

Exam Questions

Sine, Cosine Rule & Area of Triangles

The Sine Rule / The Cosine Rule / Area of a Triangle / Deciding the Trig Rule

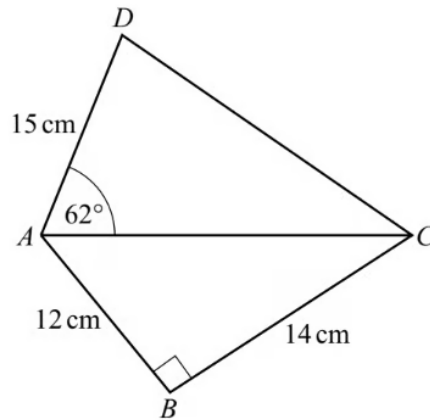
Medium (15 questions)	/72
Hard (19 questions)	/130
Very Hard (14 questions)	/104
Total Marks	/306

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Medium Questions

1 (a)



NOT TO
SCALE

The diagram shows a quadrilateral, $ABCD$, formed from two triangles, ABC and ACD .

ABC is a right-angled triangle.

Calculate angle BAC .

Angle BAC =

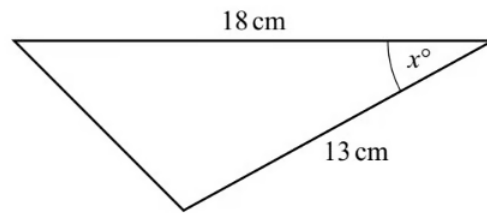
(2 marks)

(b) Calculate BD .

BD = cm

(4 marks)

2



NOT TO
SCALE

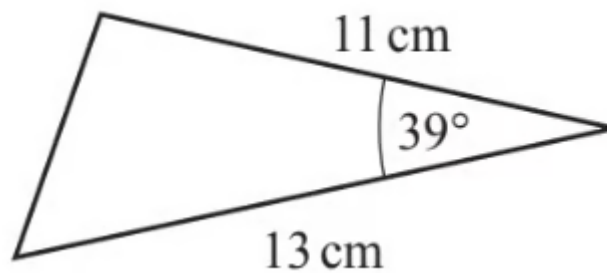
The area of the triangle is 50cm^2 .

Calculate the value of $\sin x$.

$\sin x = \dots\dots\dots$

(2 marks)

3



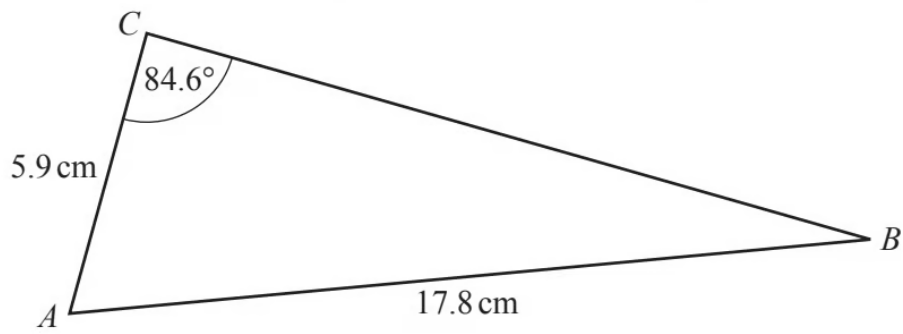
NOT TO
SCALE

Calculate the area of the triangle.

$\dots\dots\dots \text{cm}^2$

(2 marks)

4



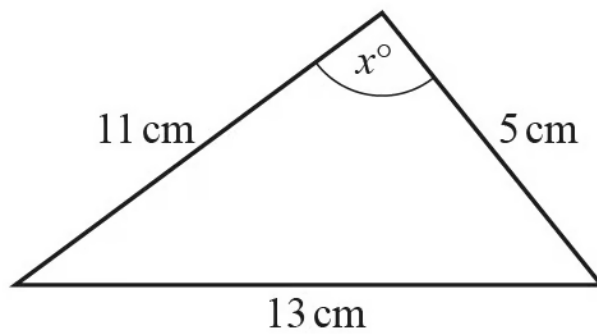
NOT TO
SCALE

Use the sine rule to find angle ABC .

Angle $ABC = \dots\dots\dots$

(3 marks)

5



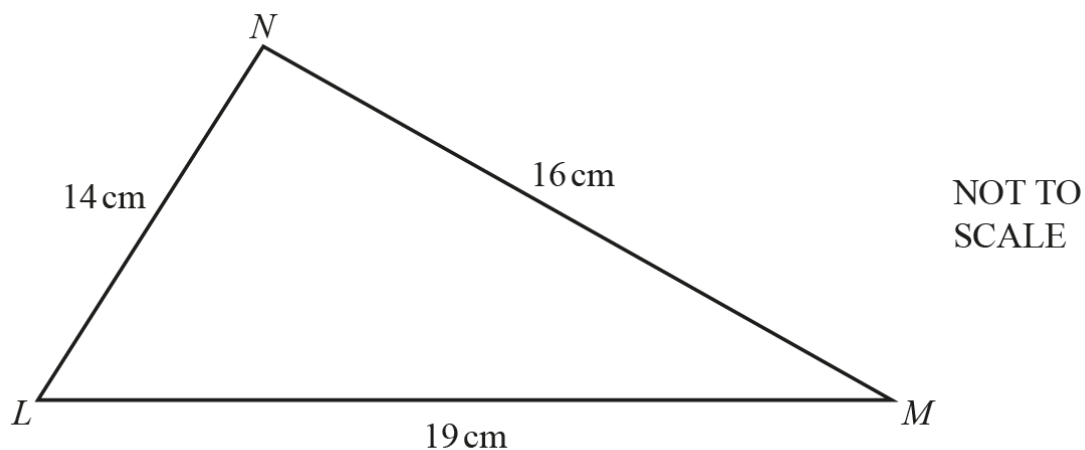
NOT TO
SCALE

Calculate the value of x .

$x = \dots\dots\dots$

(4 marks)

6



Calculate angle LMN .

Angle $LMN = \dots\dots\dots$

(4 marks)

7 (a) ABC is a triangle.

