5.19 SOHCAHTOA (Trigonometry): Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

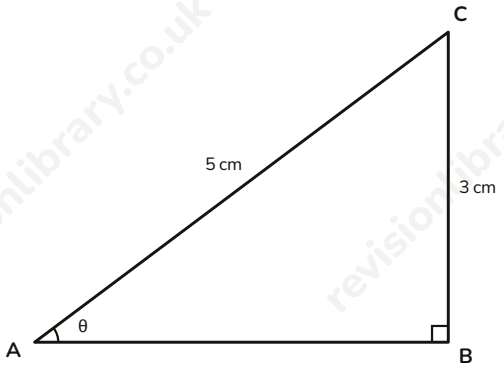
1 Write down the trigonometric ratio that links opposite and hypotenuse. Use the word "sine" in your answer.

(Total for Question 1 is 1 mark)

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2 Work out sin(θ) for a right-angled triangle with opposite = 3 cm and hypotenuse = 5 cm.

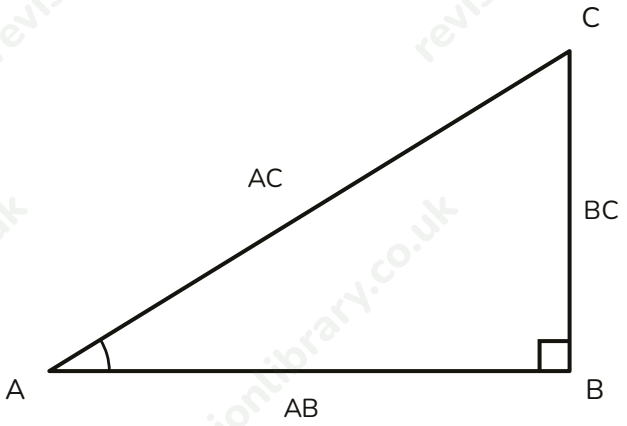
Diagram NOT accurately drawn



(Total for Question 2 is 2 marks)

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3 The diagram shows a right-angled triangle ABC. The right angle is at B, and angle A is marked. AB is the horizontal base, BC is the vertical side, and AC is the sloping side joining A to C.



(a) Which side is the hypotenuse? **(1)**

(b) Which side is opposite angle A? **(1)**

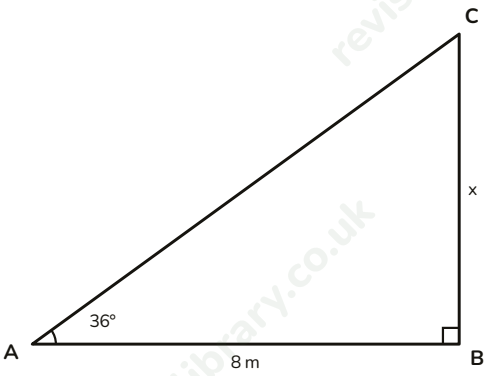
(c) Which side is adjacent to angle A? **(1)**

(Total for Question 3 is 3 marks)

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4 A tree casts a shadow 8 m long. The angle of elevation of the sun is 36 degrees. Work out the height of the tree. Give your answer to 1 decimal place.

Diagram NOT accurately drawn

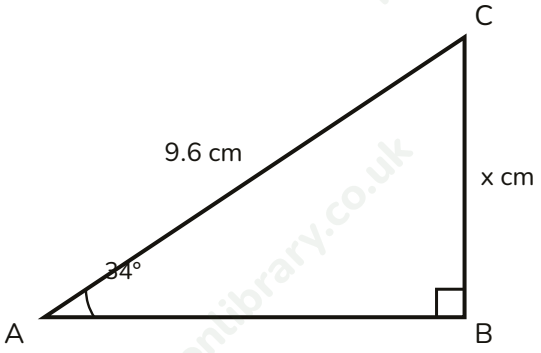


(Total for Question 4 is 4 marks)

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5 In triangle ABC, angle B = 90 degrees, angle A = 34 degrees and the hypotenuse AC = 9.6 cm. Calculate the length of BC, marked x. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

