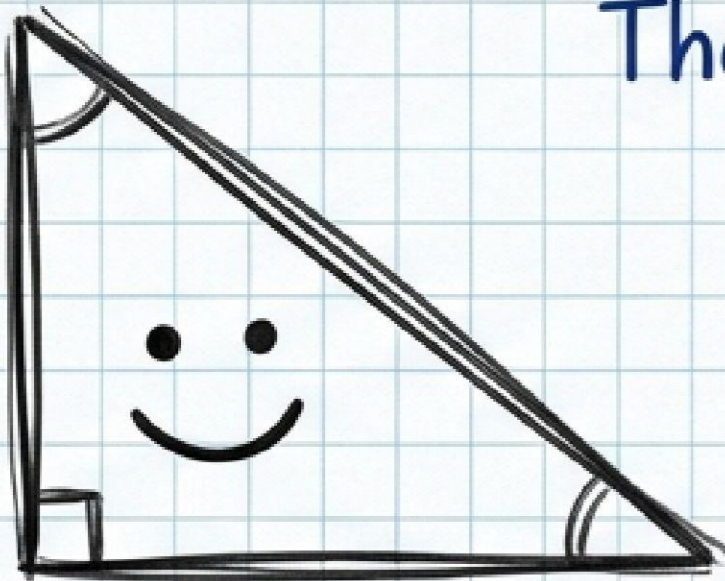


# Trigonometry Revision Notes

Core Concepts  
+ Formulas  
+ Hacks

The Cheat Sheet for Triangles, Angles & Ratios.

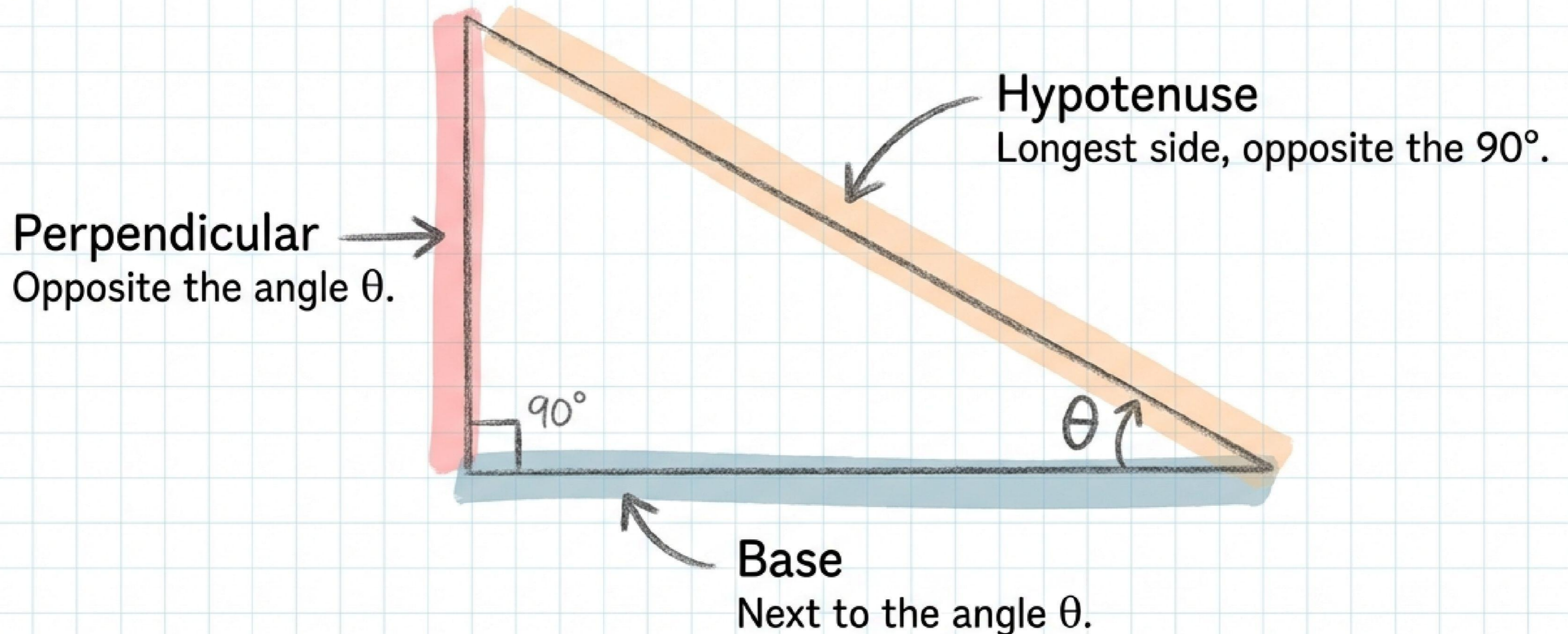


Name: [User/Presenter]  
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# The Anatomy of a Right-Angled Triangle