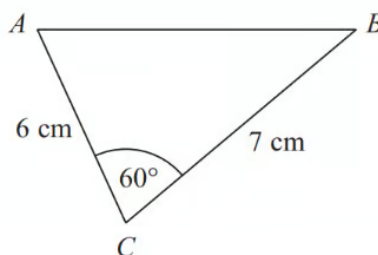


Diagram **NOT**
accurately drawn

Work out the area of triangle ABC .

Give your answer as an exact value.

(2 marks)

(b) Work out the length of the side AB . Give your answer as a simplified surd.

(3 marks)

8

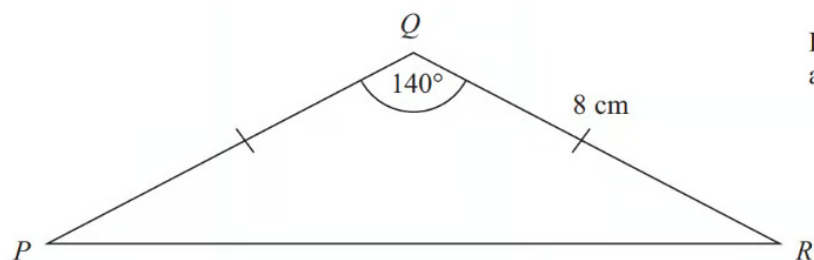


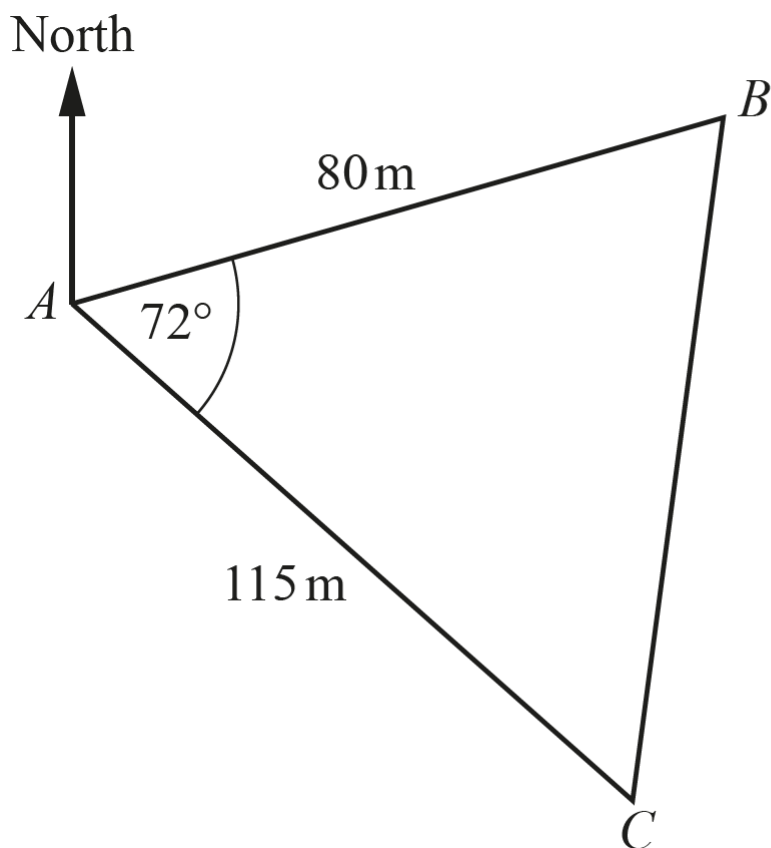
Diagram **NOT**
accurately drawn

Calculate the length of PR .

Give your answer correct to 3 significant figures.

(3 marks)

9 (a)



NOT TO
SCALE

The diagram shows the positions of three points A , B and C in a field.

Show that BC is 118.1 m, correct to 1 decimal place.

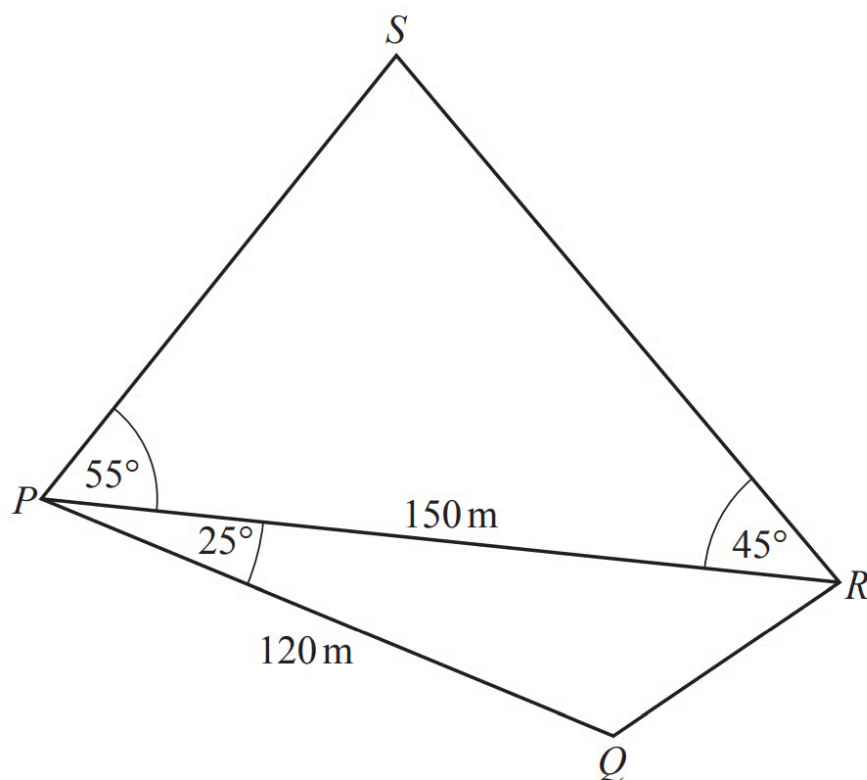
(3 marks)

(b) Calculate angle ABC .

Angle $ABC =$

(3 marks)

10 (a)



NOT TO
SCALE

The diagram shows two triangles.

Calculate QR .

$QR = \dots\dots\dots\text{ m}$

(3 marks)

(b) Calculate RS .