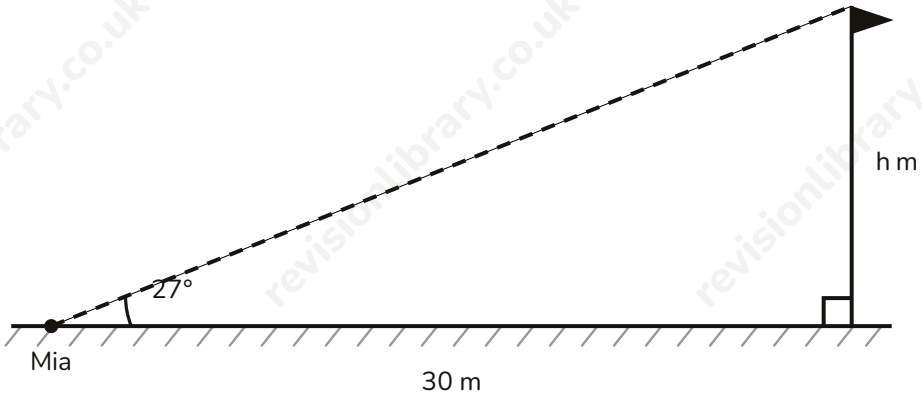


(Total for Question 5 is 3 marks)

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6 Mia stands 30 m from the base of a vertical flagpole. She measures the angle of elevation to the top of the flagpole as 27 degrees.
Calculate the height of the flagpole, h. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn



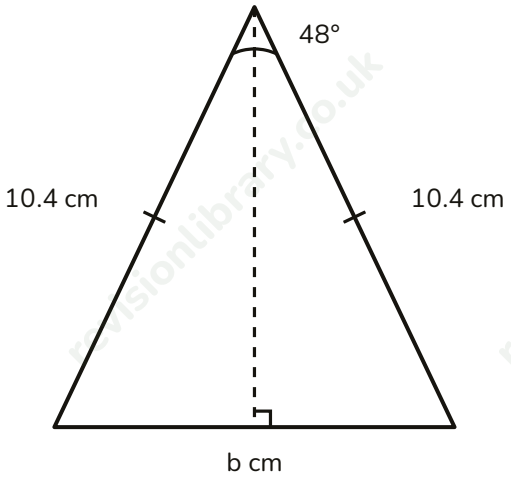
(Total for Question 6 is 3 marks)

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7 An isosceles triangle has two equal sides of length 10.4 cm and an apex angle of 48 degrees between them. A line is drawn from the apex perpendicular to the base, meeting the base at its midpoint.

Calculate the length of the base, b. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

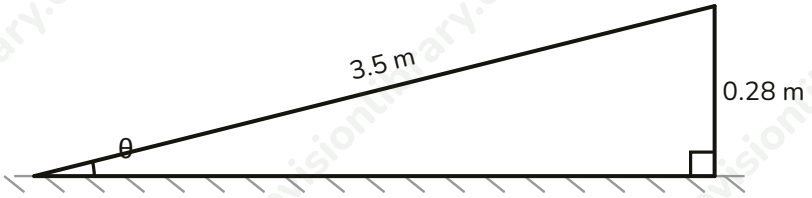


(Total for Question 7 is 4 marks)

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8 A wheelchair access ramp has a sloped length of 3.5 m and rises a vertical height of 0.28 m.
Building regulations recommend that the angle of a wheelchair ramp should not exceed the angle produced by a gradient of 1 in 12 (a rise of 1 unit for every 12 units travelled horizontally).
Determine, with full working, whether this ramp meets the recommended maximum angle.

Diagram NOT accurately drawn

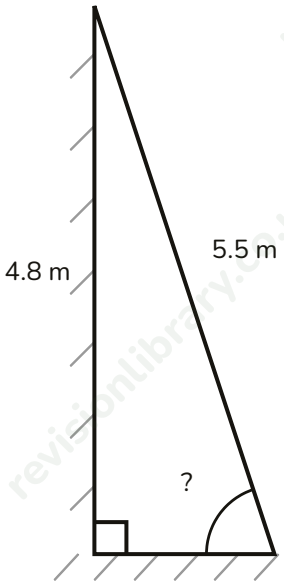


(Total for Question 8 is 4 marks)

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9 A ladder 5.5 m long leans against a vertical wall, with its foot on horizontal ground. The ladder reaches 4.8 m up the wall.