**Trigonometry** studies the relationship between angles and sides.

Crucial Rule: This only works for **Right-Angled Triangles!**



# The Big Three: Primary Ratios

Remember: these are relative to angle  $\theta$ .

$$\sin \theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$$

**SOH**

$$\cos \theta = \frac{\text{Base}}{\text{Hypotenuse}}$$

**CAH**

$$\tan \theta = \frac{\text{Perpendicular}}{\text{Base}}$$

**TOA**

# The Flip Side: Reciprocal Ratios

$\sin \theta$   $\xrightarrow{\text{Flip it!}}$   $\operatorname{cosec} \theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}}$   
(Text: Reciprocal of Sine)

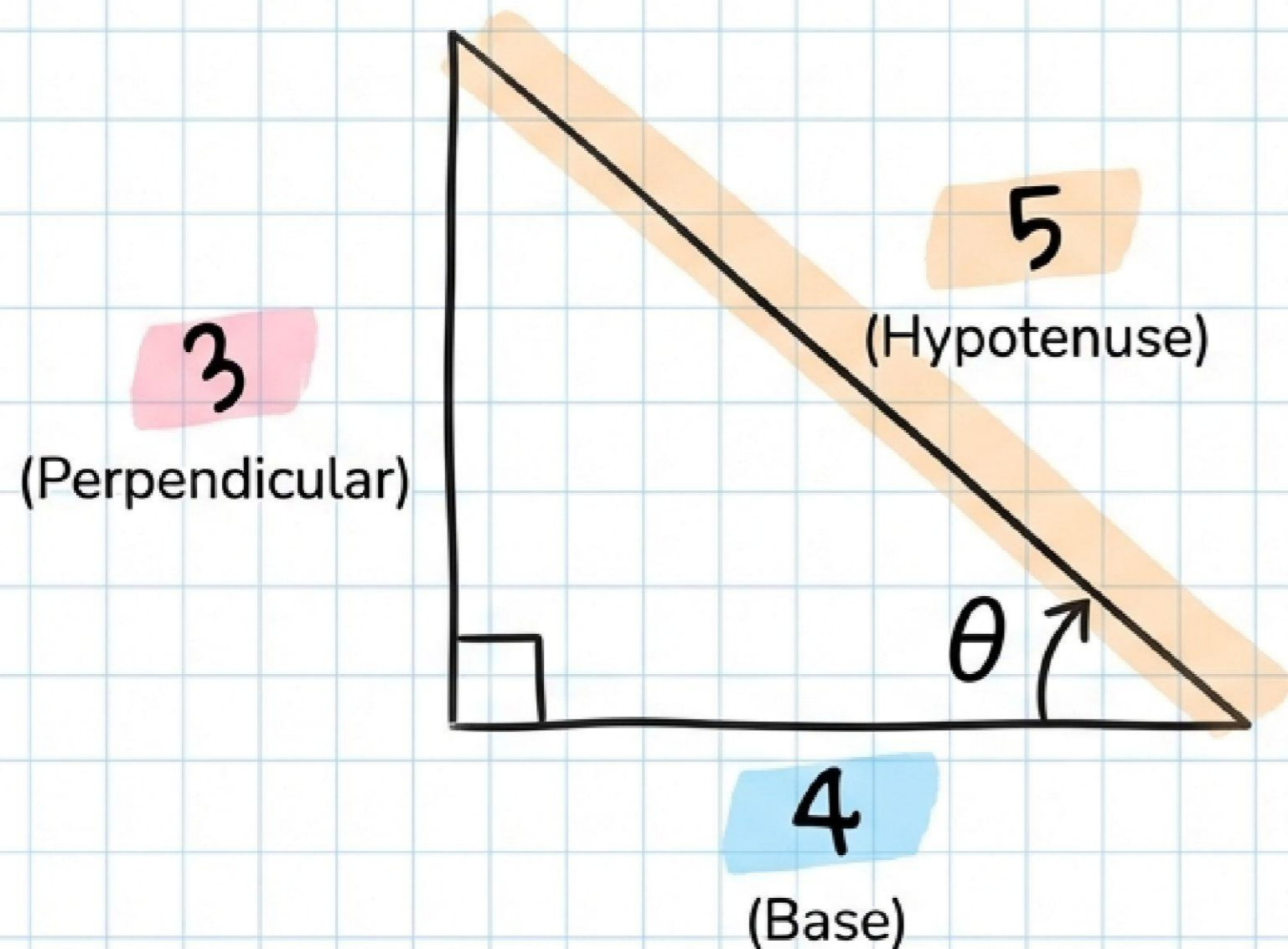
$\cos \theta$   $\xrightarrow{\text{Flip it!}}$   $\sec \theta = \frac{\text{Hypotenuse}}{\text{Base}}$   
(Text: Reciprocal of Cosine)

