7.11 Finding the Area of Any Triangle: 2-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 120 minutes

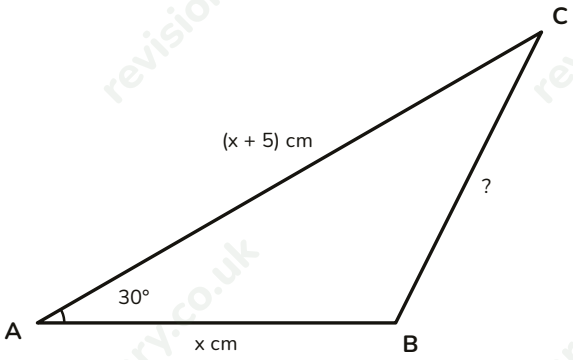
Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 In triangle ABC, AB = x cm, AC = (x + 5) cm and angle BAC = 30 degrees. The area of the triangle is 26 cm². Work out the value of x.

Diagram NOT accurately drawn

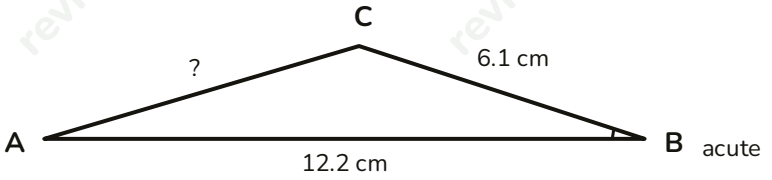


(Total for Question 1 is 4 marks)

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2 The area of triangle ABC is 11.5 cm². AB = 12.2 cm and BC = 6.1 cm. Angle ABC is acute. Work out the size of angle ABC. Give your answer correct to 1 decimal place.

Diagram NOT accurately drawn

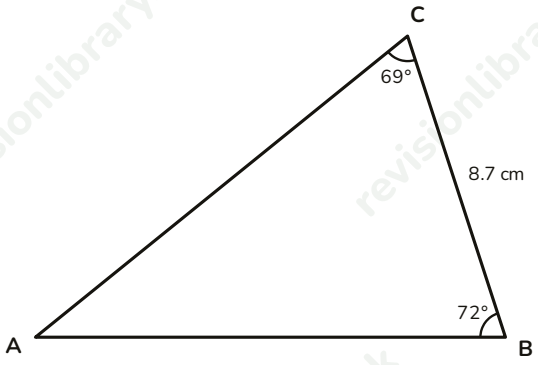


(Total for Question 2 is 3 marks)

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3 In triangle ABC, BC = 8.7 cm, angle ABC = 72 degrees and angle ACB = 69 degrees. Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

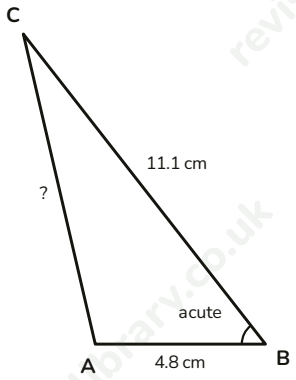


(Total for Question 3 is 4 marks)

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4 The area of triangle ABC is 21 cm². AB = 4.8 cm and BC = 11.1 cm. Angle ABC is acute. Work out the size of angle ABC. Give your answer correct to 1 decimal place.

Diagram NOT accurately drawn

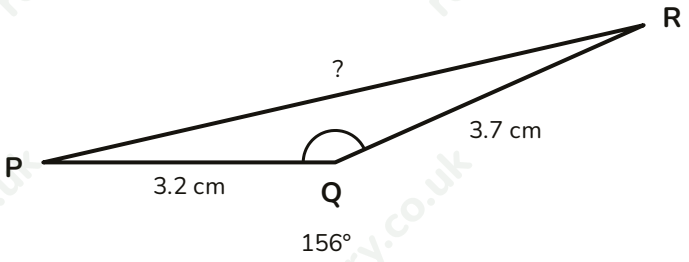


(Total for Question 4 is 3 marks)

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5 In triangle PQR, PQ = 3.2 cm, QR = 3.7 cm and angle PQR = 156 degrees. Work out the area of the triangle. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

