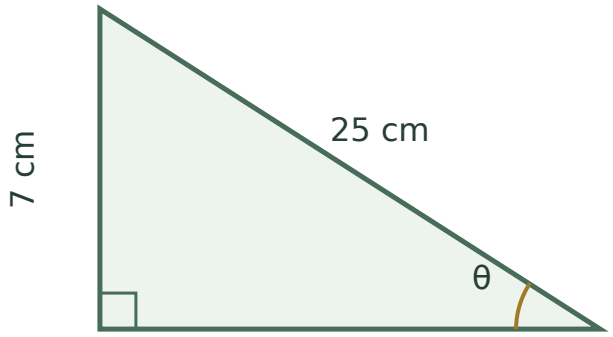
Pythagoras and Trigonometry - Practice test 2

16 questions | 48 marks | 60 minutes

A second balanced paper emphasising interpretation, method selection, bearings and trigonometric representations.

Equivalent correct methods earn the corresponding marks.

1. A right triangle has hypotenuse 25 cm and one leg 7 cm. Find the other leg. [2 marks]



Sketch not to scale

$x^2 = 25^2 - 7^2 = 576$.

$x = 24$ cm.

Answer: 24 cm

2. An acute angle has opposite side 11 cm and hypotenuse 19 cm. Find the angle to 0.1°. [2 marks]

$\sin\theta = \frac{11}{19}$.

$\theta = \sin^{-1}\left(\frac{11}{19}\right)$.

Answer: 35.4°

3. A platform is 32 m above flat ground. A ground point is 45 m horizontally from its base. Find the depression angle from the platform to 0.1°. [3 marks]

The equal elevation angle has tangent $\frac{32}{45}$.

$\theta = \tan^{-1}\left(\frac{32}{45}\right)$.

Answer: 35.4°

4. A walker goes 9 km west and 12 km north. Find direct distance and bearing from the start to 0.1°. [3 marks]

$d = \sqrt{9^2 + 12^2} = 15$ km.

The angle west of north is $\tan^{-1}\left(\frac{9}{12}\right) = 36.869\ldots^\circ$.

Bearing $= 360^\circ - 36.869\ldots^\circ$.

Answer: 15 km; bearing 323.1°

5. A symmetrical triangular roof has span 28 m and vertical rise 12 m. [3 marks]

(a) Find either sloping side to 0.1 m. [2 marks]

Half-span $= 14$ m.

Slope $= \sqrt{14^2 + 12^2}$ m.

Answer: 18.4 m

(b) Find the triangular cross-sectional area. [1 mark]

$A = \frac{1}{2}(28)(12) = 168$ m².

Answer: 168 m²

6. In triangle ABC, $A = 65^\circ$, $B = 40^\circ$ and $b = 14$ cm. Find a to 0.1 cm. [3 marks]

$a = \frac{14\sin 65^\circ}{\sin 40^\circ}$.

Answer: 19.7 cm

7. A triangle has sides 9 cm, 12 cm and 15 cm. Find the angle opposite 12 cm to 0.1°. [3 marks]

$\cos B = \frac{9^2 + 15^2 - 12^2}{2 \cdot 9 \cdot 15} = 0.6$.

$B = \cos^{-1}(0.6)$.

Answer: 53.1°

8. A triangle has sides 9 cm and 16 cm with area 36 cm². Find both possible included angles. [3 marks]

$36 = \frac{1}{2}(9)(16)\sin C$, so $\sin C = \frac{1}{2}$.

Both 30° and 150° have this sine.

Answer: 30° or 150°

9. Evaluate $\tan 45^\circ - 2\cos 60^\circ$ exactly. [2 marks]

$1 - 2(\frac{1}{2}) = 0$.