$RS = \dots\dots\dots\text{ m}$

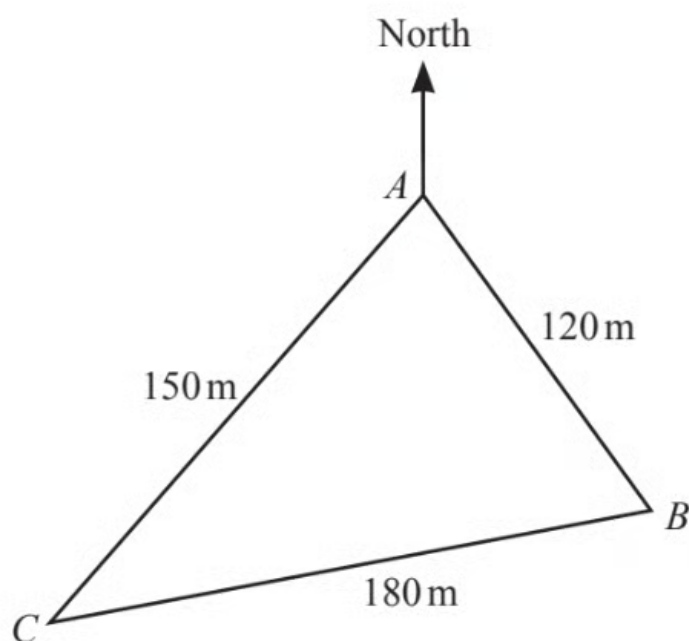
(4 marks)

(c) Calculate the total area of the two triangles.

..... m²

(3 marks)

11

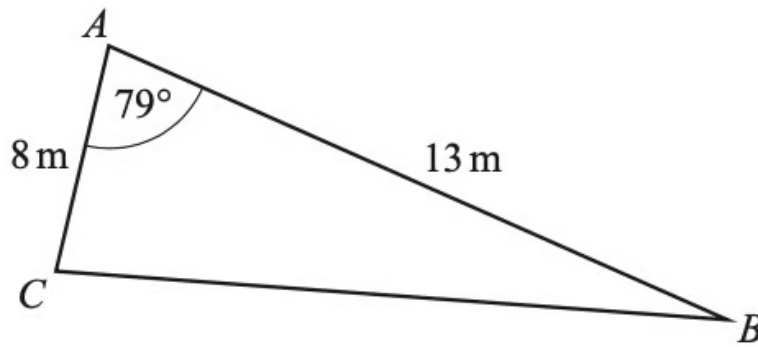


NOT TO
SCALE

Use the cosine rule to find angle BAC .

Angle BAC =

(4 marks)



NOT TO
SCALE

The diagram shows triangle ABC .

i) Use the cosine rule to calculate BC .

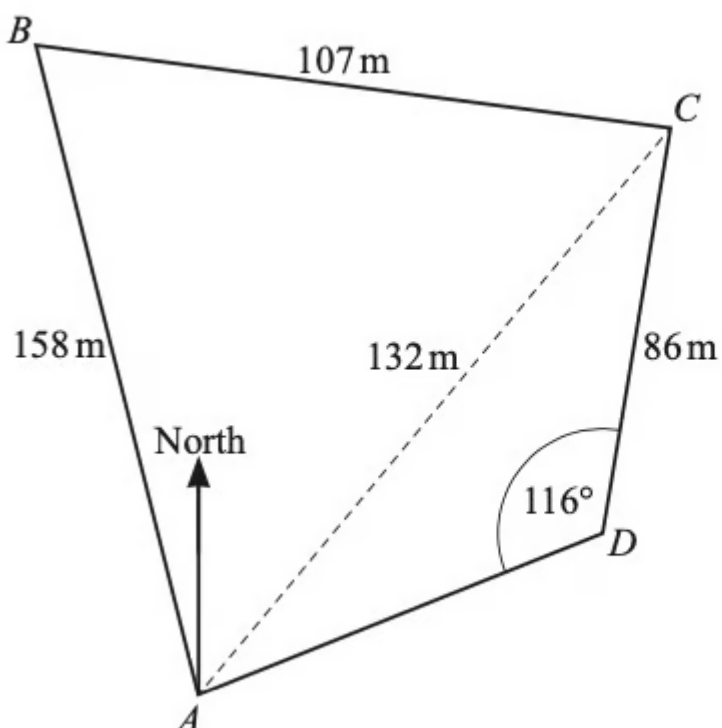
$BC = \dots\dots\dots$ m [4]

ii) Use the sine rule to calculate angle ACB .

Angle $ACB = \dots\dots\dots$ [3]

(7 marks)

13 (a)



NOT TO
SCALE

The diagram shows a field, $ABCD$, on horizontal ground.

Use the cosine rule to find angle BAC .

Angle $BAC = \dots\dots\dots$

(4 marks)

(b) Use the sine rule to find angle CAD .

Angle $CAD = \dots\dots\dots$

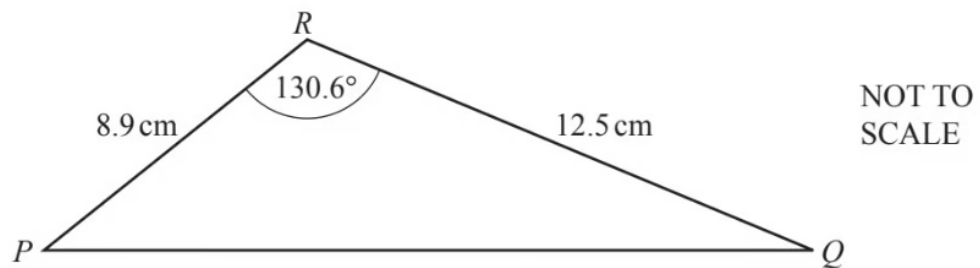
(3 marks)

(c) Calculate the area of the field.

