FOUNDATION & HIGHER

SAME AT BOTH TIERS

Name ..... Class .....

G21: Exact trigonometric values

Derive and reason with exact trigonometric values

20 marks · 25 minutes · Non-calculator

1) Use an equilateral triangle with sides of 2 units, cut in half, to show that $\sin 30° = \frac{1}{2}$

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[Question 1: 3 marks]

2) Use a right-angled isosceles triangle with shorter sides of 1 unit to show that $\tan 45° = 1$ and $\sin 45° = \frac{\sqrt{2}}{2}$

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[Question 2: 3 marks]

3) Show that $(\sin 30°)^2 + (\cos 30°)^2 = 1$

[Question 3: 2 marks]

4) Explain why $\sin 60° = \cos 30°$

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[Question 4: 2 marks]

5) Kim says $\tan 60° = \frac{1}{\sqrt{3}}$. Explain her mistake.

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[Question 5: 2 marks]

6) Show that $2 \sin 30° \cos 30° = \sin 60°$

[Question 6: 2 marks]

7) Explain why $\tan 90^\circ$ is not defined.

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[Question 7: 2 marks]

8) A right-angled triangle has hypotenuse 8 cm and an angle of 60°. Show that the side next to the 60° angle is exactly 4 cm.

[Question 8: 2 marks]

9) Explain why $\sin 0^\circ = 0$

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[Question 9: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Shown	Half: hypotenuse 2, opposite 30° is 1 (M1); angles 30°, 60°, 90° (M1); $\frac{1}{2}$ (C1).
2	Shown	Hypotenuse $\sqrt{2}$ (M1); $\tan 45 = \frac{1}{1}$ (C1); $\sin 45 = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ (C1).
3	Shown	$\frac{1}{4} + \frac{3}{4}$ (M1); C1.
4	Explanation	In a 30-60-90 triangle the side opposite 60° is next to 30° (C2).
5	$\sqrt{3}$	That is $\tan 30°$ (C1); B1.
6	Shown	$2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2}$ (M1); C1.
7	Explanation	Adjacent side would be 0 (C1); cannot divide by 0 (C1).
8	Shown	$8 \cos 60° = 8 \times \frac{1}{2}$ (M1); C1.
9	Explanation	Opposite side has zero length (C2).