$\tan \theta$   $\xrightarrow{\text{Flip it!}}$   $\cot \theta = \frac{\text{Base}}{\text{Perpendicular}}$   
(Text: Reciprocal of Tangent)

**Pro-Tip:** Easy mix-up! 'Sec' goes with 'Cos', 'Cosec' goes with 'Sin'.  
Check the 3rd letter! (S in coSec -> Sin, C in seC -> Cos).

# Let's try it: The 3-4-5 Triangle

Here's a classic example to practice.



$$\sin \theta = \frac{3}{5}$$

$$\cos \theta = \frac{4}{5}$$

$$\tan \theta = \frac{3}{4}$$

## Steps

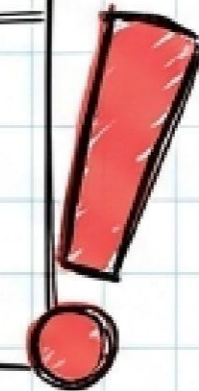
- 1. Identify the Angle.
- 2. Label the sides.
- 3. Pick the ratio.

# Memorise This Table!

Angle	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$
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	$\sqrt{3}$	$\infty$

⇒ Values go UP

⇒ Values go DOWN



$$\sin^2\theta + \cos^2\theta = 1$$

This is the most important one. The MVP.

$$1 + \tan^2\theta = \sec^2\theta$$

$$1 + \cot^2\theta = \operatorname{cosec}^2\theta$$

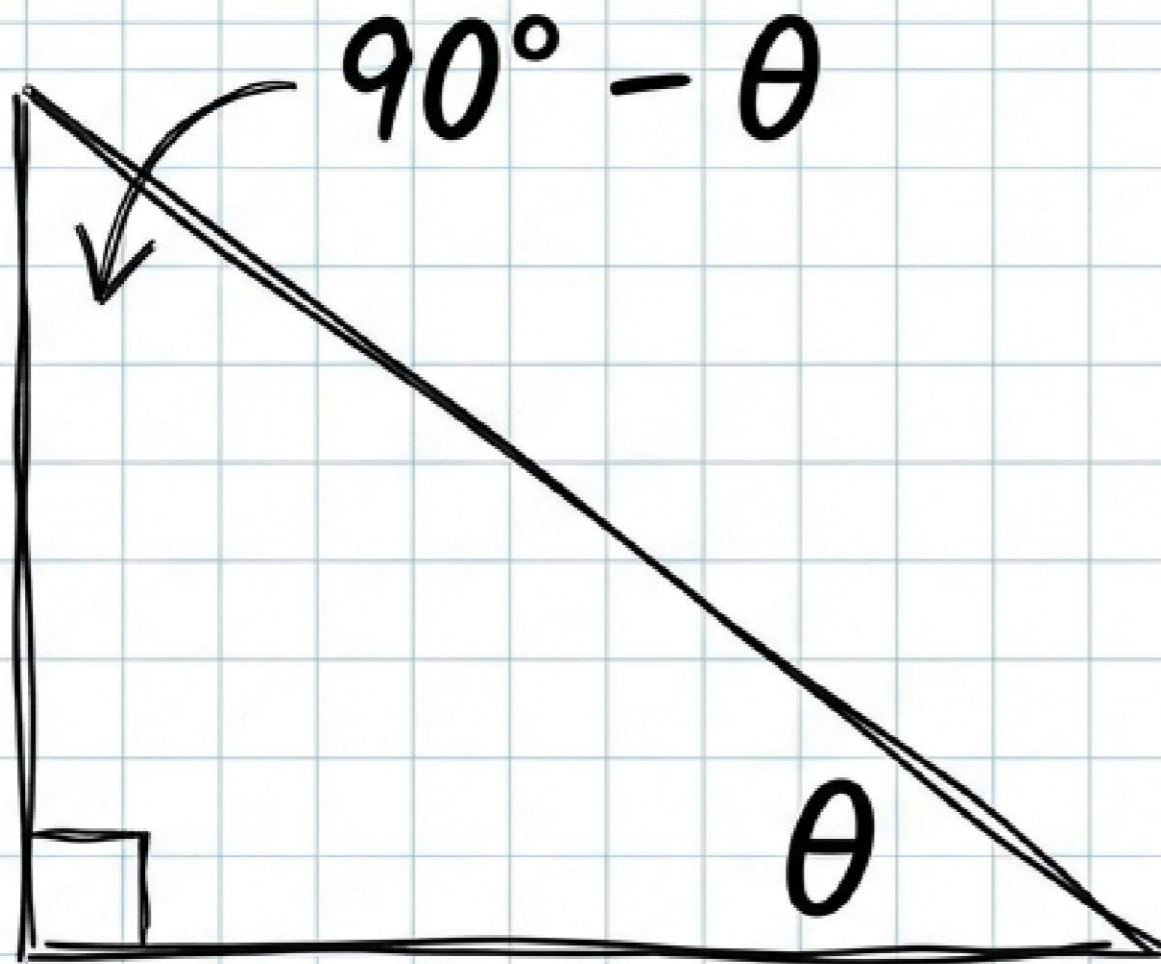
Example: If  $\sin\theta = 1/2$ , find  $\cos\theta$ .