..... m²

(3 marks)

14

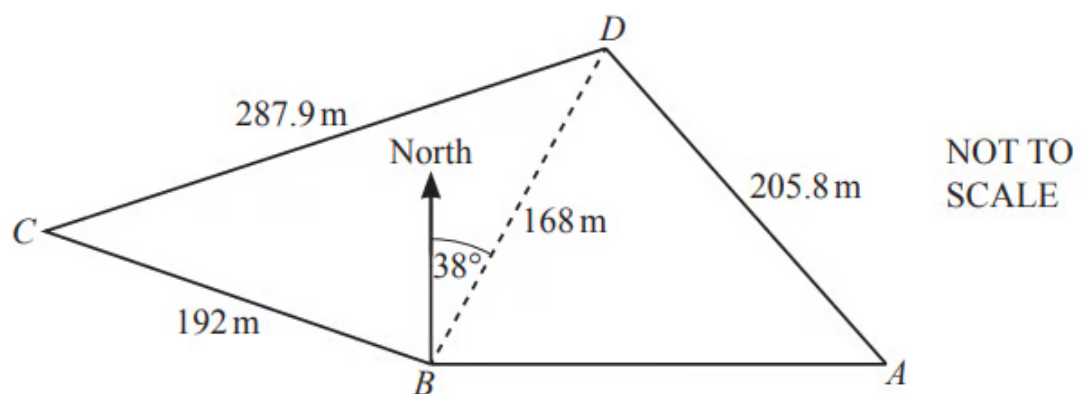


Calculate the area of triangle PQR .

..... cm²

(2 marks)

15 (a)



The diagram shows a field, $ABCD$, on horizontal ground. $BC = 192\text{ m}$, $CD = 287.9\text{ m}$ and $BD = 168\text{ m}$.

Angle CBD rounds to 106.0° , correct to 1 decimal place.

Calculate the area of triangle BCD .

..... m^2

(2 marks)

(b) Tomas buys the triangular part of the field, BCD .

The cost is \$35 750 per hectare.

Calculate the amount he pays.

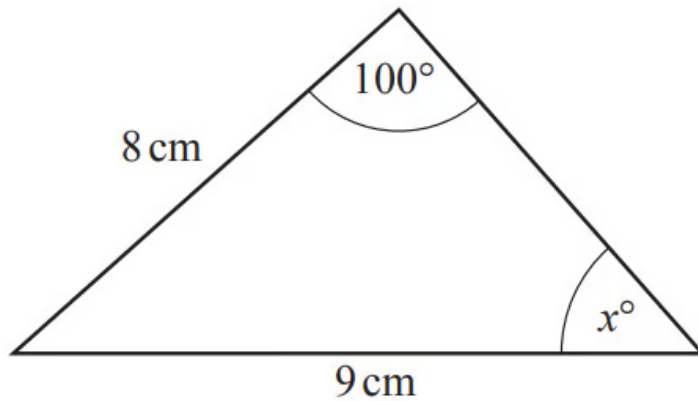
Give your answer correct to the nearest \$100. [1 hectare = 10000m^2]

\$

(2 marks)

Hard Questions

1 (a)



NOT TO
SCALE

Calculate the value of x .

$x =$

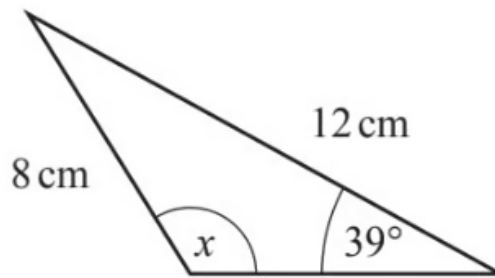
(3 marks)

(b) Calculate the area of the triangle.

..... cm^2

(3 marks)

2



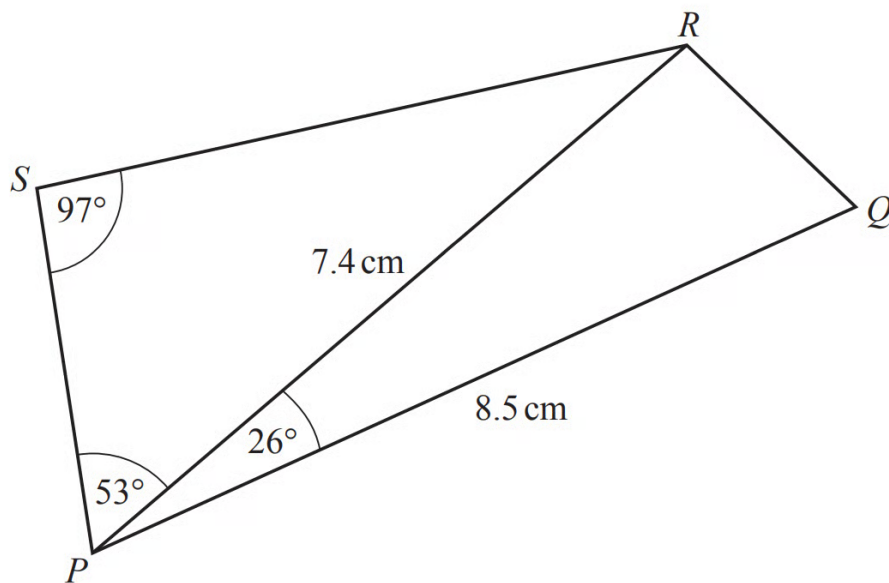
NOT TO
SCALE

Calculate the **obtuse** angle x in this triangle.

$x = \dots\dots\dots$

(3 marks)

3 (a)



NOT TO
SCALE

Calculate SR .

$SR = \dots\dots\dots$ cm

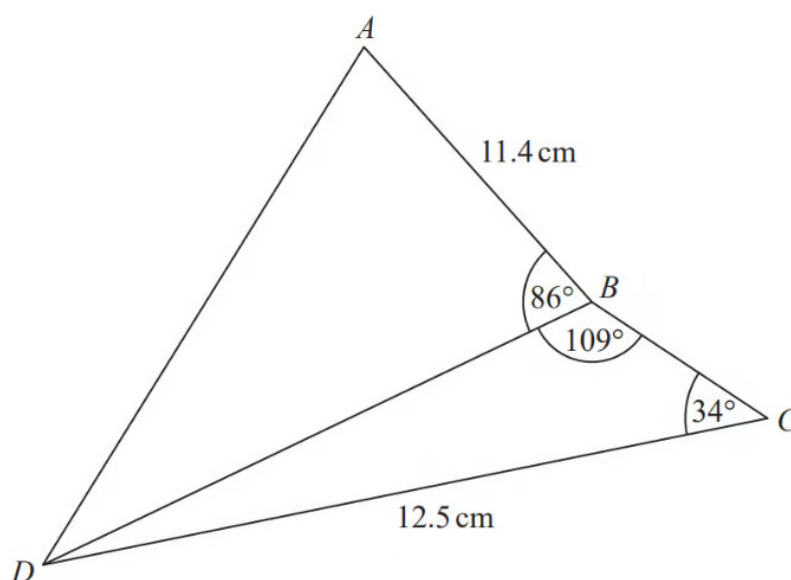
(3 marks)

(b) Calculate RQ .

