BEEXPERT

TRIGONOMETRIC IDENTITIES

(SINE AND COSINE ADDITION FORMULAS)

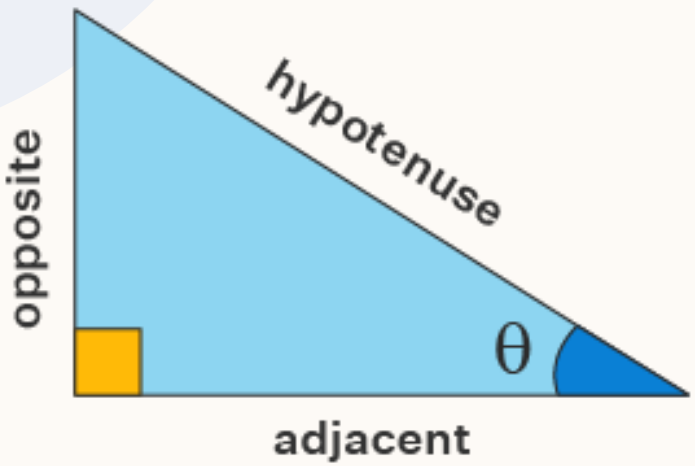
AGENDA

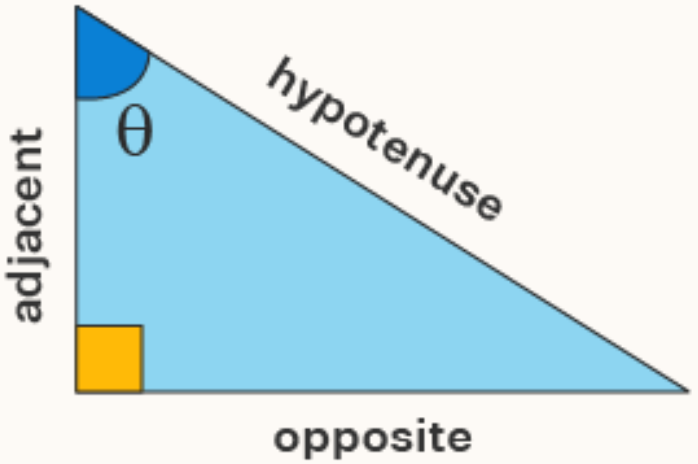
General Concept

Trigonometry Table

Sine and Cosine Addition Formulas

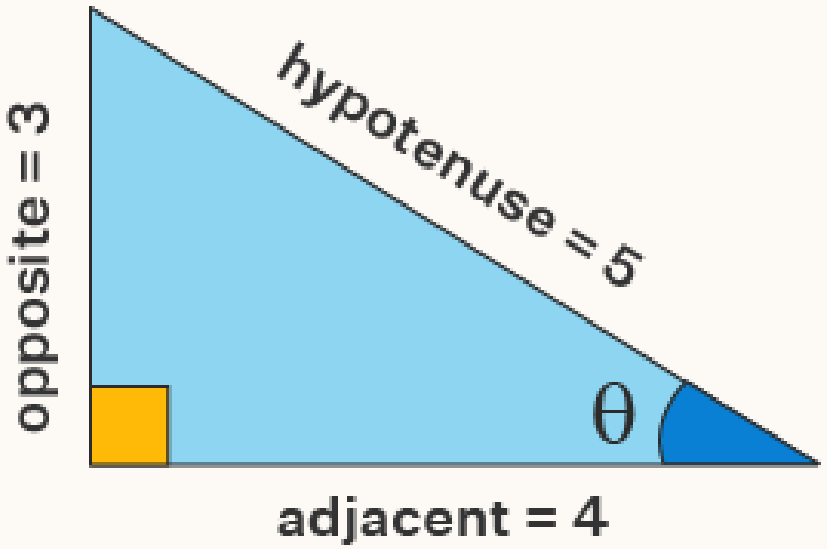
GENERAL CONCEPT





- $sin\theta = \frac{opposite}{hypothenuse}$
- $\cos\theta = \frac{adjacent}{hypothenuse}$
- $\tan\theta = \frac{opposite}{adjacent}$

GENERAL CONCEPT: EXAMPLE



Find the $sin\theta$, $cos\theta$, and $tan\theta$ using formulas from the previous slide.

- $sin\theta = \frac{opposite}{hypothenuse} = \frac{3}{5}$
- $cos\theta = \frac{adjacent}{hypothenuse} = \frac{4}{5}$
- $tan\theta = \frac{opposite}{adjacent} = \frac{3}{4}$

TRICK TO REMEMBER SIN COS TAN FORMULAS

$$SOH \longrightarrow \sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$CAH \longrightarrow \cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$TOA \longrightarrow \tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

TRIGONOMETRY TABLE

Trigonometry table is a chart with the trigonometric values of sine, cosine, and tangent functions for some standard angles 30°, 45°, 60°, and 90°.

θ	$0°$ (or) 0	$30°$ (or) $\frac{\pi}{6}$	$45°$ (or) $\frac{\pi}{4}$	$60°$ (or) $\frac{\pi}{3}$	$90°$ (or) $\frac{\pi}{2}$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Not Defined

TIPS TO REMEMBER TRIGONOMETRY TABLE

- The angle 30°, 45°, 60°, and 90° is in order.
- The first row (of sin) can be remembered like this: **0**/2, √**1**/2, √**2**/2, √**3**/2, √**4**/2.
- That's all you need to remember because:
  - **The row of cos** is as same as the row of sin just in the **reverse order**.
  - Each value in the row of tan is obtained by dividing the corresponding values of sin by cos because **tan = sin/cos**.

θ	0° (or) 0	30° (or) $\frac{\pi}{6}$	45° (or) $\frac{\pi}{4}$	60° (or) $\frac{\pi}{3}$	90° (or) $\frac{\pi}{2}$
sin θ	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan θ	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Not Defined

SINE AND COSINE ADDITION FORMULAS

- Sine
  - $\sin(\alpha + \beta) = sin\alpha \cdot cos\beta + cos\alpha \cdot sin\beta$
  - $\sin(\alpha - \beta) = sin\alpha \cdot cos\beta - cos\alpha \cdot sin\beta$
- Cosine
  - $\cos(\alpha + \beta) = cos\alpha \cdot cos\beta - sin\alpha \cdot sin\beta$
  - $\cos(\alpha - \beta) = cos\alpha \cdot cos\beta + sin\alpha \cdot sin\beta$

Additional: $sin^2\alpha + cos^2\beta = 1$

SINE AND COSINE ADDITION FORMULAS: EXAMPLE

$$sin36° \cdot cos24° + cos36° \cdot sin24°$$

Use Sine Addition formula:

$$\sin(\alpha + \beta) = sin\alpha \cdot cos\beta + cos\alpha \cdot sin\beta$$

$$\sin(36° + 24°) = sin36° \cdot cos24° + cos36° \cdot sin24°$$

$$\mathbf{sin(60°)} = sin36° \cdot cos24° + cos36° \cdot sin24°$$

Therefore,

$$sin36° \cdot cos24° + cos36° \cdot sin24° = \frac{\sqrt{3}}{2}$$

REFERENCES:

- https://www.cuemath.com/trigonometry/sin-cos-tan/
- https://www.mathcentre.ac.uk/resources/uploaded/mc-ty-addnformulae-2009-1.pdf