Pythagoras and Trigonometry - Applications test

Name: _____ Date: _____

16 questions | 58 marks | 60 minutes

A more demanding paper combining surveying, design, shadows, bearings, periodic models and checks on assumptions.

A scientific calculator may be used.

1. A rectangular practice court is 28 m by 21 m. Find its diagonal. [2 marks]

2. At one time of day, a 1.8 m vertical post casts a 2.4 m shadow on level ground. [4 marks]

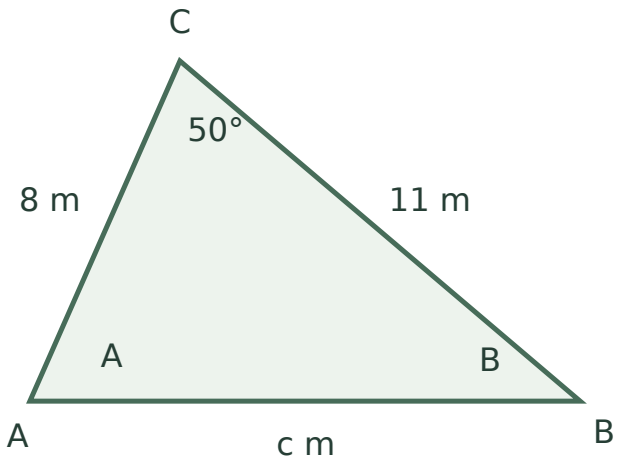
(a) Find the Sun elevation to 0.1°. [2 marks]

(b) At the same time, a vertical tree has an 18 m shadow on the same level ground. Find its height. [2 marks]

3. A drone travels 200 m horizontally on bearing 135°. Find its eastward and southward displacements exactly. [3 marks]

4. A 15 m ladder initially has its foot 9 m from a wall. The foot moves to 12 m from the wall. Find the drop of the ladder top. [3 marks]

5. Two edges of a triangular sail are 8 m and 11 m. Their included angle is 50°. [5 marks]



Sketch not to scale

(a) Find the sail area to 0.1 m². [2 marks]

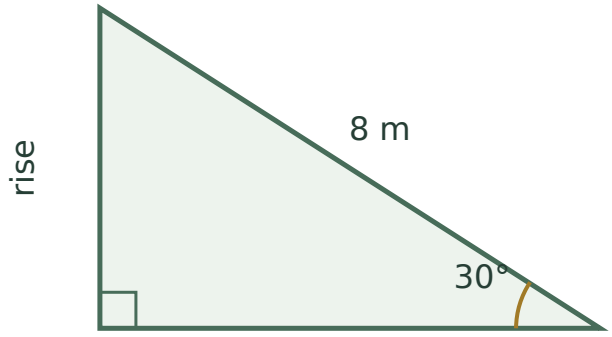
(b) Find the third edge to 0.1 m. [3 marks]

6. A survey triangle has angles 47° and 68°. The side opposite 68° is 23 m. Find the side opposite the third angle, to 0.1 m. [3 marks]

7. A triangular roof brace has lengths 10 cm, 13 cm and 17 cm. Find its largest angle to 0.1° and classify it. [3 marks]

8. Two sides of a triangular garden are fixed at 12 m and 20 m. What is the greatest possible area, and which included angle gives it? [3 marks]

9. A ramp rises at 30° to level ground and its sloping length is 8 m. [4 marks]

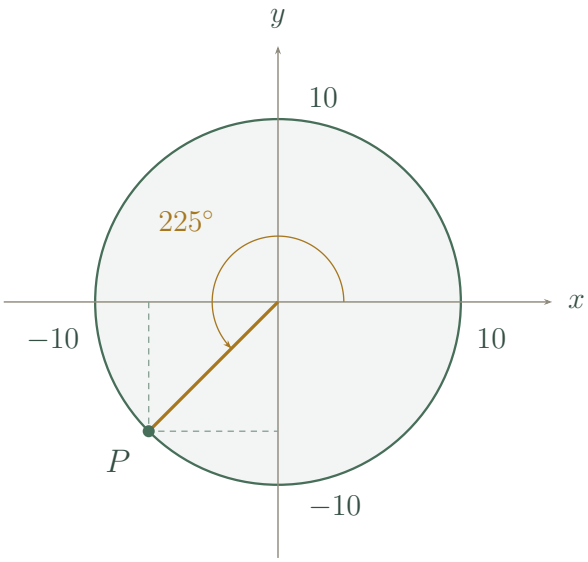


Sketch not to scale

(a) Find its rise exactly. [2 marks]

(b) Find its horizontal run exactly. [2 marks]

10. A point lies 10 units from the origin at angle 225° anticlockwise from positive x. Give its exact coordinates. [3 marks]



11. A model of tide height is $H = 3 + 1.2\cos(30t)$, where H is in metres, t is in hours and the angle is in degrees. [4 marks]

(a) State its period and range. [2 marks]

(b) Find the first time at or after $t = 0$ of maximum height and of minimum height. [2 marks]

12. For $H = 3 + 1.2\cos(30t)$, find every time between 0 and 12 hours inclusive when $H = 3$ m. Angles are in degrees. [3 marks]

13. A survey triangle has $A = 30^\circ$, $a = 20$ m and $b = 30$ m. [4 marks]

(a) Find all possible B to 0.1°. [3 marks]

(b) Would the extra statement that B is acute select a unique value? Explain. [1 mark]

14. An estimated height uses $h = 100\tan\theta$ metres. Compare the estimates for $\theta = 10.0^\circ$ and $\theta = 10.1^\circ$. Give each height and the difference to 0.1 m. [4 marks]

15. Two points on opposite sides of a vertical tower are 30 m apart on level ground. The tower lies between them. Elevations to its top are 52° and 38°. Find tower height to 0.1 m. [5 marks]

16. A triangular paddock has sides 40 m, 60 m and 75 m. [5 marks]

(a) Find the angle between the 40 m and 60 m sides to 0.1°. [3 marks]

(b) Find the paddock area to 0.1 m². [2 marks]