Practical trigonometry - Practice test 3: connected problems

Name: _____ Date: _____

10 questions | 52 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.

A scientific calculator may be used.

1. Similar displays have length ratio $\text{small} : \text{large} = 2 : 3$. The small display has a side 9 cm and area $28\,\text{cm}^2$. [4 marks]

(a) Find the matching large side. [2 marks]

(b) Find the large area. [2 marks]

2. Triangle ABC is right-angled at C, with $AC = 15\,\text{cm}$ and $AB = 17\,\text{cm}$. [5 marks]

(a) Find BC and $\sin A$. [3 marks]

(b) Find $\cos B$ and explain its relationship to $\sin A$. [2 marks]

3. A 13 m ladder slides on level ground against a vertical wall. Its foot moves from 5 m to 12 m from the wall. [4 marks]

(a) Find the original and final heights of its top. [2 marks]

(b) Find the vertical drop. [2 marks]

4. A right triangle has opposite leg 5 cm and adjacent leg 12 cm relative to θ. [4 marks]

(a) Find both acute angles. [2 marks]

(b) Explain the error in using $\sin^{-1}(\frac{5}{12})$. [2 marks]

5. Two ground-level observers and a tower base lie on one straight level line. Both observers are on the same side of the tower, 20 m apart. The nearer elevation is 60°, the farther 30°. [7 marks]

(a) Let x be the nearer distance. Form an equation. [3 marks]

(b) Find the two distances and the tower height. [4 marks]

6. A boat travels 10 km on bearing 030°, then 15 km due east. [6 marks]

(a) Find its final eastward and northward distances. [3 marks]

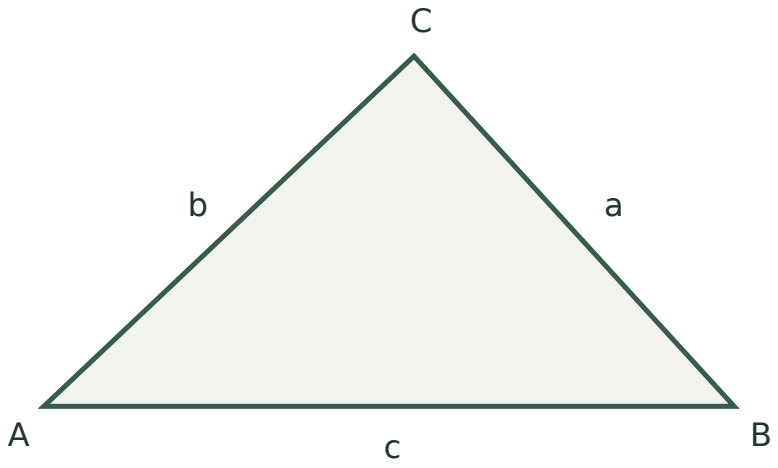
(b) Find its direct return distance and bearing. [3 marks]

7. A 10 m diagonal divides a quadrilateral into two triangles. The perpendicular heights from the other vertices are 4 m and 7 m, on opposite sides of the diagonal. [4 marks]

(a) Find the two triangle areas. [2 marks]

(b) Find total area and explain why an outside sloping side cannot replace either height. [2 marks]

8. Triangle ABC has $A = 30^\circ$, $a = 10\,\text{cm}$ and $b = 14\,\text{cm}$. [7 marks]



Sketch not to scale

(a) Find every possible pair B,C. [4 marks]

(b) Find c for each triangle. [3 marks]

9. Sides 8 cm and 13 cm enclose 45°. [5 marks]

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

(b) Find area and explain why these two sides are not Pythagoras legs. [3 marks]

10. A survey triangle is proposed with $A = 45^\circ$, $a = 6\,\text{m}$ and $b = 10\,\text{m}$. [6 marks]

(a) Show that no triangle fits. [3 marks]

(b) Find the smallest possible a for $A = 45^\circ$, $b = 10\,\text{m}$. Describe the boundary triangle. [3 marks]