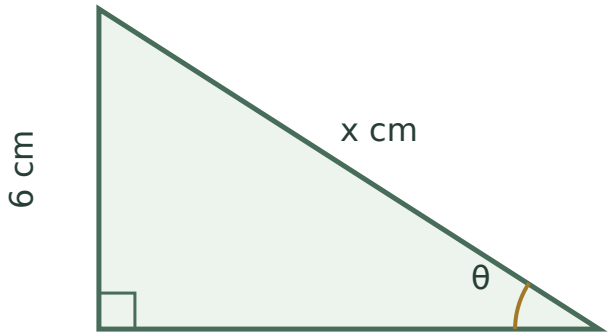
Pythagoras and Trigonometry - Practice test 1

16 questions | 50 marks | 60 minutes

A balanced paper moving from right triangles to non-right triangles, exact values, graphs and applications.

Equivalent correct methods earn the corresponding marks.

1. Find the hypotenuse x of the right triangle shown. [2 marks]



Sketch not to scale

$x^2 = 8^2 + 6^2 = 100.$

$x = 10$ cm.

Answer: 10 cm

2. A 10 m ladder makes an angle of 26° with level ground. Find the height it reaches, to 0.1 m. [2 marks]

$h = 10\sin 26^\circ.$

The vertical height is opposite the ground angle.

Answer: 4.4 m

3. An observer eye is 1.4 m high, 18 m from a pole on level ground. Top elevation is 42°. Find pole height to 0.1 m. [3 marks]

$h - 1.4 = 18\tan 42^\circ.$

Add the eye height after finding the vertical difference.

Answer: 17.6 m

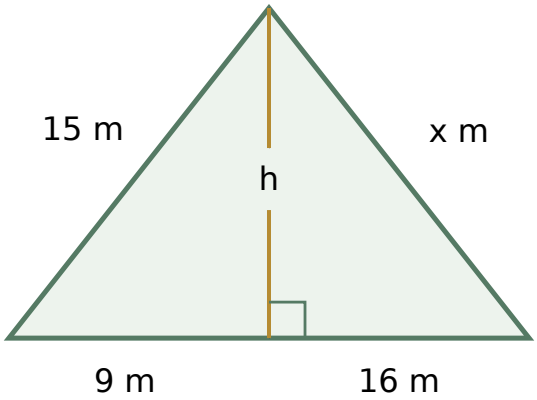
4. The bearing of a hut from a campsite is 318°. Find the bearing of the campsite from the hut. [2 marks]

The reverse bearing differs by 180°.

$318^\circ - 180^\circ = 138^\circ$.

Answer: 138°

5. Two right triangles share a height. The left base is 9 m and its hypotenuse is 15 m. The right base is 16 m. [4 marks]



The height h is shared; sketch not to scale.

(a) Find the shared height. [2 marks]

$h = \sqrt{15^2 - 9^2} = 12$ m.

Answer: 12 m

(b) Find the right hypotenuse and the full base. [2 marks]

$\sqrt{12^2 + 16^2} = 20$ m.

Total base $= 9 + 16 = 25$ m.

Answer: 20 m; full base 25 m

6. In triangle ABC, $A = 42^\circ$, $B = 58^\circ$ and $a = 11$ cm. Find b to 0.1 cm. [3 marks]

$b = \frac{11 \sin 58^\circ}{\sin 42^\circ}$.

Use the opposite side-angle pairs.

Answer: 13.9 cm

7. Two sides of a triangle are 6 cm and 9 cm. Their included angle is 70°. Find the opposite side to 0.1 cm. [3 marks]

$c^2 = 6^2 + 9^2 - 2(6)(9)\cos 70^\circ$.

Take the positive square root.

Answer: 8.9 cm

8. Two sides of a triangular plot are 12 m and 15 m, with included angle 35°. Find its area to 0.1 m². [3 marks]

$A = \frac{1}{2}(12)(15)\sin 35^\circ$.

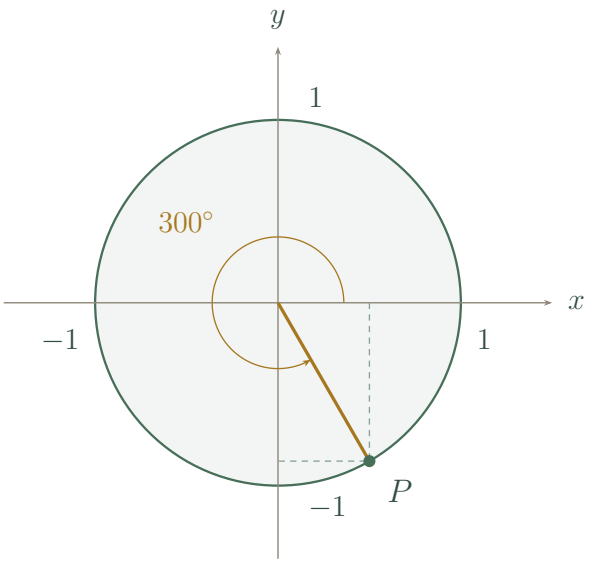
Answer: 51.6 m²

9. Evaluate $\sin 60^\circ + \cos 60^\circ$ exactly. [2 marks]

$\sin 60^\circ + \cos 60^\circ = \frac{\sqrt{3}}{2} + \frac{1}{2}$.