$RQ = \dots\dots\dots$ cm

(4 marks)

4



Work out the length of AD .

Give your answer correct to 3 significant figures.

(5 marks)

5

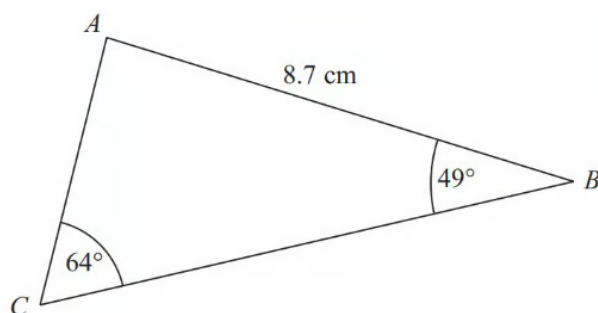


Diagram **NOT**
accurately drawn

ABC is a triangle.

$AB = 8.7$ cm.

Angle $ABC = 49^\circ$.

Angle $ACB = 64^\circ$.

Calculate the area of triangle ABC .

Give your answer correct to 3 significant figures.

(5 marks)

6 The diagram shows triangle LMN .

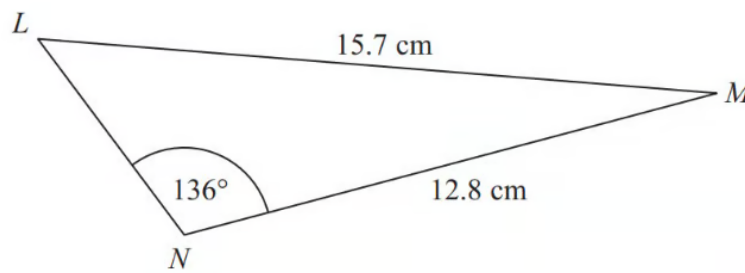


Diagram **NOT**
accurately drawn

Calculate the length of LN .

Give your answer correct to 3 significant figures.

(5 marks)

7

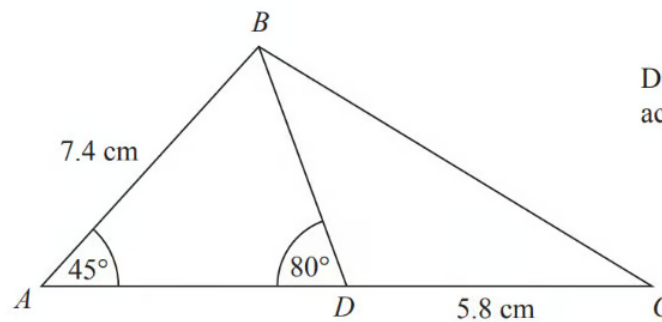


Diagram **NOT**
accurately drawn

ABC is a triangle.

D is a point on AC .

Angle $BAD = 45^\circ$

Angle $ADB = 80^\circ$

$$AB = 7.4\text{cm}$$

$$DC = 5.8\text{ cm}$$

Work out the length of BC .

Give your answer correct to 3 significant figures.

(5 marks)

8 ABC is a triangle.

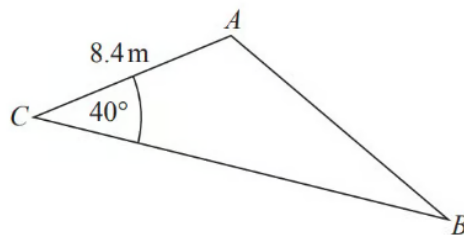


Diagram **NOT**
accurately drawn

$$AC = 8.4\text{m}$$

$$\text{Angle } ACB = 40^\circ$$

The area of the triangle = 100 m^2 .

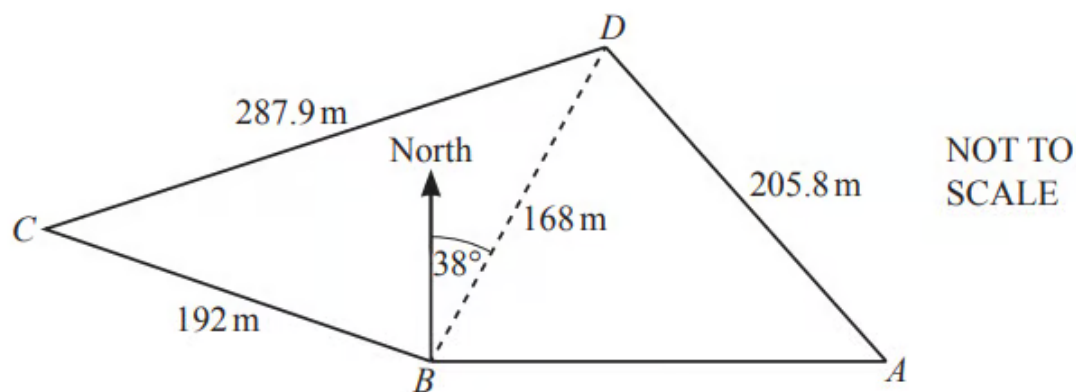
Work out the length of AB .

Give your answer correct to 3 significant figures.

You must show all your working.