Diagram NOT accurately drawn



(a) Calculate the angle the ladder makes with the ground. Give your answer correct to 1 decimal place. **(2)**

.....

(b) Health and safety guidance recommends that a ladder should make an angle of between 70 and 80 degrees with the ground. Using your answer to part (a), determine whether this ladder meets the guidance. Give a reason for your answer. **(2)**

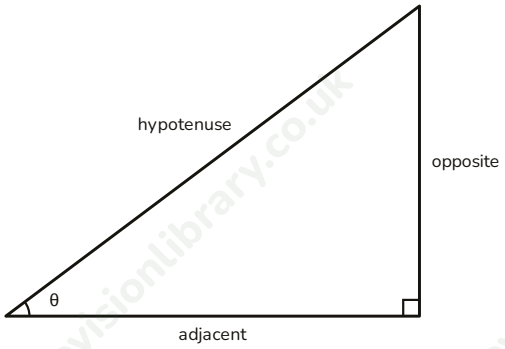
(Total for Question 9 is 4 marks)

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10 Show that in any right-angled triangle the tangent of an acute angle is equal to the sine of that angle divided by the cosine of that angle. Give a short explanation using side lengths. This is a 'show that' question; all marks are for method and explanation.

(a) Show that $\tan \theta = \sin \theta / \cos \theta$ using opposite, adjacent and hypotenuse labels. **(3)**

Diagram NOT accurately drawn



(Total for Question 10 is 3 marks)

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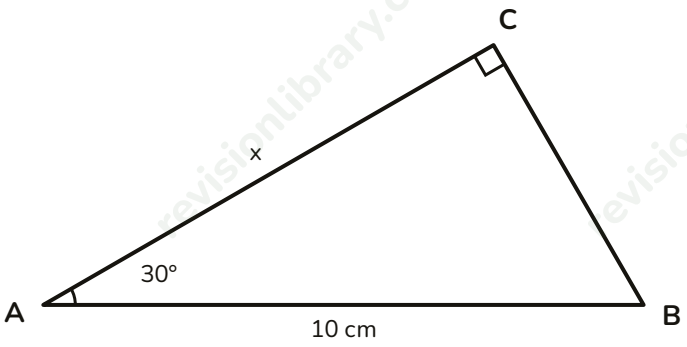
11 This question must be answered without a calculator.

(a) Write down the exact value of cos(30 degrees). **(1)**

.....

(b) A right-angled triangle has a hypotenuse of length 10 cm and one angle of 30 degrees. Calculate the exact length of the side adjacent to the 30 degree angle. Give your answer in the form a*$\sqrt{3}$, where a is an integer. **(2)**

Diagram NOT accurately drawn



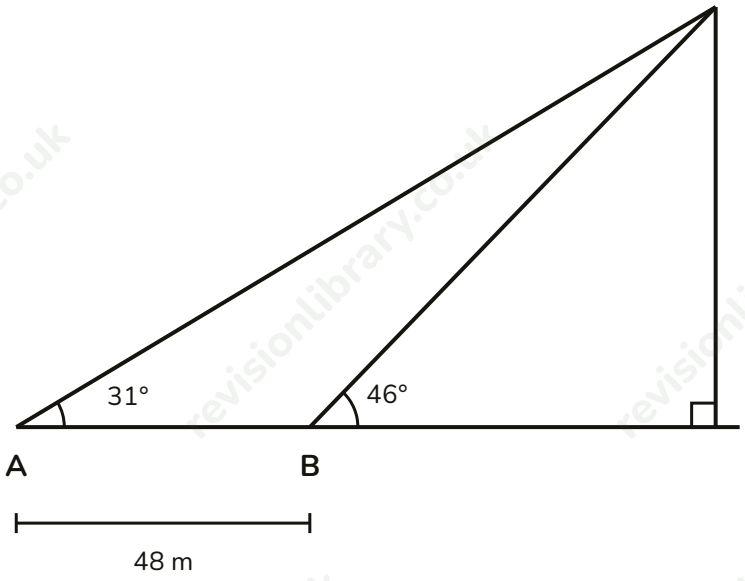
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(Total for Question 11 is 3 marks)