Answer: $\frac{\sqrt{3}+1}{2}$

10. Give the exact coordinates of the unit-circle point at 300°. [3 marks]

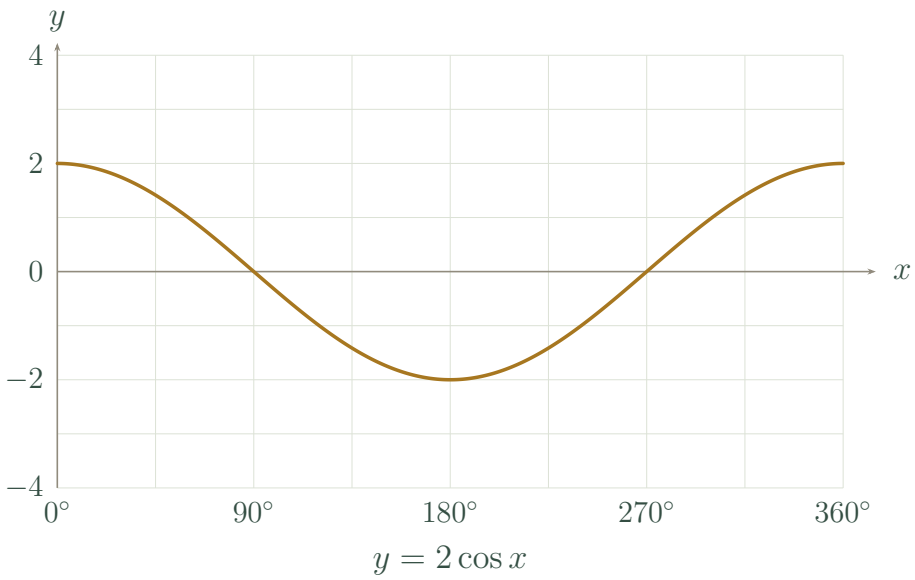


The reference angle is 60° in quadrant IV.

Coordinates are $(\cos 300^\circ, \sin 300^\circ)$.

Answer: $(\frac{1}{2}, -\frac{\sqrt{3}}{2})$

11. Sketch $y = 2\cos x$ for $0^\circ \leq x \leq 360^\circ$ on the supplied grid. Label the intercepts and turning points. [4 marks]



Calculate the five quarter-cycle points.

Plot and join with a smooth cosine curve.

Answer: Maxima $(0^\circ, 2)$, $(360^\circ, 2)$; minimum $(180^\circ, -2)$; intercepts $(90^\circ, 0)$, $(270^\circ, 0)$.

12. Solve $\sin x = -\frac{\sqrt{2}}{2}$ for $0^\circ \leq x \leq 360^\circ$. [3 marks]

The reference angle is 45°.

Sine is negative in quadrants III and IV.

Answer: 225°, 315°.

13. Solve $\cos(2x) = 0$ for $0^\circ \leq x \leq 360^\circ$. [3 marks]

For $0^\circ \leq 2x \leq 720^\circ$, cosine is zero at 90°, 270°, 450° and 630°.

Divide by 2.

Answer: 45°, 135°, 225°, 315°.

14. A triangle has $A = 40^\circ$, $a = 9$ cm and $b = 12$ cm. Find every possible B to 0.1°. [4 marks]

$\sin B = \frac{12\sin 40^\circ}{9}$.

Find the inverse sine and its supplement.

Both have $A + B$ below 180°.

Answer: 59.0° or 121.0°

15. A student estimates a height as $30\tan 28^\circ$ metres. [4 marks]

(a) Calculate the height to 0.1 m using the full calculator value. [2 marks]

$30\tan 28^\circ = 15.951\ldots$ m.

Answer: 16.0 m

(b) The student rounds $\tan 28^\circ$ to 0.53 first. Find that height and explain the difference. [2 marks]

$30 \times 0.53 = 15.9$ m.

The full-ratio result rounds to 16.0 m.

Answer: 15.9 m; early rounding changes the final tenth of a metre.

16. Two ground-level observation points lie on the same straight line towards a tower. The farther point is 20 m behind the nearer point. Elevations are 30° at the farther point and 45° at the nearer point. Find tower height to 0.1 m. [5 marks]

Let the near horizontal distance be x. Then $h = x\tan 45^\circ = x$.

At the far point, $h = (x + 20)\tan 30^\circ = \frac{x + 20}{\sqrt{3}}$.

$\sqrt{3}x = x + 20$, so $x = \frac{20}{\sqrt{3} - 1}$.

Height equals x.

Answer: 27.3 m