Answer: 0

10. An angle θ is in quadrant IV with $\sin\theta = -\frac{5}{13}$. Find $\cos\theta$ and $\tan\theta$ exactly. [3 marks]

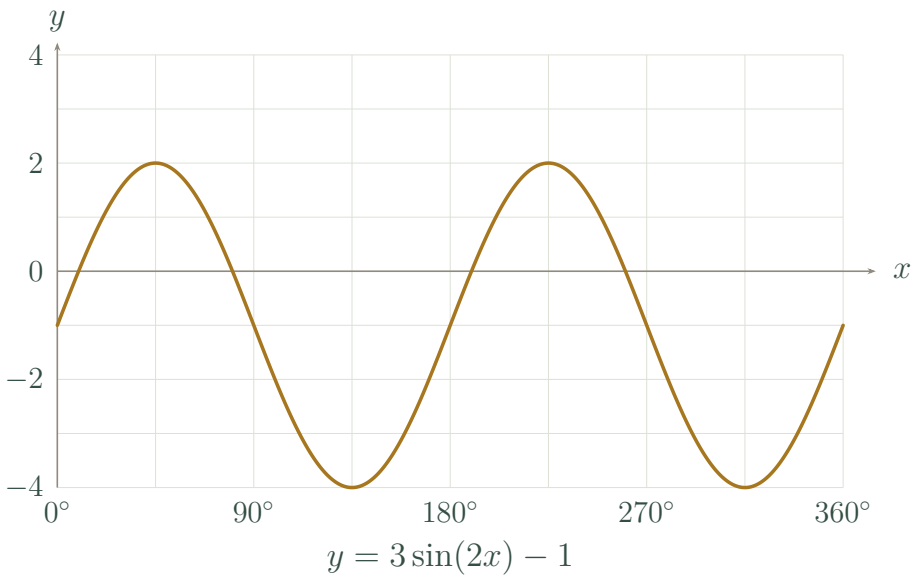
$\cos^2\theta = 1 - \frac{25}{169} = \frac{144}{169}$.

Cosine is positive in quadrant IV.

$\tan\theta = \frac{-\frac{5}{13}}{\frac{12}{13}} = -\frac{5}{12}$.

Answer: $\cos\theta = \frac{12}{13}$; $\tan\theta = -\frac{5}{12}$

11. The supplied graph shows $y = 3\sin(2x) - 1$. [3 marks]



(a) State its amplitude, midline and range. [2 marks]

Amplitude is $|3|$.

Add/subtract 3 from the midline -1.

Answer: Amplitude 3; midline $y = -1$; range $-4 \le y \le 2$.

(b) State its period. [1 mark]

$\frac{360^\circ}{2} = 180^\circ$.

Answer: 180°.

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

Reference angle $= 45^\circ$; cosine is positive in I and IV.

Answer: 45°, 315°.

13. Solve $\tan(2x) = -1$ for $0^\circ \le x \le 180^\circ$. [3 marks]

The inside angle ranges from 0° to 360°.

Tangent is -1 at 135° and 315°; divide by 2.

Answer: 67.5°, 157.5°.

14. $A = 35^\circ$, $a = 3$ cm and $b = 8$ cm are proposed for a triangle. Is it possible? Justify. [3 marks]

$\sin B = \frac{8\sin 35^\circ}{3} \approx 1.5295.$

A sine greater than 1 is impossible.

Answer: No.

15. Choose a suitable starting method in each case. Give a reason. [3 marks]

(a) A non-right triangle has two sides and their included angle known. [1 mark]

It directly connects SAS information to the opposite side.

Answer: Cosine rule.

(b) A triangle has two angles and one opposite side known. [1 mark]

A complete opposite pair is available.

Answer: Sine rule.

(c) A right triangle has both perpendicular sides known. [1 mark]

It connects the three sides of a right triangle.

Answer: Pythagoras.

16. Two straight paths leave a campsite on bearings 060° and 140°. Their endpoints are 70 m and 90 m from the campsite. [6 marks]

(a) Find the smaller angle between the paths. [1 mark]

$140^\circ - 60^\circ = 80^\circ.$

Answer: 80°.

(b) Find the distance between endpoints to 0.1 m. [3 marks]

$d^2 = 70^2 + 90^2 - 2(70)(90)\cos 80^\circ.$

Take the positive square root.

Answer: 104.0 m

(c) Find the triangular area between the paths to 0.1 m². [2 marks]

$A = \frac{1}{2}(70)(90)\sin 80^\circ.$

Answer: 3102.1 m²