

GCSE / IGCSE Maths – Trigonometry

GCSE/IGCSE (Higher) · Total marks: 56 · Answers on the last page

Right-angled trigonometry (SOHCAHTOA), exact values, the sine and cosine rules, area of a triangle, 3D problems and trigonometric graphs. Section A is non-calculator; a scientific calculator is needed for Sections B and C. Allow about 60 minutes.

Section A – Skills (Non-calculator. Give exact answers.)

- Write down the exact value of:
 - $\sin 30^\circ$
 - $\cos 45^\circ$
 - $\tan 60^\circ$
 - $\cos 90^\circ$[4]
- A right-angled triangle has a hypotenuse of 10 cm and one angle of 30° . Find the exact lengths of the other two sides. [3]
- In triangle PQR , angle $Q = 90^\circ$, $PQ = 3$ cm and $QR = 4$ cm.
 - Find PR .
 - Write down the value of $\tan P$.
 - Write down the value of $\sin R$.[4]
- The graph of $y = \sin x$ is drawn for $0^\circ \leq x \leq 360^\circ$.
 - Write down the maximum value of y and the value of x at which it occurs.
 - Write down the two values of x in this range for which $\sin x = 0$, other than $x = 0^\circ$.
 - Given that $\sin 50^\circ \approx 0.766$, use the symmetry of the graph to write down another solution of $\sin x = 0.766$ in the range $0^\circ \leq x \leq 360^\circ$. [4]

Section B – Exam-style (Calculator allowed. Give answers to 3 significant figures unless stated.)

- A right-angled triangle has hypotenuse 8 cm and one angle of 35° . Find the length of the side opposite the 35° angle.
 - In a different right-angled triangle, the side adjacent to an angle of 52° is 5 cm. Find the hypotenuse.
 - A ramp rises 7 m over a horizontal distance of 12 m. Find the angle the ramp makes with the horizontal. [6]
- A ladder of length 6 m leans against a vertical wall, making an angle of 70° with the horizontal ground. Find how far the foot of the ladder is from the wall, giving your answer to 2 decimal places. [2]
- In triangle ABC , angle $A = 38^\circ$, angle $B = 71^\circ$ and $BC = 9$ cm.
 - Find the length of AC .
 - Find the size of angle C . [4]
- In triangle XYZ , $XY = 7$ cm, $XZ = 10$ cm and angle $X = 58^\circ$.
 - Find the length of YZ .
 - Find the area of triangle XYZ . [5]
- A triangle has sides of length 8 cm, 11 cm and 14 cm. Find the size of the largest angle. [3]

10. A cuboid has length 8 cm, width 6 cm and height 5 cm. Vertex A is at one bottom corner and vertex G is the top corner diagonally opposite.
- (a) Find the length of the base diagonal AC .
 - (b) Find the length of the space diagonal AG .
 - (c) Find the angle that AG makes with the base.
- [6]

Section C – Challenge (Calculator allowed.)

11. A ship sails 12 km from port P on a bearing of 040° to point Q . It then sails 9 km on a bearing of 150° to point R .
- (a) Show that angle $PQR = 70^\circ$.
 - (b) Find the distance PR .
 - (c) Find the bearing of R from P .
- [7]
12. A square-based pyramid has base side 10 cm and vertical height 9 cm. The apex V is directly above the centre O of the base $ABCD$.
- (a) Find the length of OA .
 - (b) Find the angle that edge VA makes with the base.
 - (c) M is the midpoint of AB . Find the length VM and hence the angle between the face VAB and the base.
- [8]

Answers

Check your working against these. If an answer does not match, try the question again before looking for the method.

- $\frac{1}{2}$
 - $\frac{\sqrt{2}}{2}$ or $\frac{1}{\sqrt{2}}$
 - $\sqrt{3}$
 - 0
- Opposite 30° : $10 \sin 30^\circ = 5$ cm; adjacent: $10 \cos 30^\circ = 5\sqrt{3}$ cm
- $PR = 5$ cm
 - $\tan P = \frac{4}{3}$
 - $\sin R = \frac{3}{5}$
- Maximum $y = 1$ at $x = 90^\circ$
 - $x = 180^\circ$ and $x = 360^\circ$
 - $x = 180^\circ - 50^\circ = 130^\circ$
- $8 \sin 35^\circ = 4.59$ cm
 - $\frac{5}{\cos 52^\circ} = 8.12$ cm
 - $\tan^{-1}\left(\frac{7}{12}\right) = 30.3^\circ$
- $6 \cos 70^\circ = 2.05$ m
- $\frac{AC}{\sin 71^\circ} = \frac{9}{\sin 38^\circ} \Rightarrow AC = 13.8$ cm
 - $C = 180^\circ - 38^\circ - 71^\circ = 71^\circ$
- $YZ^2 = 7^2 + 10^2 - 2(7)(10) \cos 58^\circ \Rightarrow YZ = 8.65$ cm
 - $\frac{1}{2}(7)(10) \sin 58^\circ = 29.7$ cm²
- $\cos \theta = \frac{8^2 + 11^2 - 14^2}{2(8)(11)} = -\frac{11}{176} \Rightarrow \theta = 93.6^\circ$
- $AC = \sqrt{8^2 + 6^2} = 10$ cm
 - $AG = \sqrt{8^2 + 6^2 + 5^2} = \sqrt{125} = 11.2$ cm
 - $\tan^{-1}\left(\frac{5}{10}\right) = 26.6^\circ$
- At Q the reverse bearing of P is 220° ; $220^\circ - 150^\circ = 70^\circ$
 - $PR^2 = 12^2 + 9^2 - 2(12)(9) \cos 70^\circ \Rightarrow PR = 12.3$ km
 - $\sin(QPR) = \frac{9 \sin 70^\circ}{12.3} \Rightarrow QPR = 43.5^\circ$; bearing = $040^\circ + 43.5^\circ = 083.5^\circ$ (accept 084°)
- $OA = \frac{1}{2}\sqrt{10^2 + 10^2} = 5\sqrt{2} = 7.07$ cm
 - $\tan^{-1}\left(\frac{9}{5\sqrt{2}}\right) = 51.8^\circ$
 - $VM = \sqrt{9^2 + 5^2} = \sqrt{106} = 10.3$ cm; angle = $\tan^{-1}\left(\frac{9}{5}\right) = 60.9^\circ$

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