(5 marks)

9

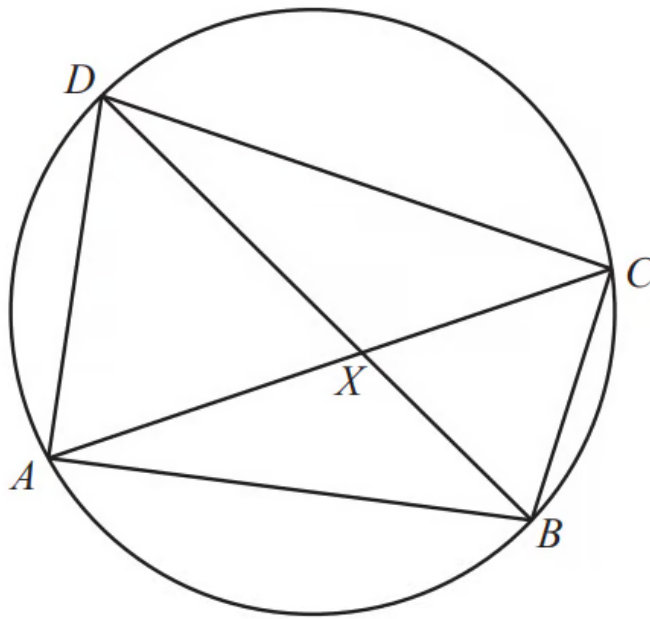


The diagram shows a field, $ABCD$, on horizontal ground.

$BC = 192\text{ m}$, $CD = 287.9\text{ m}$ and $BD = 168\text{ m}$.

Calculate angle CBD and show that it rounds to 106.0° , correct to 1 decimal place.

(4 marks)



NOT TO
SCALE

$AD = 10 \text{ cm}$, $BC = 8 \text{ cm}$, $BX = 5 \text{ cm}$, $CX = 7 \text{ cm}$.

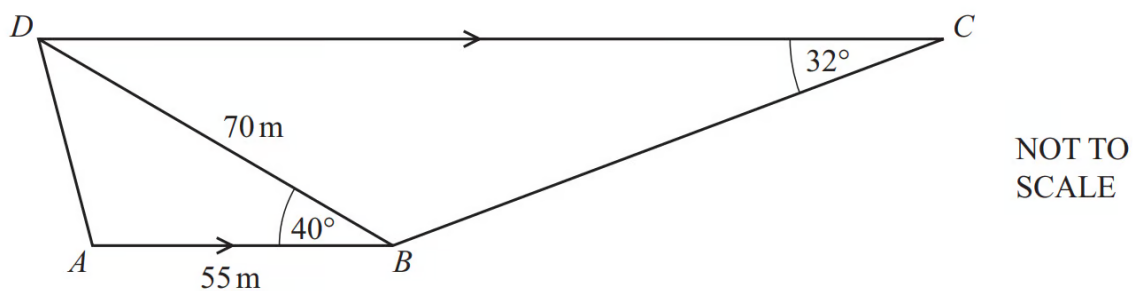
The diagonals of the cyclic quadrilateral $ABCD$ intersect at X .

Calculate angle BXC .

Angle $BXC = \dots\dots\dots$

(4 marks)

11 (a)



The diagram shows a trapezium $ABCD$.

AB is parallel to DC .

$AB = 55\text{ m}$, $BD = 70\text{ m}$, angle $ABD = 40^\circ$ and angle $BCD = 32^\circ$.

Calculate AD .

$AD = \dots\dots\dots\text{ m}$

(4 marks)

(b) Calculate BC .

$BC = \dots\dots\dots\text{ m}$

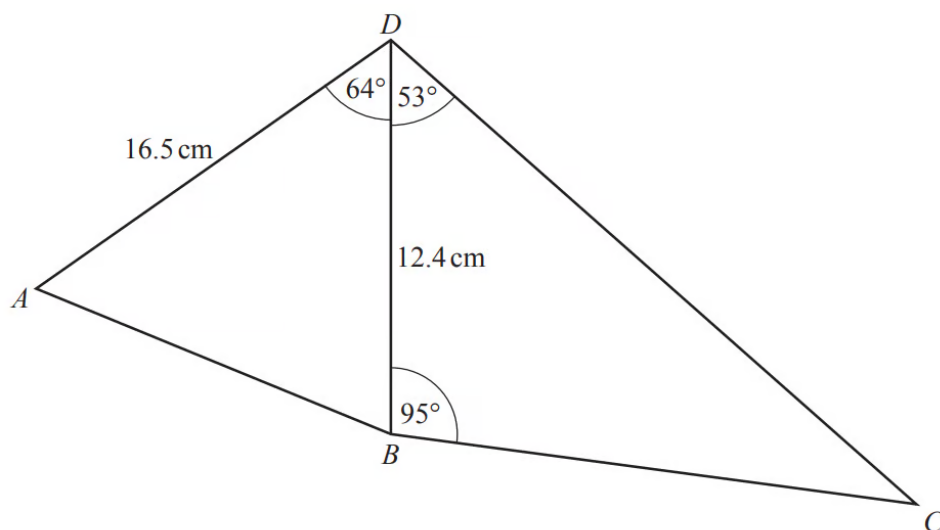
(4 marks)

(c) Calculate the area of $ABCD$.

$\dots\dots\dots\text{ m}^2$

(3 marks)

12



The diagram shows two triangles ABD and BCD .

$AD = 16.5$ cm and $BD = 12.4$ cm.

Angle $ADB = 64^\circ$, angle $BDC = 53^\circ$ and angle $DBC = 95^\circ$.

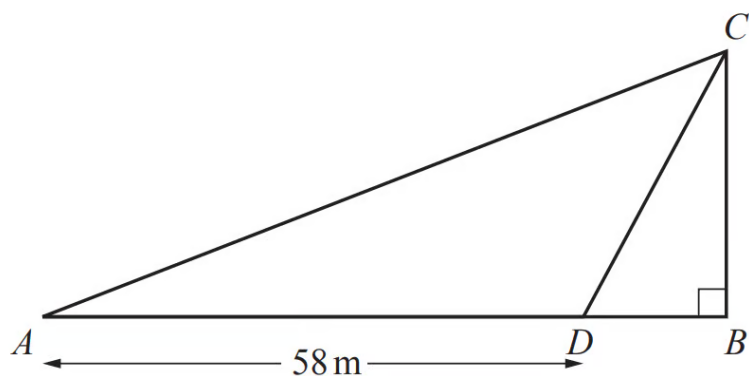
i) Find AB .

$AB = \dots\dots\dots$ cm [4]

ii) Find BC .