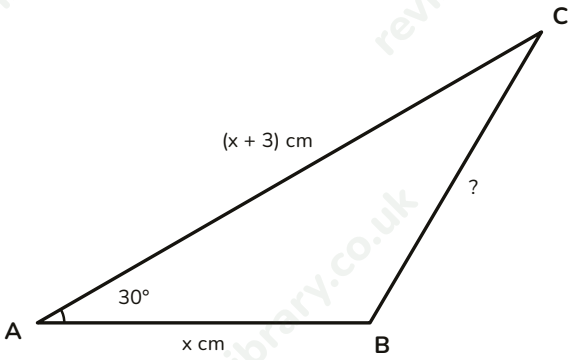


(Total for Question 5 is 2 marks)

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6 In triangle ABC, AB = x cm, AC = (x + 3) cm and angle BAC = 30 degrees. The area of the triangle is 7 cm². Work out the value of x.

Diagram NOT accurately drawn

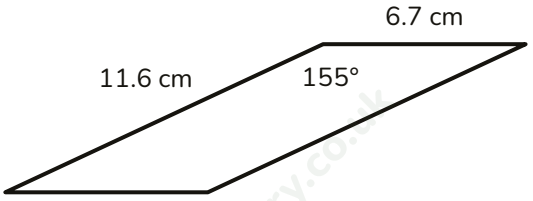


(Total for Question 6 is 4 marks)

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7 A parallelogram has sides of length 6.7 cm and 11.6 cm. The angle between these two sides is 155 degrees. Work out the area of the parallelogram. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

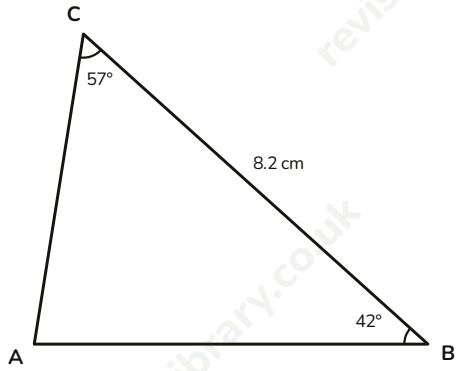


(Total for Question 7 is 2 marks)

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8 In triangle ABC, BC = 8.2 cm, angle ABC = 42 degrees and angle ACB = 57 degrees. Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

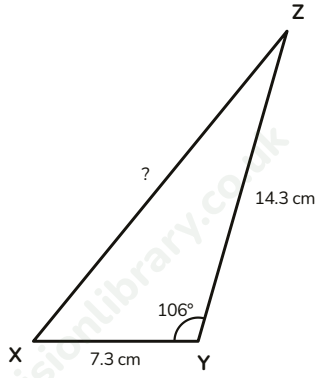


(Total for Question 8 is 4 marks)

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9 In triangle XYZ, XY = 7.3 cm, YZ = 14.3 cm and angle XYZ = 106 degrees. Work out the area of the triangle. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

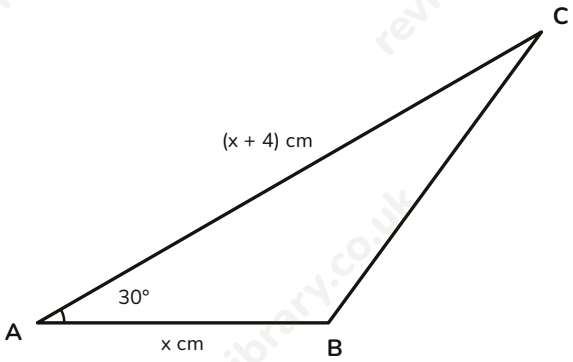


(Total for Question 9 is 2 marks)

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10 In triangle ABC, AB = x cm, AC = (x + 4) cm and angle BAC = 30 degrees. The area of the triangle is 8 cm². Work out the value of x.

