

Geometry – Pythagoras & Trigonometry

Key Knowledge/Prior Learning KS2/3 and Retrieval and Suggested Starters

- To be able to calculate the perimeter and area of a triangle
- To be able to identify square numbers
- To understand the concept of square rooting a number
- To be able to calculate the area of a compound shape
- To be able to identify different types of triangles

KS3 National Curriculum – what students will be practicing

- To be able to calculate the hypotenuse of a triangle using Pythagoras
- To be able to calculate a shorter length of a triangle using Pythagoras
- To be able to solve problems linking to Pythagoras' theorem.
- To be able to label sides opposite, hypotenuse and adjacent
- To be able to recognise which trigonometric function to use (SOHCAHTOA)
- To be able to use trigonometry to calculate the size of one length
- To be able to use trigonometry to calculate the size of an angle
- To be able to solve problems linked to trigonometry (area or perimeter)
- To be able to calculate the area of a triangle using trigonometry (the formula)

Specific Ambitious Knowledge

- To be able to use Pythagoras theorem in 3 dimensions
- To be able to use trigonometry in 3 dimensions
- To be able link Pythagoras to volumes of 3D shapes
- To recall key exact values using trig
- To be able to give answers as surds
- To be able to use the sine rule
- To be able to use the cosine rule
- To know which rule to use (sine / cosine)
- To be able to calculate the area of a segment

Key Vocabulary/Literacy Opportunities

- Right-angle
- Square
- Square-root
- Perpendicular height
- Parallel
- Hypotenuse
- Opposite
- Adjacent
- Sine
- Cos
- Tan
- Inverse

• SOHCAHTOA

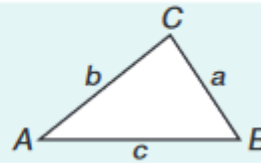
Key Formulae/Knowledge

Trigonometric formulae

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

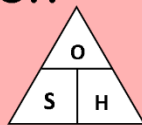
Area of triangle $= \frac{1}{2} ab \sin C$



SOHCAHTOA

www.cazoommaths.com

SOH

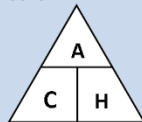


$\sin = \frac{\text{OPPOSITE}}{\text{HYPOTENUSE}}$

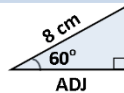


$\sin 30 = \frac{\text{OPP}}{7}$
 $\sin 30 \times 7 = \text{OPP}$
OPP = 3.5 cm

CAH

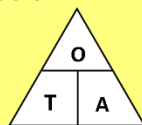


$\cos = \frac{\text{ADJACENT}}{\text{HYPOTENUSE}}$

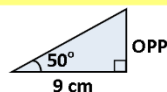


$\cos 60 = \frac{\text{ADJ}}{8}$
 $\cos 60 \times 8 = \text{ADJ}$
ADJ = 4 cm

TOA



$\tan = \frac{\text{OPPOSITE}}{\text{ADJACENT}}$



$\tan 50 = \frac{\text{OPP}}{9}$
 $\tan 50 \times 9 = \text{OPP}$
OPP = 10.7 cm

	0°	30°	45°	60°	90°
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	$\sqrt{3}$	—

Maths in context

Is there a link between cos and sin?

Could you use different versions of SOHCAHTOA to get the same length?

Projects/Enrichment/Investigations

- Investigation / plot the graphs of each trig identity
- How many Pythagorean triples can you find?

Career links

Crime scene investigators – Investigators use trig to determine the position of individuals involved in crime to work out angles of wounds and the likelihood of different people causing the wound.

Pilots – pilots are required to have an extensive knowledge of trig. This helps with the takeoff, the landing and estimating the timings of the flight as well as overcoming issues with weather.

Architecture and construction – when constructing buildings, you must have an understanding of these topics in order to calculate the correct measurements for properly sized beams, a roof and to make sure all parts of the building are correctly supported.

Hook questions / ideas

Is this possible? <https://en-gb.padlet.com/tessmaths1/hooks/wish/2227828213>

This is why we need Pythagoras and trig in construction.

<https://en-gb.padlet.com/tessmaths1/hooks/wish/179119721> Pythagoras helps you spot shortcuts in life!

<https://en-gb.padlet.com/tessmaths1/hooks/wish/191742017>

<https://www.bing.com/videos/search?q=water+demonstration+of+pythagoras&view=detail&mid=F2DF55E529A98F8187FFF2DF55E529A98F8187FF&FORM=VIRE>