$BC = \dots\dots\dots$ cm [4]

(8 marks)



NOT TO
SCALE

In the diagram, BC is a vertical wall standing on horizontal ground AB .

D is the point on AB where $AD = 58$ m.

The angle of elevation of C from A is 26° .

The angle of elevation of C from D is 72° .

i) Show that $AC = 76.7$ m, correct to 1 decimal place.

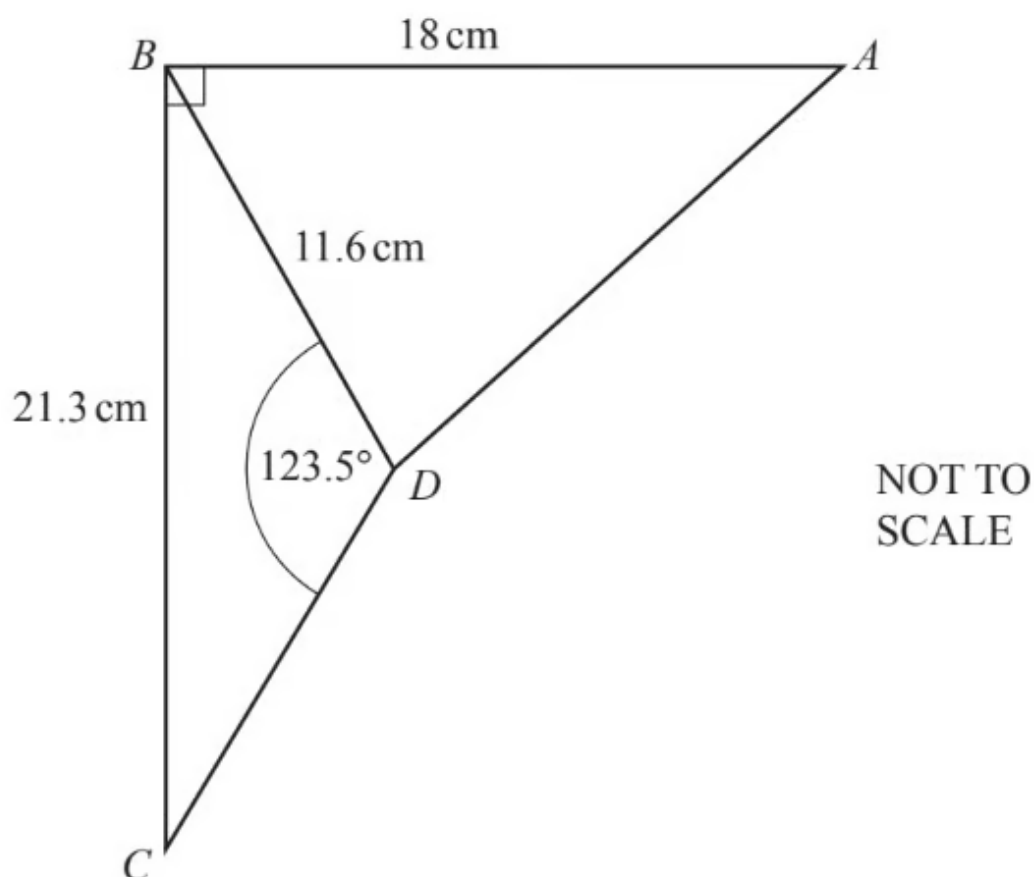
[5]

ii) Calculate BD .

$BD = \dots\dots\dots$ m

[3]

14



In the diagram, $AB = 18$ cm, $BC = 21.3$ cm and $BD = 11.6$ cm.

Angle $BDC = 123.5^\circ$ and angle ABC is a right angle.

i) Calculate angle BCD .

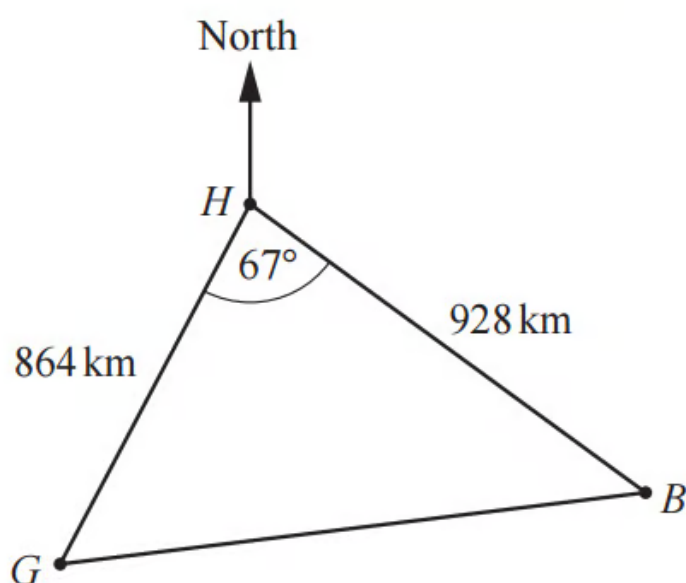
Angle $BCD = \dots\dots\dots$ [3]

ii) Calculate AD .

$AD = \dots\dots\dots$ cm [5]

(8 marks)

- 15 (a)** The diagram shows the positions of three cities, Geneva (G), Budapest (B) and Hamburg (H).



NOT TO
SCALE

Use the cosine rule to calculate the distance from Geneva to Budapest.

..... km

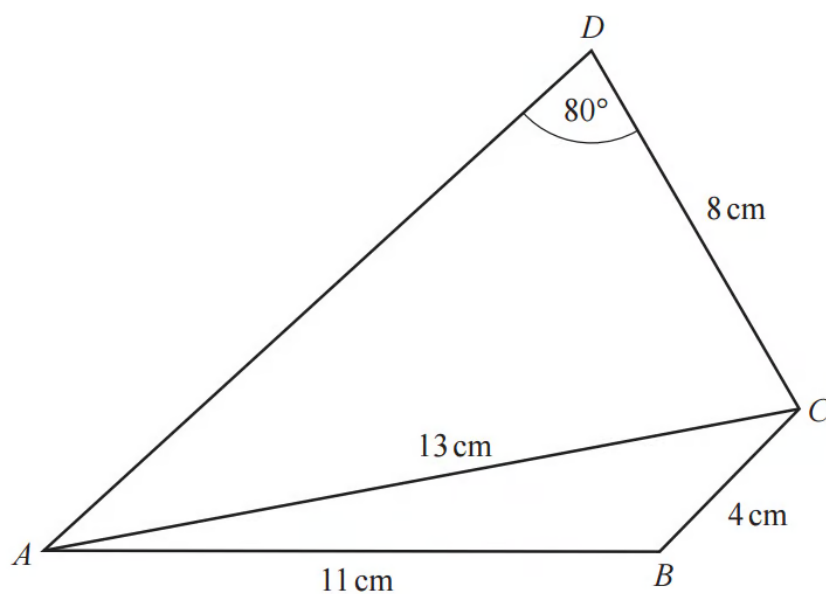
(4 marks)

(b) The bearing of Budapest from Hamburg is 133° .