Diagram NOT accurately drawn

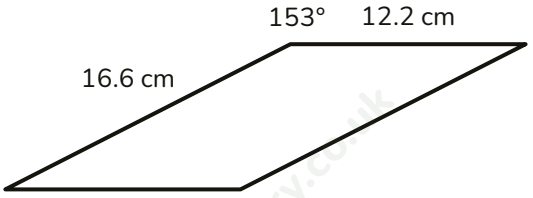


(Total for Question 10 is 4 marks)

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11 A parallelogram has sides of length 12.2 cm and 16.6 cm. The angle between these two sides is 153 degrees. Work out the area of the parallelogram. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

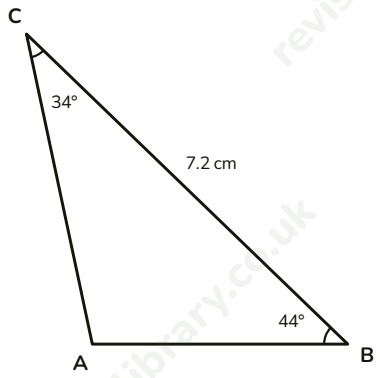


(Total for Question 11 is 2 marks)

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12 In triangle ABC, BC = 7.2 cm, angle ABC = 44 degrees and angle ACB = 34 degrees. Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

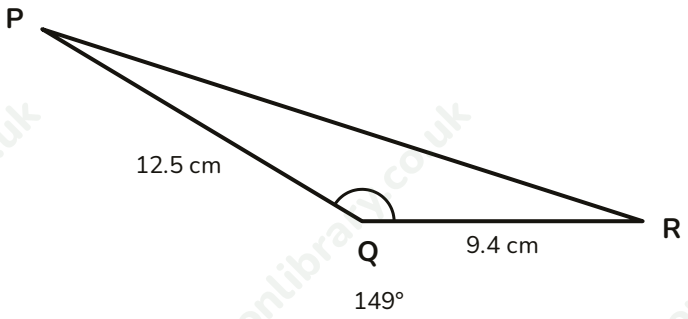


(Total for Question 12 is 4 marks)

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13 In triangle PQR, PQ = 12.5 cm, QR = 9.4 cm and angle PQR = 149 degrees. Work out the area of the triangle. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

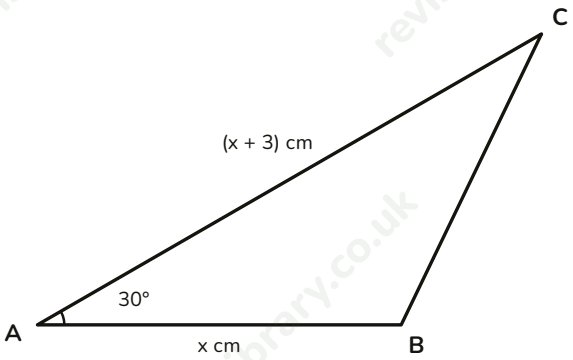


(Total for Question 13 is 2 marks)

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14 In triangle ABC, AB = x cm, AC = (x + 3) cm and angle BAC = 30 degrees. The area of the triangle is 10 cm². Work out the value of x.

Diagram NOT accurately drawn

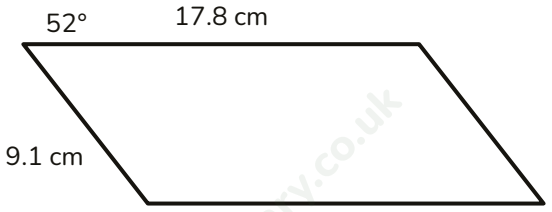


(Total for Question 14 is 4 marks)

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15 A parallelogram has sides of length 17.8 cm and 9.1 cm. The angle between these two sides is 52 degrees. Work out the area of the parallelogram. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

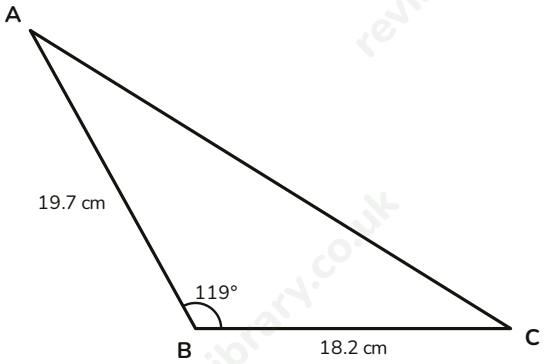


(Total for Question 15 is 2 marks)