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12 A surveyor stands at point A and measures the angle of elevation to the top of a tower as 31 degrees. She then walks 48 m closer to the tower along the level ground to point B and measures the angle of elevation as 46 degrees. Work out the height of the tower to the nearest metre.

Diagram NOT accurately drawn



(a) Find the height of the tower to the nearest metre. **(6)**

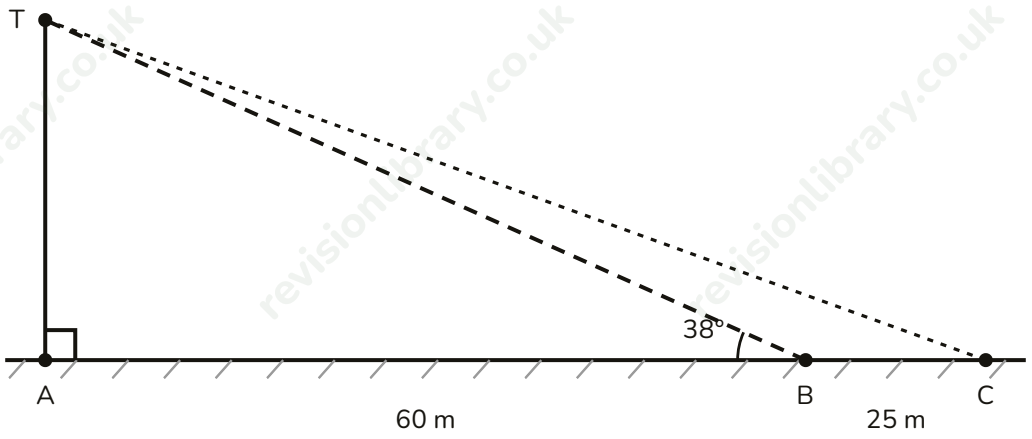
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(Total for Question 12 is 6 marks)

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13 Amara, a surveyor, wants to find the width of a river. She stands at point A on one bank, directly opposite a tree T on the opposite bank, so that angle TAB = 90 degrees, where B is a point along her own bank. She walks 60 m along her bank, from A to B, and measures the angle TBA as 38 degrees.

Diagram NOT accurately drawn



(a) Calculate the width of the river, AT. Give your answer correct to 3 significant figures. **(2)**

.....

(b) Amara checks her result from point C, further along the same bank as B, so that BC = 25 m (with A, B, C in a straight line). Calculate the angle TCA that Amara should expect to measure. She actually measures angle TCA as 29 degrees. Comment on whether her original width, AT, appears to be consistent with this second measurement. **(4)**

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(Total for Question 13 is 6 marks)

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Mark scheme · 5.19 SOHCAHTOA (Trigonometry): Test Pack

Question 1

sine = opposite/hypotenuse or sine(θ) = opposite/hypotenuse cao **B1**

Answer: sine = opposite/hypotenuse (sine(θ) = opposite/hypotenuse)

Question 2

substitute into ratio sin = opposite/hypotenuse, sin = 3/5 oe **M1**

0.6 cao or 3/5 cao **A1**

Answer: 0.6 (or 3/5)

Question 3

(a) AC cao **B1**

(a) Answer: AC

(b) BC cao **B1**

(b) Answer: BC

(c) AB cao **B1**

(c) Answer: AB

Question 4

identify tan(θ) = opposite/adjacent, so height = 8 * tan36 **M1**

substitute and use calculator: height = 8 * tan36 **M1**

height = 8 * 0.726542... = 5.81234... (correct value) **A1**

5.8 m to 1 dp cao **A1**

Answer: 5.8 m

Question 5

sin(34) = x / 9.6 oe **M1**

x = 9.6 x sin(34) **M1**

awrt 5.37 cm **A1**

Answer: 5.37 cm (3 s.f.)

