Trigonometry - Applications and reasoning test

Name: _____ Date: _____

10 questions | 58 marks | 75 minutes

A more demanding paper requiring method selection, domain checks and interpretation. All necessary data are supplied.

A scientific calculator may be used.

1. A triangle is claimed to have $A = 60^\circ$, $a = 4$ cm and $b = 8$ cm. [6 marks]

(a) Show whether the data are possible. [3 marks]

(b) If only b changes, find the greatest b compatible with the sine bound. State whether it gives a valid triangle. [3 marks]

2. Sides 4 cm and 6 cm enclose 150°. [6 marks]

(a) Find the third side and area exactly. [4 marks]

(b) An included angle 30° gives the same area. Does it give the same third side? Explain. [2 marks]

3. A triangle has $A = 45^\circ$, $a = 7$ cm and $b = 8$ cm. [6 marks]

(a) Find all possible B values to one decimal place. [3 marks]

(b) Find corresponding third angles and decide how many triangles exist. [3 marks]

4. Two sectors each have full perimeter 20 cm. Sector I has angle 1 radian; sectorII has angle 2 radians. [6 marks]

(a) Find each radius and exact area. [4 marks]

(b) Which has greater area and by how much? [2 marks]

5. A periodic displacement has minimum 2 cm, maximum 14 cm and period 10 s. At $t = 0$ it crosses the midline downwards. [6 marks]

(a) Write a sine rule consistent with the description. [3 marks]

(b) Find the first minimum and first return to the same downward crossing. [3 marks]

6. Solve $\sin^2 x + \sin x = 0$. [5 marks]

(a) Find possible sine values. [2 marks]

(b) Find all roots on $0 \leq x < 2\pi$. [3 marks]

7. Consider $\cos(3x - \frac{\pi}{2}) = 0$ for $0 \leq x \leq \pi$. [5 marks]

(a) Transform the x interval into an interval for the argument. [2 marks]

(b) Find every solution. [3 marks]

8. An isosceles triangular panel has two equal sides 10 cm and included angle C. [6 marks]

(a) Find C values giving area 25 cm². [3 marks]

(b) Find the base length for each panel exactly and compare the shapes. [3 marks]

9. A proposed cosine model is $h = 5 + 2\cos(\frac{\pi t}{4})$. Measurements at $t = 0, 2, 4$ h are respectively 7,5,4 m. [6 marks]

(a) Identify which measurement disagrees with the model and give the predicted value. [3 marks]

(b) Explain two possible responses before using the model for a long prediction. [3 marks]

10. A walker goes 100 m east from A to B, then 60 m on bearing 330° to C. [6 marks]

(a) Find C's east and north displacements from A exactly. [3 marks]

(b) Find AC exactly and the bearing of C from A to one decimal place. [3 marks]