FOUNDATION & HIGHER

HIGHER EXTENDS

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

G20: Pythagoras and trigonometry

Reason with Pythagoras' theorem and trigonometric ratios

20 marks · 25 minutes · Calculator allowed

1) Show that a triangle with sides 5, 12 and 13 is right-angled.

[Question 1: 1 marks]

2) Explain why the hypotenuse is always the longest side of a right-angled triangle.

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[Question 2: 1 marks]

3) Ben uses $\sin x = \frac{\text{opposite}}{\text{adjacent}}$. Explain his mistake.

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[Question 3: 2 marks]

4) A 5 m ladder has its foot 1.4 m from a wall. Show that it reaches 4.8 m up the wall.

[Question 4: 2 marks]

5) Explain why $\sin x$ cannot equal 1.2

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[Question 5: 2 marks]

6) In a right-angled triangle $\tan x = 1$. Show that $x = 45°$ and explain why the triangle is isosceles.

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[Question 6: 2 marks]

7) Show that the space diagonal of a 3 cm by 4 cm by 12 cm cuboid is 13 cm.

[Question 7: 3 marks]

8) A right-angled triangle has hypotenuse 10 cm. Kim says the side opposite the 30° angle is 8.66 cm. Explain her mistake.

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[Question 8: 2 marks]

9) Explain why cos x decreases as x increases from 0° to 90°.

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[Question 9: 2 marks]

10) Show that the angle between a diagonal of a unit cube and its base is 35.3° to 1 d.p.

[Question 10: 3 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Shown	$25 + 144 = 169$ (C1).
2	Explanation	It is opposite the largest angle, 90° (C1).
3	Explanation	That is tan (C1); $\sin = \frac{\text{opp}}{\text{hyp}}$ (C1).
4	Shown	$\sqrt{25 - 1.96}$ (M1); C1.
5	Explanation	Opposite can never be longer than the hypotenuse (C2).
6	Shown	$\tan^{-1} 1 = 45$ (M1); opposite = adjacent (C1).
7	Shown	Base diagonal 5 (M1); $\sqrt{25 + 144}$ (M1); C1.
8	5 cm	She used cos; should be $10 \sin 30°$ (C1); B1.
9	Explanation	The adjacent side gets shorter for a fixed hypotenuse (C2).
10	Shown	Base diagonal $\sqrt{2}$ (M1); $\tan^{-1} \frac{1}{\sqrt{2}}$ (M1); C1.