Question 6

tan(27) = h / 30 oe **M1**

h = 30 x tan(27) **M1**

awrt 15.3 m **A1**

Answer: 15.3 m (3 s.f.)

Question 7

half apex angle = 48 / 2 = 24 (the perpendicular bisects the apex angle by symmetry) **M1**

half base = 10.4 x sin(24) oe **M1**

b = 2 x (their half base) **dM1**

awrt 8.46 cm **A1**

Answer: 8.46 cm (3 s.f.)

Question 8

sin(θ) = 0.28 / 3.5 oe **M1**

θ = awrt 4.6 degrees **A1**

maximum angle = $\tan^{-1}(1/12)$ oe (= awrt 4.8 degrees) **M1**

correct conclusion with comparison, e.g. since 4.6 < 4.8 (or equivalent gradient/tangent comparison), the ramp meets the recommended maximum angle cso **C1**

Answer: The ramp's angle is awrt 4.6 degrees, which is less than the maximum recommended angle of awrt 4.8 degrees, so the ramp does meet the recommended maximum.

Question 9

(a) sin(angle) = 4.8/5.5 oe **M1**

(a) awrt 60.8 (degrees) **A1**

(a) Answer: 60.8 degrees (1 d.p.)

(b) correct comparison of their angle from part (a) with the range 70 to 80 degrees (ft their angle) **M1**

(b) correct conclusion (No) with valid reason, e.g. 60.8 degrees is less than 70 degrees, so the foot of the ladder is too far from the wall / the ladder is at risk of slipping **A1**

(b) Answer: No; 60.8 degrees is less than 70 degrees, so the ladder does not meet the guidance.

Question 10

(a) state sin θ = opposite/hypotenuse and cos θ = adjacent/hypotenuse **M1**

(a) divide sin θ by cos θ to get (opposite/hypotenuse)/(adjacent/hypotenuse) = opposite/adjacent **M1**

(a) conclude tan θ = opposite/adjacent = sin θ / cos θ cso **A1**

(a) Answer: tan θ = sin θ / cos θ

Question 11

(a) $\sqrt{3}/2$ cao **B1**

(a) Answer: cos(30 degrees) = $\sqrt{3}/2$

(b) adjacent = 10 cos(30) oe, using their exact value from part (a) **M1**

(b) cao $5*\sqrt{3}$ (cm) **A1**

(b) Answer: adjacent = $5*\sqrt{3}$ cm (= 8.660 cm, awrt 8.66 cm to 3 s.f.)

Question 12

(a) use tan 31 = h / x and tan 46 = h / (x - 48) to form two equations **M1**

(a) eliminate x: h = x * tan31 and h = (x - 48) * tan46 then set x * tan31 = (x - 48) * tan46 **M1**

(a) rearrange to x (tan31 - tan46) = -48 * tan46 and solve for x **M1**

(a) find h using h = x * tan31 **M1**

(a) height = 69 m awrt (1 m) **A1**

(a) method and final value consistent with working **A1**

(a) Answer: 69 m

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Question 13

(a) AT = 60 tan(38) oe **M1**

(a) awrt 46.9 (m) **A1**

(a) Answer: AT = 46.9 m (3 s.f.)

(b) AC = AB + BC = 60 + 25 = 85 (m) **M1**

(b) angle TCA = $\tan^{-1}$(their AT / 85) oe, using right-angled triangle TAC **M1**

(b) awrt 28.9 (degrees) **A1**

(b) valid comment comparing the predicted angle (awrt 28.9 degrees) with the measured 29 degrees, e.g. the two values are very close (within 0.2 degrees), so the original width AT = 46.9 m appears consistent, with any small difference likely due to rounding or measurement error **B1**

(b) Answer: predicted angle TCA = 28.9 degrees (1 d.p.); since this is very close to the measured 29 degrees, the original measurement of 46.9 m appears consistent.

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