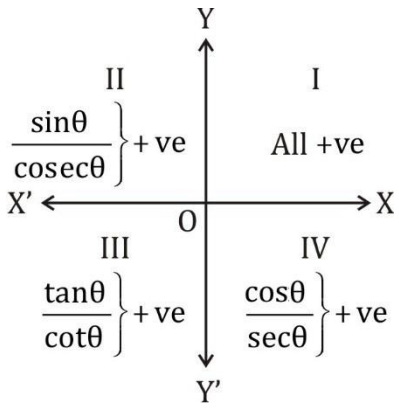
(ii) $\mathbf{sec\ \theta = \frac{1}{\cos\theta}}$ **Or** $\mathbf{sec\ \theta \times \cos\theta = 1}$

(iii) $\mathbf{cot\ \theta = \frac{1}{\tan\theta}}$ **Or** $\mathbf{cot\ \theta \times \tan\theta = 1}$

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

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

## Value of Trigonometric Ratios in Different Quadrants




## Different Values of Specific Angle of Trigonometric Ratio

You must learn the following table to solve the question based on trigonometrical ratio of angle 0°, 30°, 45°, 60°,

| θ | 0° | 30° | 45° | 60° | 90° |
|---|---|---|---|---|---|
| sin | 0 | $\frac{1}{2}$ | $\frac{1}{\sqrt{2}}$ | $\frac{\sqrt{3}}{2}$ | 1 |
| cos | 1 | $\frac{\sqrt{3}}{2}$ | $\frac{1}{\sqrt{2}}$ | $\frac{1}{2}$ | 0 |
| tan | 0 | $\frac{1}{\sqrt{3}}$ | 1 | $\sqrt{3}$ | ∞ |
| cot | ∞ | $\sqrt{3}$ | 1 | $\frac{1}{\sqrt{3}}$ | 0 |
| sec | 1 | $\frac{2}{\sqrt{3}}$ | $\sqrt{2}$ | 2 | ∞ |
| cosec | ∞ | 2 | $\sqrt{2}$ | $\frac{2}{\sqrt{3}}$ | 1 |

## Relation Between Square Of Different Types Of Trigonometric ratios

(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) **$1 + \tan^2\theta = \sec^2\theta$ or $\tan^2\theta = \sec^2\theta - 1$ or $\sec^2\theta - \tan^2\theta = 1$**
(iii) **$1 + \cot^2\theta = \text{cosec}^2\theta$ or $\text{cosec}^2\theta - 1 = \cot^2\theta$ or $\text{cosec}^2\theta - \cot^2\theta = 1$**

## Important Concept to Solve a Specific Type of Question

**If A + B = 90°**

Results that are true always :

(i) **sin A. sec B = 1 or sin A = cos B**
(ii) **cos A. cosec B = 1 or sec A = cosec B**
(iii) **tan A. tan B = 1 or tan A = cot B**
(iv) **cot A. cot B = 1**
(v) **$\sin^2 A + \sin^2 B = 1$**
(vi) **$\cos^2 A + \cos^2 B = 1$**

## Important Formula for Sum and Difference Of Two Angles

(1) **sin (A+B) =sinA. cosB + cosA sinB**
(2) **sin(A - B) =sinA. cosB - cosA sinB**
(3) **cos(A+B) =cosA. cosB - sinA sinB**
(4) **cos(A-B) = cosA. cosB+sinA sinB**
(5) **2 sinA.cosB = sin(A+B)+sin (A-B)**
(6) **2 cosA. sinB = sin(A+B)-sin (A-B)**
(7) **2 sinA. sinB = cos(A-B)-cos(A+B)**
(8) **2 cosA.cosB = cos(A+B)+cos(A-B)**
(9) **$\sin^2$A-$\sin^2$B = sin(A+B). sin(A-B)**
(10) **$\cos^2$A-$\cos^2$B = cos(A+B).cos (A-B)**

## Different Formula For Tangent

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

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

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

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

(v) $\tan(45+\theta)=\frac{1+\tan\theta}{1-\tan\theta}=\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}$

(vi) $\tan(45-\theta)=\frac{1-\tan\theta}{1+\tan\theta}=\frac{\cos\theta-\sin\theta}{\cos\theta+\sin\theta}$