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16 In triangle ABC, AB = 19.7 cm, BC = 18.2 cm and angle ABC = 119 degrees. Work out the area of the triangle. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

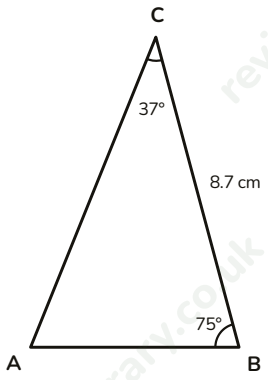


(Total for Question 16 is 2 marks)

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17 In triangle ABC, BC = 8.7 cm, angle ABC = 75 degrees and angle ACB = 37 degrees. Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

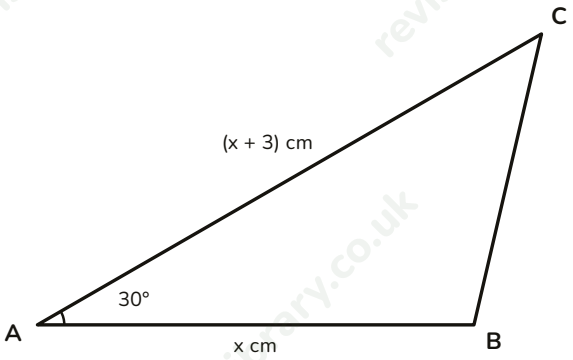


(Total for Question 17 is 4 marks)

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18 In triangle ABC, AB = x cm, AC = (x + 3) cm and angle BAC = 30 degrees. The area of the triangle is 27 cm². Work out the value of x.

Diagram NOT accurately drawn

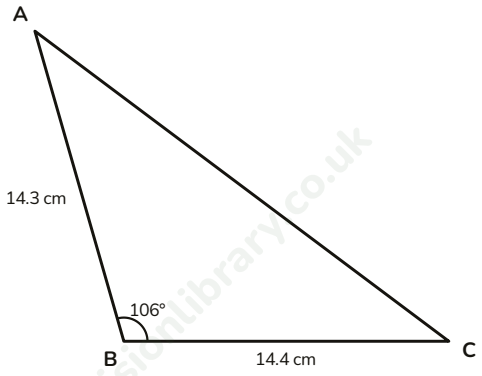


(Total for Question 18 is 4 marks)

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19 In triangle ABC, AB = 14.3 cm, BC = 14.4 cm and angle ABC = 106 degrees. Work out the area of the triangle. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

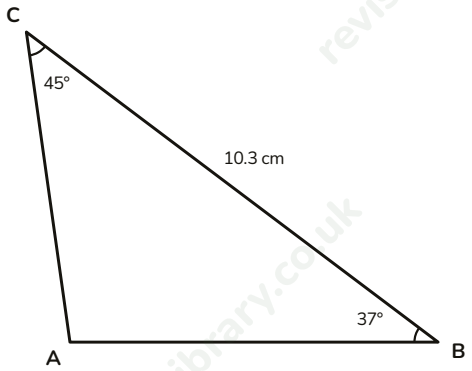


(Total for Question 19 is 2 marks)

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20 In triangle ABC, BC = 10.3 cm, angle ABC = 37 degrees and angle ACB = 45 degrees. Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

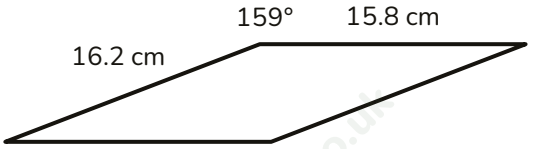


(Total for Question 20 is 4 marks)

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21 A parallelogram has sides of length 15.8 cm and 16.2 cm. The angle between these two sides is 159 degrees. Work out the area of the parallelogram. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