Step 1:  $\cos\theta = \sqrt{1 - \sin^2\theta}$

Step 2:  $= \sqrt{1 - (1/2)^2}$

Step 3:  $= \sqrt{1 - 1/4} = \sqrt{3/4} = \sqrt{3}/2$

# Complementary Angles $(90^\circ - \theta)$



$$\sin(90^\circ - \theta) = \cos \theta$$

$$\cos(90^\circ - \theta) = \sin \theta$$

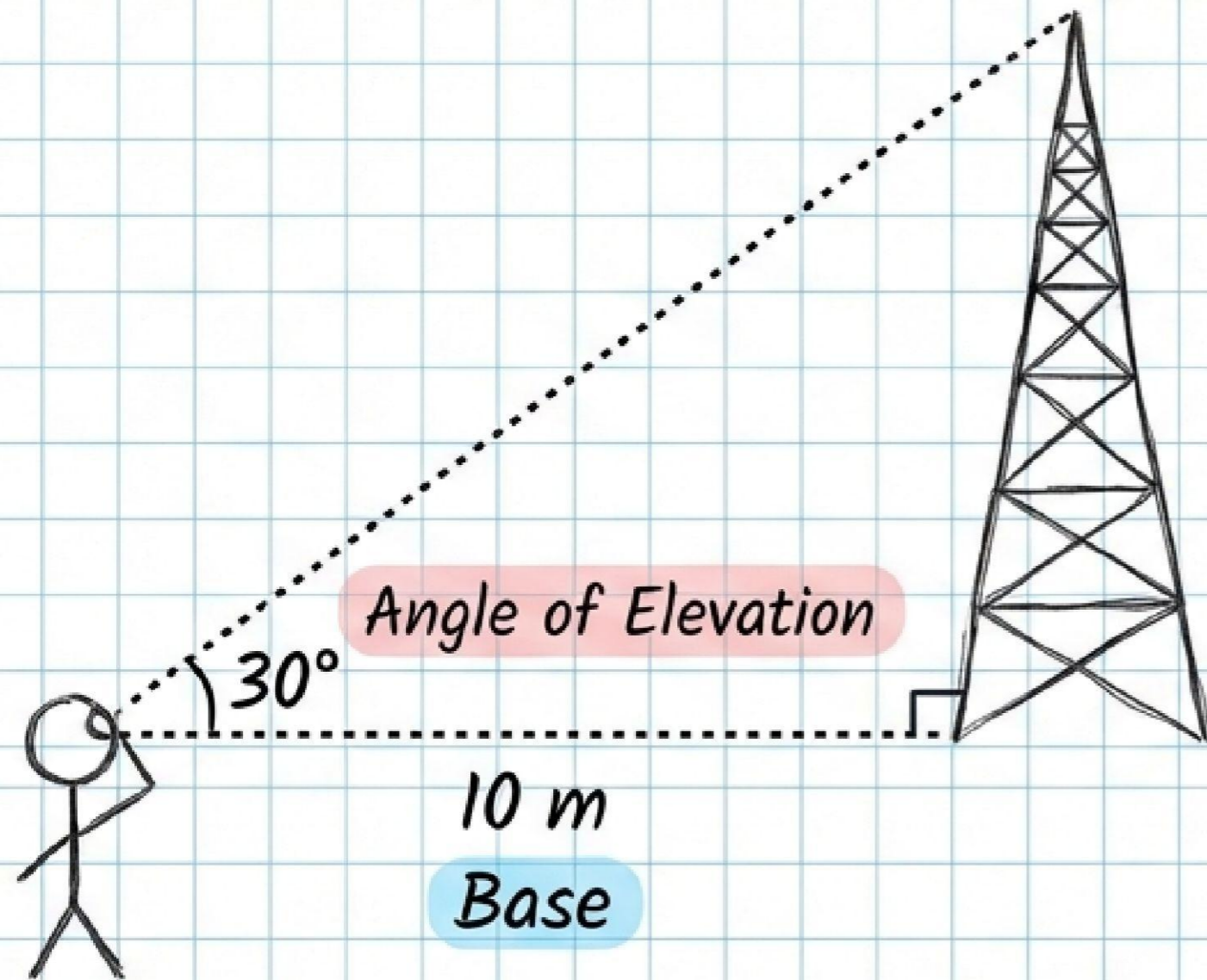
$$\tan(90^\circ - \theta) = \cot \theta$$

