HIGHER

3.2 The Sine Rule, Cosine Rule and Area of a Triangle: 30-minute Pack

Total Marks

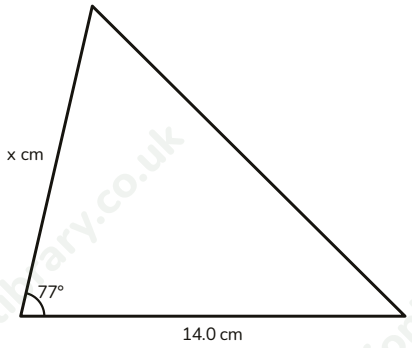
EDEXCEL 4MA1 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Show full working for multi-step questions. Write answers in clear sentences for questions where a reason is asked. Suggested time 30 minutes.

1 A triangle has sides of length 14.0 cm and x cm with an angle of 77 degrees between them. Its area is 79.1 cm².

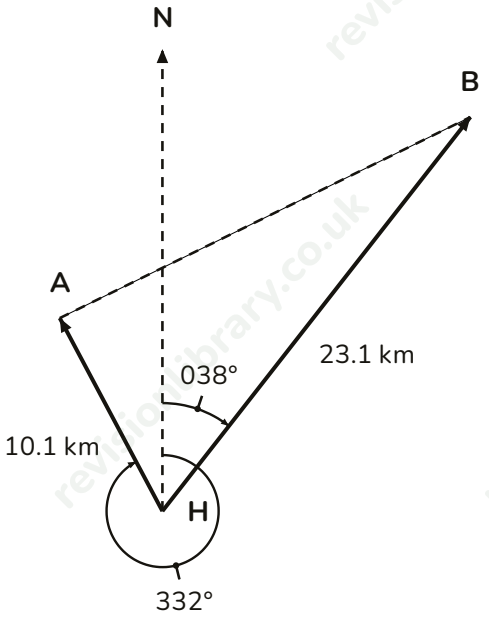
Calculate the value of x. Give your answer to 1 decimal place.



(Total for Question 1 is 3 marks)

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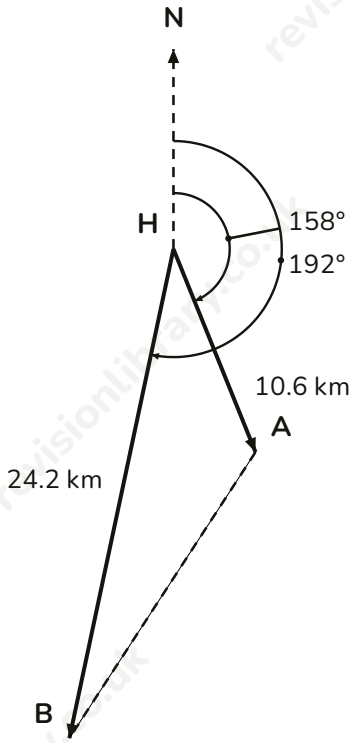
2 Two boats leave a harbour H at the same time. Boat A sails 10.1 km on a bearing of 332 degrees. Boat B sails 23.1 km on a bearing of 038 degrees.
Calculate the bearing of B from A. Give your answer to the nearest degree.



(Total for Question 2 is 5 marks)

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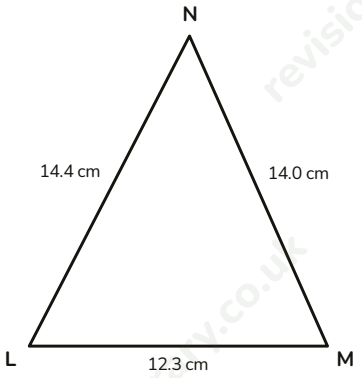
3 Two boats leave a harbour H at the same time. Boat A sails 10.6 km on a bearing of 158 degrees. Boat B sails 24.2 km on a bearing of 192 degrees.
Calculate the distance between the boats. Give your answer to 1 decimal place.



(Total for Question 3 is 4 marks)

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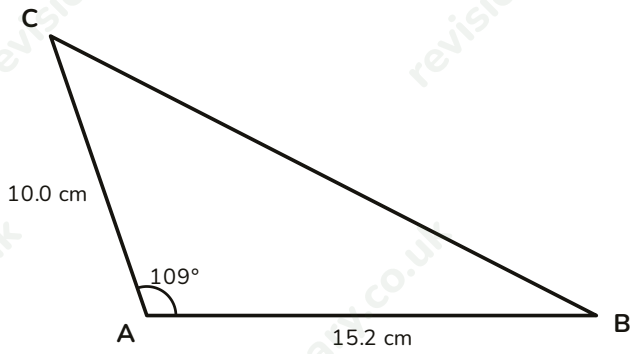
4 In triangle LMN, MN = 14.0 cm, LN = 14.4 cm and LM = 12.3 cm.
Calculate the size of angle L. Give your answer to 1 decimal place.