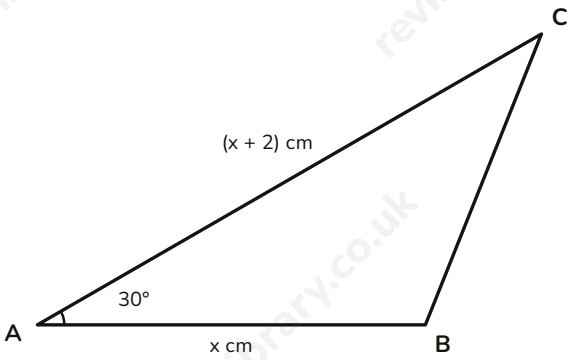


(Total for Question 21 is 2 marks)

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22 In triangle ABC, AB = x cm, AC = (x + 2) cm and angle BAC = 30 degrees. The area of the triangle is 6 cm². Work out the value of x.

Diagram NOT accurately drawn

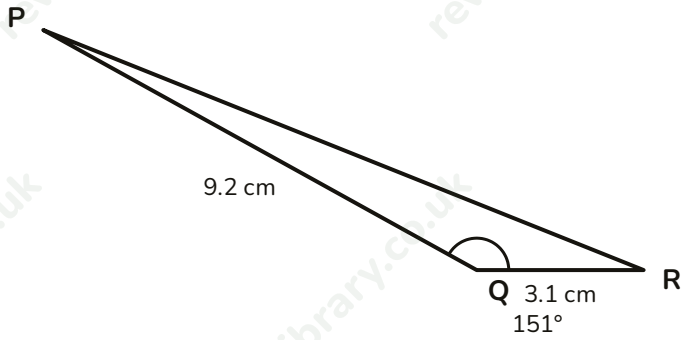


(Total for Question 22 is 4 marks)

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23 In triangle PQR, PQ = 9.2 cm, QR = 3.1 cm and angle PQR = 151 degrees. Work out the area of the triangle. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

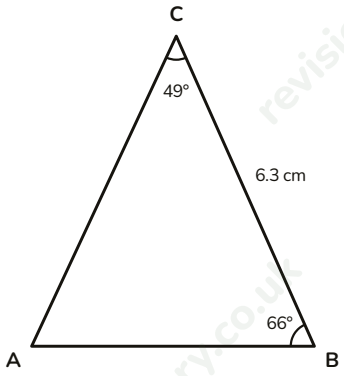


(Total for Question 23 is 2 marks)

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24 In triangle ABC, BC = 6.3 cm, angle ABC = 66 degrees and angle ACB = 49 degrees. Work out the area of triangle ABC. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

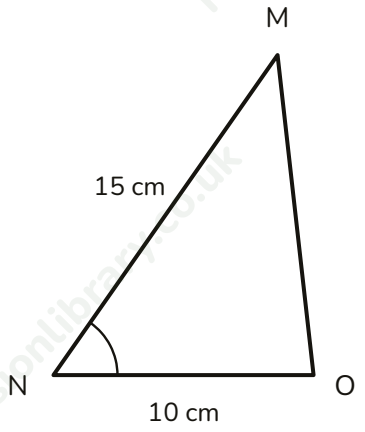


(Total for Question 24 is 4 marks)

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25 The area of triangle MNO is 60 cm². MN = 15 cm and NO = 10 cm. Angle MNO is acute. Calculate angle MNO. Give your answer correct to 1 decimal place.

Diagram NOT accurately drawn

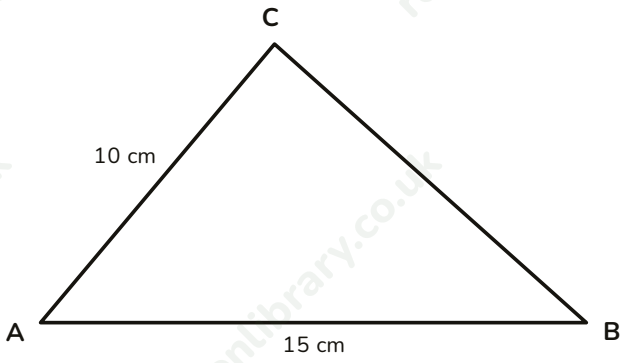


(Total for Question 25 is 3 marks)

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26 Triangle ABC has AB = 15 cm, AC = 10 cm and area 36 cm². Angle A is acute.
Work out angle A and then calculate the length BC. Give the final length BC to the nearest whole number.