$$\sec(90^\circ - \theta) = \operatorname{cosec} \theta$$

$$\operatorname{cosec}(90^\circ - \theta) = \sec \theta$$

# Real World: Heights & Distances

Calculate heights of objects (like towers) without climbing them.



We know Base (10) and Angle (30°)  
We want Perpendicular (Height)

Use Tan! ( $\tan = \frac{P}{B}$ )

$$\text{Height} = 10 \times \tan 30^\circ$$

$$\text{Height} = 10 \times \frac{1}{\sqrt{3}} = \frac{10}{\sqrt{3}} \text{ meters.}$$

# Quick Quiz: Test Yourself

Q1.  $\sin 30^\circ$  is equal to:

a) 1

b)  $1/2$

c)  $\sqrt{3}/2$

d) 0

Q2. Which ratio is equal to Perpendicular/Base?

a)  $\sin$

b)  $\cos$

c)  $\tan$

d)  $\sec$

Q3. Value of  $\cos 60^\circ$  is:

a) 1

b)  $1/2$

c)  $\sqrt{3}/2$

d) 0

Q4.  $\sin^2 \theta + \cos^2 \theta$  equals:

a) 0

b) 1

c) 2

d)  $\tan \theta$

# Quick Quiz: Solutions

Q1.  $\sin 30^\circ$  is equal to:

a)  $1/2$

**b)  $1/2$**

c)  $3/4$

d)  $1/2$

Check table!

Q2. Which ratio is equal to Perpendicular/Base?

a)  $\tan$

b)  $\text{pad}$

**c)  $\tan$**

d)  $\sin$

TOA!

Q3. Value of  $\cos 60^\circ$  is:

a)  $1/2$

**b)  $1/2$**

c)  $3/4$

d)  $1/2$

Same as  $\sin 30^\circ$ .

Q4.  $\sin^2\theta + \cos^2\theta$  equals:

a) 0

**b) 1**

c) 2

d) 2

The MVP Identity.

# The One-Pager (Snapshot This!)

## Ratios

$$\sin = P/H$$

$$\cos = B/H$$

$$\tan = P/B$$

(SOH CAH TOA)

## Table

$\theta$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	N/A

## Identities

$$\sin^2 + \cos^2 = 1$$

$$1 + \tan^2 = \sec^2$$

$$1 + \cot^2 = \operatorname{cosec}^2$$

## Complementary

$$\sin(90-\theta) = \cos\theta$$

$$\cos(90-\theta) = \sin\theta$$

$$\tan(90-\theta) = \cot\theta$$

Good Luck!