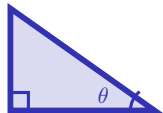


Trigonometry

IGCSE Mathematics ■ Topic 6

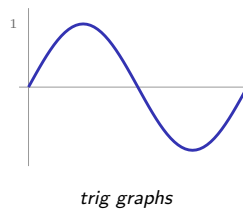
IGCSE Mathematics



Trigonometry

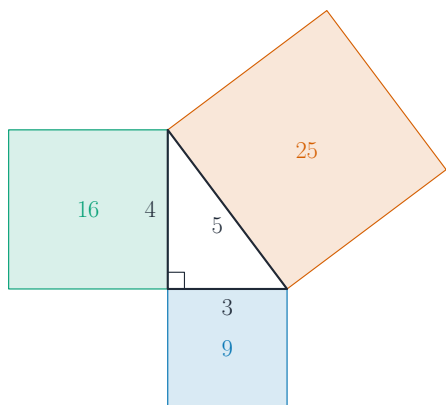
What we will cover

- 1 Pythagoras' theorem
- 2 SOH-CAH-TOA
- 3 Elevation & depression
- 4 Exact values
- 5 Trig graphs
- 6 Sine & cosine rules



1 Right-angled triangles

Pythagoras' theorem

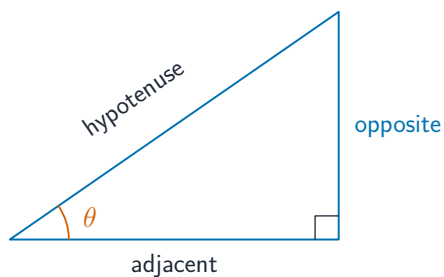


$$a^2 + b^2 = c^2.$$

Use it to find a missing side.

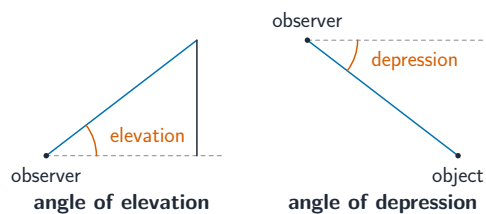
$$b^2 = 13^2 - 5^2 = 169 - 25 = 144, \quad b =$$

SOH-CAH-TOA



- $y = \sin x$ is a wave starting at 0, peaking at 90° , back to 0 at 180° , down to -1 at 270° .
- $y = \cos x$ is the same wave but starting at 1.
- $y = \tan x$ rises steeply and repeats every 180° .

Elevation and depression



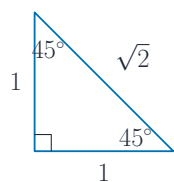
The **angle of elevation** 仰角 looks **up**; the **angle of depression** 俯角 looks **down**.
Tower: $50 \tan 40^\circ = 42.0 \text{ m}$.

2 Values and graphs

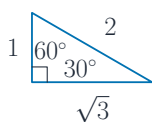
Trigonometry
└ Values and graphs

Exact values

	30°	45°	60°
sin	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$



45° triangle

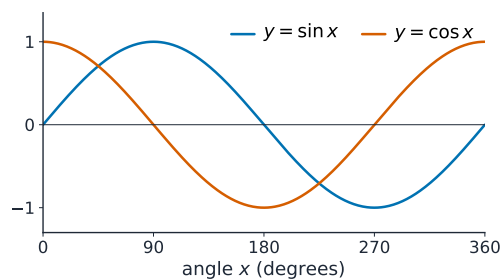


30°-60° triangle

- $y = \sin x$ is a wave starting at 0, peaking at 90° , back to 0 at 180° , down to -1 at 270° .
- $y = \cos x$ is the same wave but starting at 1.
- $y = \tan x$ rises steeply and repeats every 180° .

Trigonometry
└ Values and graphs

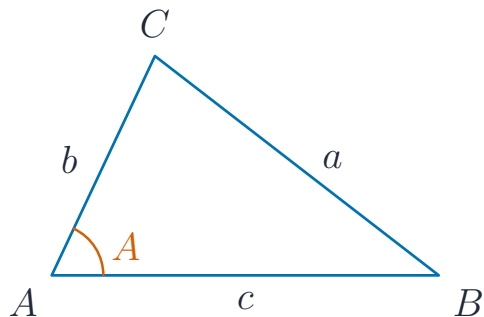
Trig graphs



$y = \sin x$ & $y = \cos x$ are waves between -1 & 1 .

A trig equation has **several** answers in $0-360^\circ$ – use the wave's symmetry. $\sin x = \frac{\sqrt{3}}{2} \Rightarrow x = 60^\circ$ or 120° .

Sine and cosine rules



- $y = \sin x$ is a wave starting at 0, peaking at 90° , back to 0 at 180° , down to -1 at 270° .
- $y = \cos x$ is the same wave but starting at 1.
- $y = \tan x$ rises steeply and repeats every 180° .

3

Recap

Worked example – Pythagoras

A right-angled triangle has hypotenuse 13 cm and one short side 5 cm. Find the other short side.

- $a^2 + b^2 = c^2$, where c is the **hypotenuse** (opposite the right angle).
- $5^2 + b^2 = 13^2$
- $25 + b^2 = 169 \Rightarrow b^2 = 144$
- $b = \sqrt{144} = 12 \text{ cm}$

Finding a **shorter** side means **subtract**; finding the hypotenuse means **add**. Check: the hypotenuse must be the **longest** side.

Topic 6 – key takeaways

1 Pythagoras

$a^2 + b^2 = c^2$ for a right triangle

2 Ratios

SOH-CAH-TOA; inverse to find an angle

3 Graphs

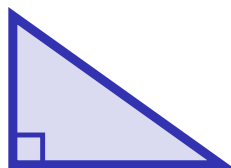
sine & cosine waves; many solutions

4 Any triangle

the sine rule & the cosine rule

Check yourself

- 1 What is the hypotenuse?
- 2 Which ratio is opp over adj?
- 3 What is $\sin 30^\circ$ exactly?
- 4 Which rule works for a non-right triangle?



Answers 1. the longest side, opposite the right angle 2. tangent 3. $\frac{1}{2}$ 4. the sine or cosine rule