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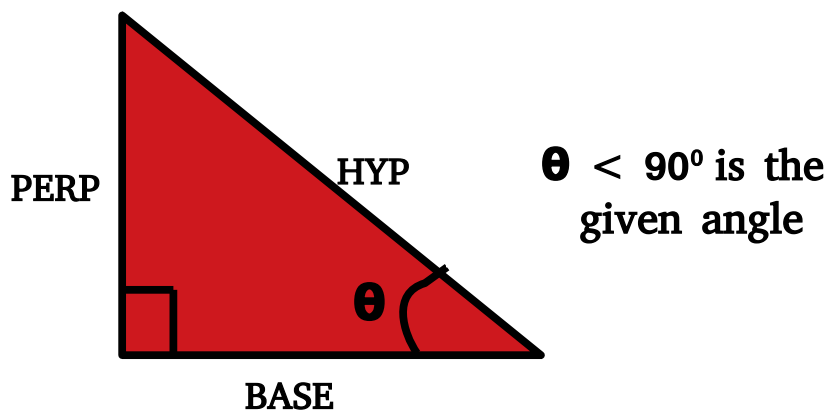
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TRIGONOMETRY FORMULAE

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TRIGONOMETRY

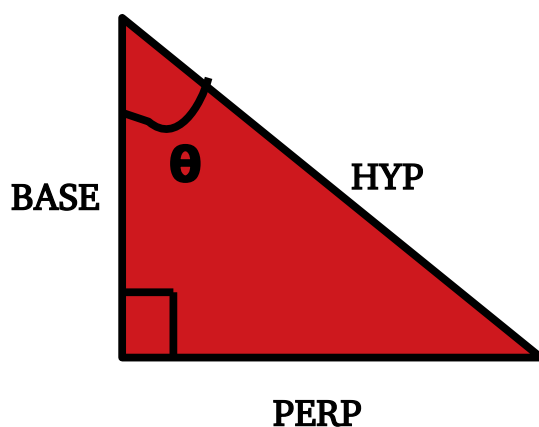


HYP = Hypotenuse
BASE = Base
PERP = Perpendicular

HYP is Opposite to Right Angle

BASE or Adjacent side is the side near to the Angle θ

PERP is Opposite to the Angle θ



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$$\sin \theta = \frac{P}{H}$$

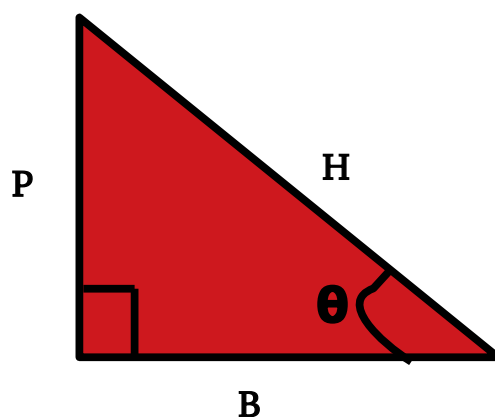
$$\cos \theta = \frac{B}{H}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\frac{P}{H}}{\frac{B}{H}} = \frac{P}{B}$$

$$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta} = \frac{\cos \theta}{\sin \theta} = \frac{B}{P}$$



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CO-FUNCTIONS

sine \leftrightarrow cosine
secant \leftrightarrow cosecant
tangent \leftrightarrow cotangent

Co-functions are obtained by adding or deleting “co” in the corresponding function.

RECIPROCAL

$\sin \theta \leftrightarrow \csc \theta$
 $\cos \theta \leftrightarrow \sec \theta$
 $\tan \theta \leftrightarrow \cot \theta$

CO-FUNCTIONS

$\sin \theta \leftrightarrow \cos \theta$
 $\sec \theta \leftrightarrow \csc \theta$
 $\tan \theta \leftrightarrow \cot \theta$

$$\begin{aligned}\sin^2 \theta + \cos^2 \theta &= 1 \\ \sec^2 \theta - \tan^2 \theta &= 1 \\ \csc^2 \theta - \cot^2 \theta &= 1\end{aligned}$$

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

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

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

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\begin{aligned}\cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\ &= 1 - 2 \sin^2 \theta \\ &= 2 \cos^2 \theta - 1\end{aligned}$$

$$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

$$\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$$

$$\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$$

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

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HALF ANGLE FORMULAE

$$\sin \theta = 2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$$

$$1 + \cos \theta = 2 \cos^2 \frac{\theta}{2}$$

$$1 - \cos \theta = 2 \sin^2 \frac{\theta}{2}$$

TRIGONOMETRIC RATIOS IN TERMS OF Tan θ

$$\sin 2\theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}$$

$$\cos 2\theta = \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta}$$

$$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

SUM TO PRODUCT FORMULAE

$$\sin C + \sin D = 2 \sin \frac{C + D}{2} \quad \cos \frac{C - D}{2}$$

$$\sin C - \sin D = 2 \cos \frac{C + D}{2} \quad \sin \frac{C - D}{2}$$

$$\cos C + \cos D = 2 \cos \frac{C + D}{2} \quad \cos \frac{C - D}{2}$$

$$\cos C - \sin D = -2 \sin \frac{C + D}{2} \quad \cos \frac{C - D}{2}$$

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Tip to remember Above Formulae

For R.H.S → Learn the song

“ sin cos
cos sin
cos cos
minus sin sin ” ♪

For L.H.S → Remember the Order

PRODUCT TO SUM FORMULAE

$$\sin A \cos B = \frac{1}{2} \{ \sin (A+B) + \sin (A-B) \}$$

$$\cos A \sin B = \frac{1}{2} \{ \sin (A+B) - \sin (A-B) \}$$

$$\cos A \cos B = \frac{1}{2} \{ \cos (A+B) + \cos (A-B) \}$$

$$\sin A \sin B = -\frac{1}{2} \{ \cos (A+B) - \cos (A-B) \}$$

DEGREES TO RADIANS

Multiply by $\frac{\pi}{180}$

$$\begin{aligned} \text{Example: } 60^\circ &= 60 \times \frac{\pi}{180} \\ &= \frac{\pi}{3} \end{aligned}$$

RADIANS TO DEGREES

Multiply by $\frac{180}{\pi}$

$$\begin{aligned} \text{Example: } \frac{\pi}{4} &= \frac{\pi}{4} \times \frac{180}{\pi} \\ &= 45^\circ \end{aligned}$$

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