(Total for Question 4 is 3 marks)

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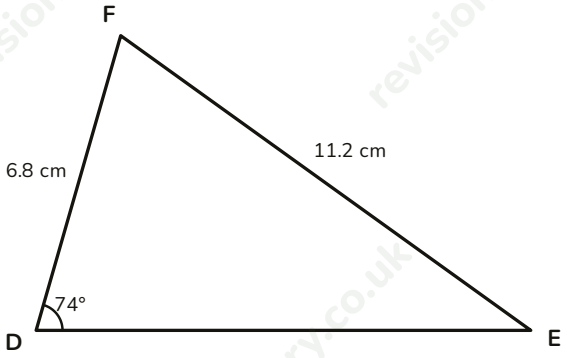
5 In triangle ABC, AB = 15.2 cm, AC = 10.0 cm and angle A = 109 degrees.
Calculate the length of BC. Give your answer to 1 decimal place.



(Total for Question 5 is 3 marks)

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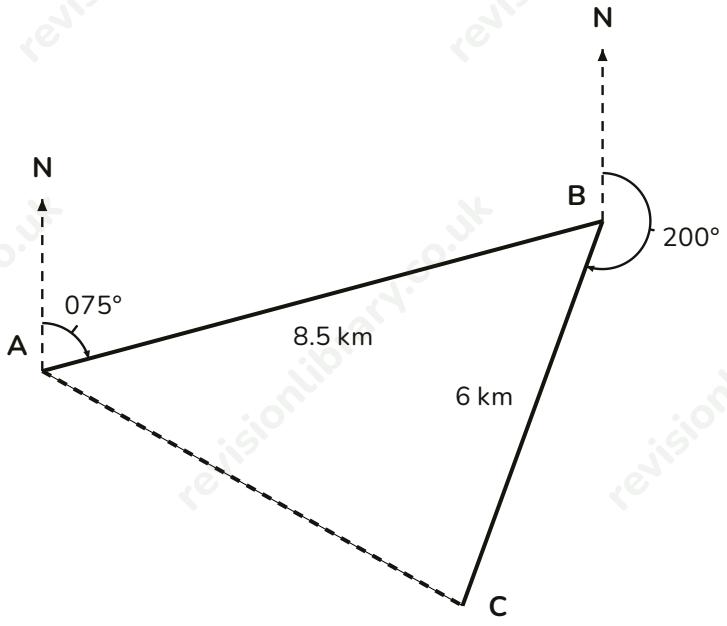
6 In triangle DEF, angle D = 74 degrees, EF = 11.2 cm and DF = 6.8 cm.
Calculate the size of angle E, given that it is acute. Give your answer to 1 decimal place.



(Total for Question 6 is 3 marks)

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7 A boat sails from point A on a bearing of 075 degrees for 8.5 km to point B. From B it sails on a bearing of 200 degrees for 6 km to point C. Work out the straight-line distance AC, correct to 2 decimal places, by extracting the triangle ABC and using the cosine rule.



(Total for Question 7 is 2 marks)

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Mark scheme · 3.2 The Sine Rule, Cosine Rule and Area of a Triangle: 30-minute Pack

Question 1

79.1 = (1/2) x 14.0 x x x sin 77	**M1**
x = 2 x 79.1 / (14.0 x sin 77)	**M1**
x = 11.6	**A1**

Answer: x = 11.6

Question 2

angle AHB = 66 degrees	**M1**
cosine rule to find AB = 21.11 km	**M1**
sine rule to find angle HAB = 88.1 degrees (acute or obtuse chosen from the diagram)	**M1**
uses the north line at A: bearing of H from A is the reverse of the bearing of A from H, then adds or subtracts the angle HAB	**M1**
bearing = 064 degrees	**A1**

Answer: 064 degrees

Question 3

angle AHB = 34 degrees (difference of the bearings)	**M1**
cosine rule: $AB^2 = 10.6^2 + 24.2^2 - 2 \times 10.6 \times 24.2 \times \cos 34$	**M1**
$AB^2 = 272.67$	**A1**
AB = 16.5 km	**A1**

Answer: 16.5 km

Question 4

cosine rule: $\cos L = (14.4^2 + 12.3^2 - 14.0^2) / (2 \times 14.4 \times 12.3)$	**M1**
cos L = 0.4592	**M1**
angle L = 62.7 degrees	**A1**

Answer: Angle L = 62.7 degrees

Question 5

cosine rule: $BC^2 = 10.0^2 + 15.2^2 - 2 \times 10.0 \times 15.2 \times \cos 109$	**M1**
$BC^2 = 430.01$	**M1**
BC = 20.7 cm	**A1**

Answer: BC = 20.7 cm

Question 6

sine rule: sin E / 6.8 = sin 74 / 11.2	**M1**
sin E = 6.8 x sin 74 / 11.2 = 0.5836	**M1**
angle E = 35.7 degrees	**A1**

Answer: Angle E = 35.7 degrees

Question 7

correctly finds the included angle at B between BA and BC: the back-bearing from B to A is 075 + 180 = 255 degrees, and the bearing from B to C is 200 degrees, so angle ABC = 255 - 200 = 55 degrees	**M1**
uses cosine rule $AC^2 = AB^2 + BC^2 - 2*AB*BC*\cos 55$ and gives AC = 7.05 km to 2 dp, cao	**A1**

Answer: AC = 7.05 km

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