Trigonometry - Practice test 4

Name: _____ Date: _____

10 questions | 56 marks | 75 minutes

Interpret periodic models and combine triangle methods in practical situations.

A scientific calculator may be used.

1. An 8 m ramp makes 30° with horizontal ground. [5 marks]

(a) Find vertical rise and horizontal run exactly. [3 marks]

(b) A safety limit allows rise at most 3 m for this ramp length. Is the proposed ramp acceptable? [2 marks]

2. Triangle data give $A = 40^\circ$, $a = 5$ cm and $b = 9$ cm. [5 marks]

(a) Use the sine rule to check whether any triangle exists. [3 marks]

(b) Explain why trying the supplementary angle does not help. [2 marks]

3. A triangle has sides 7 cm,8 cm and 9 cm. [6 marks]

(a) Find the cosine of the angle C opposite 9 cm. [3 marks]

(b) Use this to find its exact area. [3 marks]

4. A sector has angle 3 radians and full perimeter 10 cm. [6 marks]

(a) Find radius and arc length. [3 marks]

(b) Find its area and describe why 3 radians is a valid sector angle. [3 marks]

5. An angle θ is in quadrant IV and $\cos\theta = \frac{5}{13}$. [5 marks]

(a) Find sine and tangent exactly. [3 marks]

(b) Find $\sin^2\theta + \cos^2\theta$ and explain its geometric meaning. [2 marks]

6. A height model is $h = 6 - 4\cos(\frac{\pi t}{6})$ m, with t in seconds. [6 marks]

(a) Find range, period and starting value. [3 marks]

(b) Find $h = 8$ during the first cycle $0 \leq t < 12$. [3 marks]

7. A student claims $\sin(2x) = 2\sin x$ for all x. [5 marks]

(a) Give an exact counterexample. [3 marks]

(b) Explain the difference between an equation and an identity. [2 marks]

8. Consider $y = \tan(4x)$. [6 marks]

(a) State its period and closest asymptotes to 0. [3 marks]

(b) Solve $y = 0$ on $-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$. [3 marks]

9. A wheel has centre 15 m above ground, radius 12 m and period 48 s. A rider starts at the highest point. [6 marks]

(a) Write a height rule. [3 marks]

(b) Find the first two times $h = 9$ m. [3 marks]

10. Two observers are 20 m apart on level ground on the same side of a tower. The nearer angle of elevation is 60° and the farther is 30°. [6 marks]

(a) Find the nearer observer’s distance from the base. [3 marks]

(b) Find tower height exactly and state one modelling assumption. [3 marks]