Diagram NOT accurately drawn

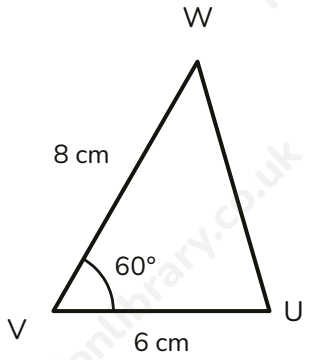


(Total for Question 26 is 5 marks)

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27 Triangle UVW has UV = 6 cm, VW = 8 cm and angle UVW = 60 degrees. Work out the exact area of triangle UVW, giving your answer in the form k*$\sqrt{3}$, where k is an integer.

Diagram NOT accurately drawn

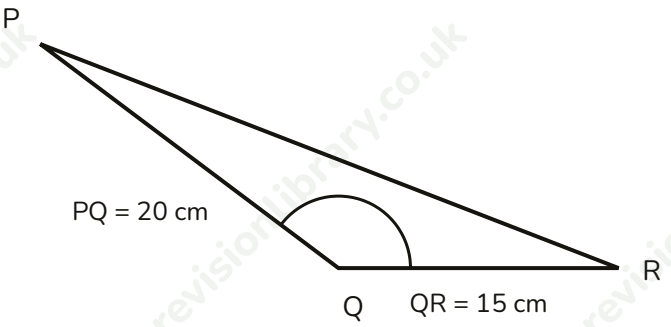


(Total for Question 27 is 3 marks)

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28 The area of triangle PQR is 90 cm². PQ = 20 cm and QR = 15 cm. Angle PQR is obtuse.

Diagram NOT accurately drawn



(a) Calculate angle PQR. Give your answer correct to 1 decimal place. **(3)**

.....

(b) Calculate the length of PR. Give your answer correct to 3 significant figures. **(3)**

.....

(Total for Question 28 is 6 marks)

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Mark scheme · 7.11 Finding the Area of Any Triangle: 2-hour Pack

Question 1

1/2 x x x (x + k) x sin 30	**M1**
$x^2 + 5x = 104$ or equivalent	**M1**
solves the quadratic	**M1**
x = 8	**A1**

Answer: x = 8

Question 2

11.5 = 1/2 x 12.2 x 6.1 x sin B	**M1**
sin B = 0.3091 or inverse sin used	**M1**
18.0 degrees cao	**A1**

Answer: 18.0 degrees

Question 3

angle BAC = 39 degrees	**M1**
sine rule used to find AC or AB	**M1**
area = 1/2 ab sin C with correct values	**M1**
53.4 cm² cao	**A1**

Answer: 53.4 cm^2

Question 4

21 = 1/2 x 4.8 x 11.1 x sin B	**M1**
sin B = 0.7883 or inverse sin used	**M1**
52.0 degrees cao	**A1**

Answer: 52.0 degrees

Question 5

1/2 x a x b x sin C with correct values	**M1**
2.41 cm² cao	**A1**

Answer: 2.41 cm^2

Question 6

1/2 x x x (x + k) x sin 30	**M1**
$x^2 + 3x = 28$ or equivalent	**M1**
solves the quadratic	**M1**
x = 4	**A1**

Answer: x = 4

Question 7

uses ab sin C or twice the area of a triangle	**M1**
32.8 cm² cao	**A1**

Answer: 32.8 cm^2

Question 8

angle BAC = 81 degrees	**M1**
sine rule used to find AC or AB	**M1**
area = 1/2 ab sin C with correct values	**M1**
19.1 cm² cao	**A1**

Answer: 19.1 cm^2

Question 9

1/2 x a x b x sin C with correct values	**M1**
50.2 cm² cao	**A1**

Answer: 50.2 cm^2

Question 10

1/2 x x x (x + k) x sin 30	**M1**
$x^2 + 4x = 32$ or equivalent	**M1**
solves the quadratic	**M1**
x = 4	**A1**

