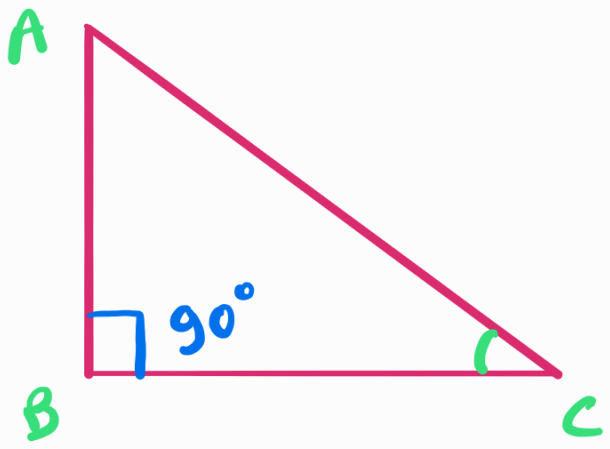
Trigonometric Ratio



Trigonometric ratio is about ratio of the sides of Right triangle

Angle $\angle B = 90^\circ$

Therefore, AC = Longest side

= opposite to the the 90° angle.

= Hypotenuse

If we consider Angle $\angle C$ then

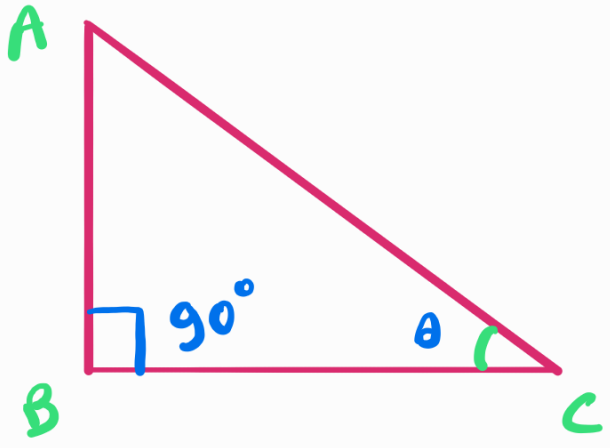
BC becomes adjecent side of $\angle C$

AB becomes opposite side of $\angle C$

AC is always hypotenuse

Note: If we consider $\angle A$ then opposite and adjacent side changes

So for above Right - triangle and Considering the angle $\angle C$, Trigonometric ratios are defined as follows:



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$\theta = \angle C$

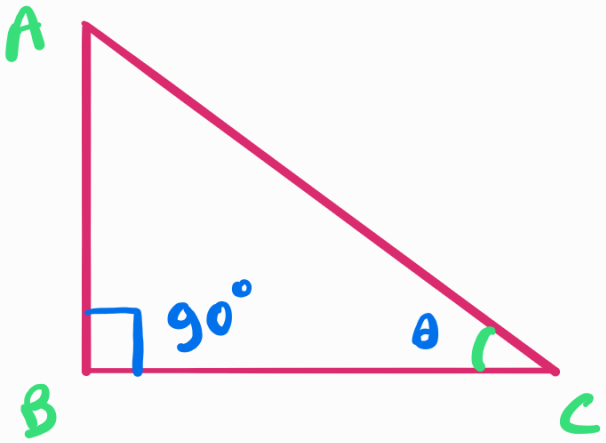
hypotenuse is the longest side

therefore, $\frac{\text{opposite}}{\text{hypotenuse}}$ and $\frac{\text{adjacent}}{\text{hypotenuse}}$

are practicaly less than 1

$$\sin\theta = \frac{AB}{AC}$$

$$\cos\theta = \frac{BC}{AC}$$



$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{AB}{AC}}{\frac{BC}{AC}} = \frac{AB}{BC}$$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{1}{\frac{AB}{BC}} = \frac{BC}{AB}$$

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

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

Note: Ratios do not change with the size of the triangle.
if the angle changes, the ratio changes.

$$\cot\theta = \frac{1}{\tan\theta}$$

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

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

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

Relations of trigonometric Ratios with each others.

Note: $\sin\theta$ is NOT a product of sin and θ

$$(\sin\theta)^2 \longrightarrow \sin^2\theta$$

Ranges of trigonometric Ratios

$$-1 \leq \sin\theta \leq 1$$

$$-1 \leq \cos\theta \leq 1$$