Practical trigonometry - Practice test 1

10 questions | 42 marks | 70 minutes

Use degree mode. Give calculated lengths and angles to one decimal place unless stated otherwise; bearings use three digits to the nearest degree. In triangle ABC, a is opposite A, b opposite B and c opposite C. Show working and units.

Equivalent correct methods earn the corresponding marks.

1. Triangles ABC and DEF are similar in that order. $AB = 5\,\text{cm}$, $BC = 7\,\text{cm}$, $AC = 9\,\text{cm}$ and $DE = 10\,\text{cm}$. [4 marks]

(a) Find the scale factor ABC to DEF, then EF. [2 marks]

$k = \frac{10}{5} = 2.$

$EF = 7 \times 2 = 14\,\text{cm}.$

Answer: 2; $EF = 14\,\text{cm}.$

(b) Find DF and the larger-to-smaller area ratio. [2 marks]

$DF = 9 \times 2 = 18\,\text{cm}.$

$\text{Area factor} = 2^2 = 4.$

Answer: 18 cm; 4:1.

2. Triangle PQR is right-angled at Q and $P = 32^\circ$. [4 marks]

(a) Name the hypotenuse and find R. [2 marks]

PR is opposite $Q = 90^\circ$.

$R = 90^\circ - 32^\circ = 58^\circ.$

Answer: PR; 58°.

(b) Relative to P, identify the opposite and adjacent legs. [2 marks]

QR does not touch P; PQ is the leg touching P.

Answer: Opposite QR; adjacent PQ.

3. A rectangular garden is 15 m by 20 m. [4 marks]

(a) Find its diagonal. [2 marks]

$d^2 = 15^2 + 20^2 = 625.$

$d = 25\,\text{m}.$

Answer: 25 m

(b) A student suggests 18 m. Reject this without repeating the calculation. [2 marks]

It is the hypotenuse; $18 < 20.$

Answer: The diagonal must exceed the 20 m side.

4. A 7 m ladder makes angle 67° with level ground and touches a vertical wall. [4 marks]

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

$h = 7\sin 67^\circ.$

Answer: 6.4 m

(b) Find the horizontal distance of its foot from the wall. [2 marks]

$x = 7\cos 67^\circ.$

Answer: 2.7 m

5. An instrument is 1.5 m above level ground, 24 m horizontally from a tower. Elevation to its top is 38°. [4 marks]

(a) Find the rise above instrument level. [2 marks]

$\text{rise} = 24\tan 38^\circ.$

Answer: 18.8 m

(b) Find the tower height and explain the instrument correction. [2 marks]

$H = 1.5 + 24\tan 38^\circ.$

The rise starts 1.5 m above ground.

Answer: 20.3 m

6. A campsite is 18 km east and 24 km north of a station. [4 marks]

(a) Find the direct distance. [2 marks]

$d = \sqrt{18^2 + 24^2} = 30.$

Answer: 30 km

(b) Find its bearing from the station. [2 marks]

$\beta = \tan^{-1}\left(\frac{18}{24}\right) = 36.87\ldots^\circ$ from north.

Answer: 037°

7. Two sides of a triangular banner are 8 m and 11 m, enclosing 50°. [4 marks]

(a) Find its area. [2 marks]

$K = \frac{1}{2} \times 8 \times 11 \sin 50^\circ.$

Answer: $33.7\,\text{m}^2$

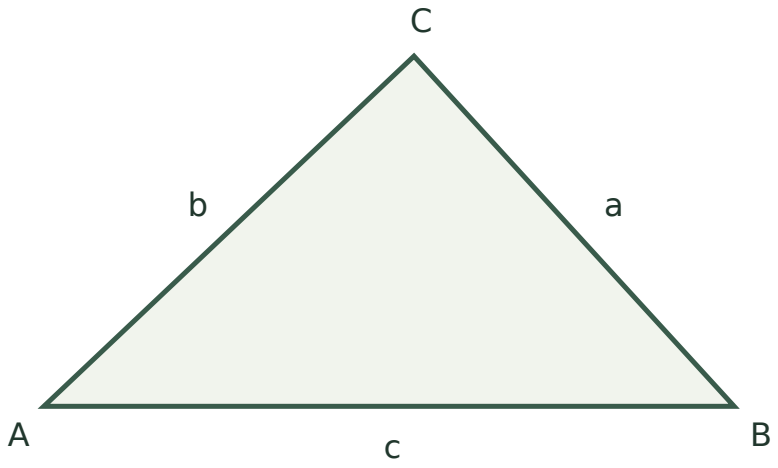
(b) Find the maximum possible area with these two sides and state when it occurs. [2 marks]

$K = 44 \sin C \leq 44.$

$\sin C = 1$ at 90°.

Answer: $44\,\text{m}^2$, at included angle 90°.

8. Triangle ABC has $A = 42^\circ$, $B = 68^\circ$ and $a = 9\,\text{cm}$. [4 marks]



Sketch not to scale

(a) Find C. [2 marks]

$C = 180^\circ - 42^\circ - 68^\circ = 70^\circ$.

Answer: 70°

(b) Find b. [2 marks]

$b = \frac{9\sin 68^\circ}{\sin 42^\circ}$.

Answer: 12.5 cm

9. Two triangle sides are 7 cm and 9 cm, with included angle 110°. [4 marks]

(a) Find the third side. [2 marks]

$c^2 = 7^2 + 9^2 - 2 \times 7 \times 9\cos 110^\circ$.

Take the positive root.

Answer: 13.2 cm

(b) Explain why it is the longest side. [2 marks]

The other two angles together total 70°.

Answer: It faces the largest angle, 110°.

10. Survey stations A and B are 25 m apart on a straight level line. A marker T lies to one side, with $TAB = 40^\circ$ and $TBA = 65^\circ$. [6 marks]

(a) Find ATB and AT. [3 marks]

$T = 180^\circ - 40^\circ - 65^\circ = 75^\circ$.

$AT = \frac{25\sin 65^\circ}{\sin 75^\circ}$.

Answer: 75°; 23.5 m

(b) Find the perpendicular distance from T to line AB. [3 marks]

$h = AT\sin 40^\circ$, using unrounded AT.

Answer: 15.1 m