

Formulas of Trigonometry

10th

$$\begin{aligned} \underline{1} \quad \sin^2 \theta + \cos^2 \theta &= 1 & \underline{2} \quad 1 + \tan^2 \theta &= \sec^2 \theta & \underline{3} \quad 1 + \cot^2 \theta &= \operatorname{cosec}^2 \theta \\ 1 - \sin^2 \theta &= \cos^2 \theta & \sec^2 \theta - 1 &= \tan^2 \theta & \operatorname{cosec}^2 \theta - 1 &= \cot^2 \theta \\ 1 - \cos^2 \theta &= \sin^2 \theta & \sec^2 \theta - \tan^2 \theta &= 1 & \operatorname{cosec}^2 \theta - \cot^2 \theta &= 1 \end{aligned}$$

$$\underline{4} \quad \tan \theta = \frac{\sin \theta}{\cos \theta} \quad \underline{5} \quad \sec \theta = \frac{1}{\cos \theta} \quad \operatorname{cosec} \theta = \frac{1}{\sin \theta} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

[VIBA CLASSES]

11th

Category 1.

$$\begin{aligned} \text{Degree measure} &= \text{Radian measure} \times \frac{180^\circ}{\pi} \\ \text{Radian measure} &= \text{Degree measure} \times \frac{\pi}{180} \end{aligned} \quad \theta = \frac{l}{r}$$

Category 2.

$$\begin{aligned} \sin(A+B) + \sin(A-B) &= 2 \sin A \cos B \\ \sin(A+B) - \sin(A-B) &= 2 \cos A \sin B \\ \cos(A+B) + \cos(A-B) &= 2 \cos A \cos B \\ \cos(A+B) - \cos(A-B) &= -2 \sin A \sin B \end{aligned}$$

A > B
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Category 3.

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

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

Category 4.

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

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

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

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

Category 5 Half angle formulas

1. $\sin \theta = 2 \sin \theta/2 \cos \theta/2 = \frac{2 \tan \theta/2}{1 + \tan^2 \theta/2}$
2. $\cos \theta = \cos^2 \theta/2 - \sin^2 \theta/2 = \frac{2 \cos^2 \theta/2 - 1}{1 + \tan^2 \theta/2} = 1 - 2 \sin^2 \theta/2$
3. $\tan \theta = \frac{2 \tan \theta/2}{1 - \tan^2 \theta/2}$

Category 6 Golden formula [VIBA CLASSES]

1. $1 + \cos \theta = 2 \cos^2 \theta/2 \quad \parallel \quad 1 - \cos \theta = 2 \sin^2 \theta/2$

Category 7 1/3rd of angle formula

1. $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$
 2. $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$
 3. $\tan 3\theta = \frac{3 \tan \theta - \tan^3 \theta}{1 - 3 \tan^2 \theta}$
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Category 8 General solution

1. If $\sin \theta = 0$ then $\theta = n\pi, n \in \mathbb{Z}$
2. If $\cos \theta = 0$ then $\theta = (2n+1)\frac{\pi}{2}, n \in \mathbb{Z}$
3. If $\tan \theta = 0$ then $\theta = n\pi, n \in \mathbb{Z}$
4. If $\sin \theta = \sin \alpha$ then $\theta = n\pi + (-1)^n \alpha, n \in \mathbb{Z}$
5. If $\cos \theta = \cos \alpha$ then $\theta = 2n\pi \pm \alpha, n \in \mathbb{Z}$
6. If $\tan \theta = \tan \alpha$ then $\theta = n\pi + \alpha, n \in \mathbb{Z}$

CLASS 12th \rightarrow VIBA CLASSES

1. $\sin^{-1} x + \cos^{-1} x = \pi/2$
 $\sec^{-1} x + \operatorname{cosec}^{-1} x = \pi/2$
 $\tan^{-1} x + \cot^{-1} x = \pi/2$
2. $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \left(\frac{x+y}{1-xy} \right)$
 $\tan^{-1} x - \tan^{-1} y = \tan^{-1} \left(\frac{x-y}{1+xy} \right)$
3. $2 \tan^{-1} x = \sin^{-1} \left(\frac{2x}{1+x^2} \right) = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) = \tan^{-1} \left(\frac{2x}{1-x^2} \right)$
4. $\sin^{-1}(-x) = -\sin^{-1} x$
 $\cos^{-1}(-x) = \pi - \cos^{-1} x$
 $\sec^{-1}(-x) = \pi - \sec^{-1} x$
 $\cot^{-1}(-x) = \pi - \cot^{-1} x$

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