Answer: x = 4

Question 11

uses ab sin C or twice the area of a triangle	**M1**
91.9 cm² cao	**A1**

Answer: 91.9 cm^2

Question 12

angle BAC = 102 degrees	**M1**
sine rule used to find AC or AB	**M1**
area = 1/2 ab sin C with correct values	**M1**
10.3 cm² cao	**A1**

Answer: 10.3 cm^2

Question 13

1/2 x a x b x sin C with correct values	**M1**
30.3 cm² cao	**A1**

Answer: 30.3 cm^2

Question 14

1/2 x x x (x + k) x sin 30	**M1**
$x^2 + 3x = 40$ or equivalent	**M1**
solves the quadratic	**M1**
x = 5	**A1**

Answer: x = 5

Question 15

uses ab sin C or twice the area of a triangle	**M1**
128 cm² cao	**A1**

Answer: 128 cm^2

Question 16

1/2 x a x b x sin C with correct values	**M1**
157 cm² cao	**A1**

Answer: 157 cm^2

Question 17

angle BAC = 68 degrees	**M1**
sine rule used to find AC or AB	**M1**
area = 1/2 ab sin C with correct values	**M1**
23.7 cm² cao	**A1**

Answer: 23.7 cm^2

Question 18

1/2 x x x (x + k) x sin 30	**M1**
$x^2 + 3x = 108$ or equivalent	**M1**
solves the quadratic	**M1**
x = 9	**A1**

Answer: x = 9

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Question 19

1/2 x a x b x sin C with correct values	**M1**
99.0 cm² cao	**A1**

Answer: 99.0 cm^2

Question 20

angle BAC = 98 degrees	**M1**
sine rule used to find AC or AB	**M1**
area = 1/2 ab sin C with correct values	**M1**
22.8 cm² cao	**A1**

Answer: 22.8 cm^2

Question 21

uses ab sin C or twice the area of a triangle	**M1**
91.7 cm² cao	**A1**

Answer: 91.7 cm^2

Question 22

1/2 x x x (x + k) x sin 30	**M1**
$x^2 + 2x = 24$ or equivalent	**M1**
solves the quadratic	**M1**
x = 4	**A1**

Answer: x = 4

Question 23

1/2 x a x b x sin C with correct values	**M1**
6.91 cm² cao	**A1**

Answer: 6.91 cm^2

Question 24

angle BAC = 65 degrees	**M1**
sine rule used to find AC or AB	**M1**
area = 1/2 ab sin C with correct values	**M1**
15.1 cm² cao	**A1**

Answer: 15.1 cm^2

Question 25

60 = 1/2 x 15 x 10 x sin(MNO) oe	**M1**
sin(MNO) = 60/75 (=0.8)	**M1**
53.1 degrees awrt (acute value only)	**A1**

Answer: 53.1 degrees (1 dp)

Question 26

use 1/2 * 15 * 10 * sin A = 36 so sin A = 72/150 = 0.48	**M1**
take inverse sine to find A = arcsin(0.48) oe	**M1**
use law of cosines: $BC^2 = 15^2 + 10^2$ - 2*15*10*cos A	**M1**
substitute cos A and evaluate BC	**M1**
8 cm cao	**A1**

Answer: 8 cm

Question 27

1/2 x 6 x 8 x sin60 oe	**M1**
sin60 = $\sqrt{3}/2$ used, 24 x $\sqrt{3}/2$	**M1**
$12\sqrt{3}$ cm^2 oe exact	**A1**

Answer: 12*$\sqrt{3}$ cm^2

Question 28

(a) 90 = 1/2 x 20 x 15 x sin(PQR) oe	**M1**
(a) sin(PQR) = 90/150 (=0.6)	**M1**
(a) 143.1 degrees awrt (obtuse value selected)	**A1**

(a) Answer: 143.1 degrees (1 dp)

(b) $PR^2 = 20^2 + 15^2$ - 2 x 20 x 15 x cos(PQR) oe (ft their angle)	**M1**
(b) cos(143.1) = -0.8 used, $PR^2 = 625 - 600 \times (-0.8)$ (=1105)	**M1**
(b) 33.2 cm awrt	**A1**

(b) Answer: 33.2 cm (3 sf)

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