Calculate the bearing of Budapest from Geneva.

(4 marks)

16 (a)



NOT TO
SCALE

Calculate angle ACB.

Angle ACB =

(4 marks)

(b) Calculate angle ACD.

Angle ACD =

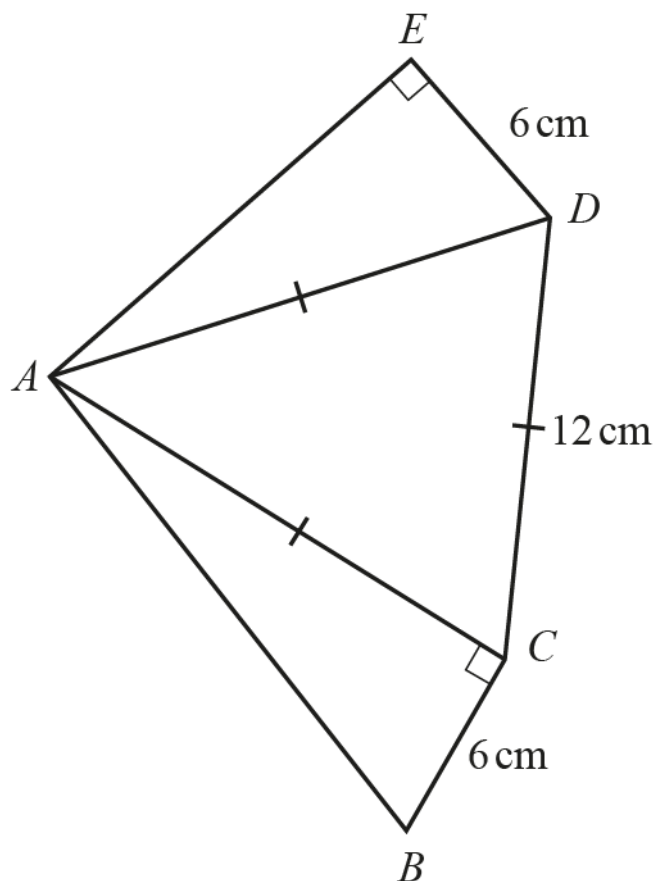
(4 marks)

(c) Calculate the area of the quadrilateral $ABCD$.

..... cm^2

(3 marks)

17 (a)



NOT TO
SCALE

In the pentagon $ABCDE$, angle $ACB = \text{angle } AED = 90^\circ$. Triangle ACD is equilateral with side length 12 cm.

$DE = BC = 6 \text{ cm}$.

Calculate angle BAE .

Angle $BAE = \dots\dots\dots$

(4 marks)

(b) Calculate.

i) AB .

$AB = \dots\dots\dots$ cm [2]

ii) AE .

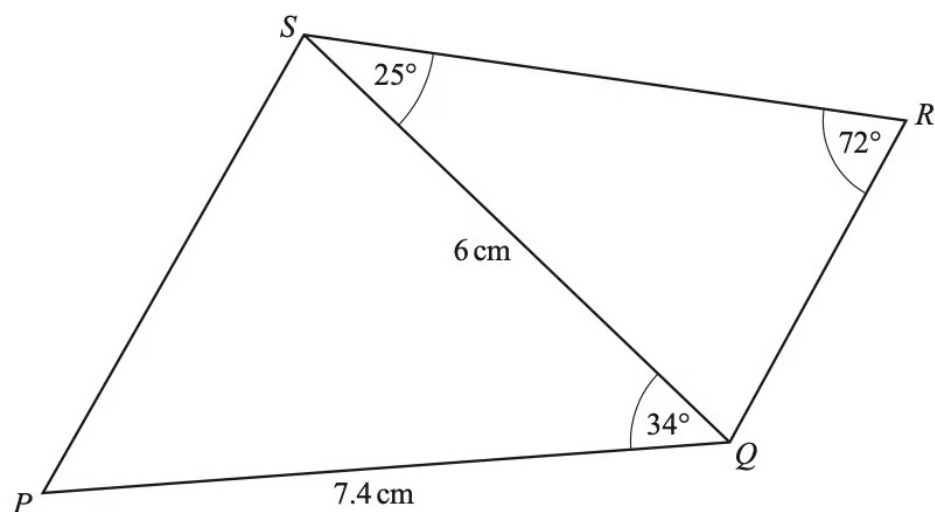
$AE = \dots\dots\dots$ cm [3]

(5 marks)

(c) Calculate the area of the pentagon.

$\dots\dots\dots$ cm²

(4 marks)



NOT TO
SCALE

The diagram shows a quadrilateral $PQRS$ formed from two triangles, PQS and QRS . Calculate

i) QR ,

$QR = \dots\dots\dots\text{ cm}$ [3]

ii) PS ,

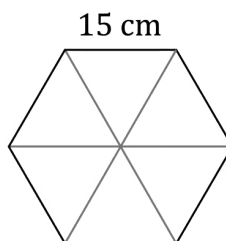
$PS = \dots\dots\dots\text{ cm}$ [3]

iii) the area of quadrilateral $PQRS$.

$\dots\dots\dots\text{ cm}^2$ [4]

(10 marks)

19



A regular hexagon has side lengths 15 cm.

The hexagon is made up of six equilateral triangles.

Work out the area of the hexagon.

Leave your answer correct to 3 significant figures.

(4 marks)

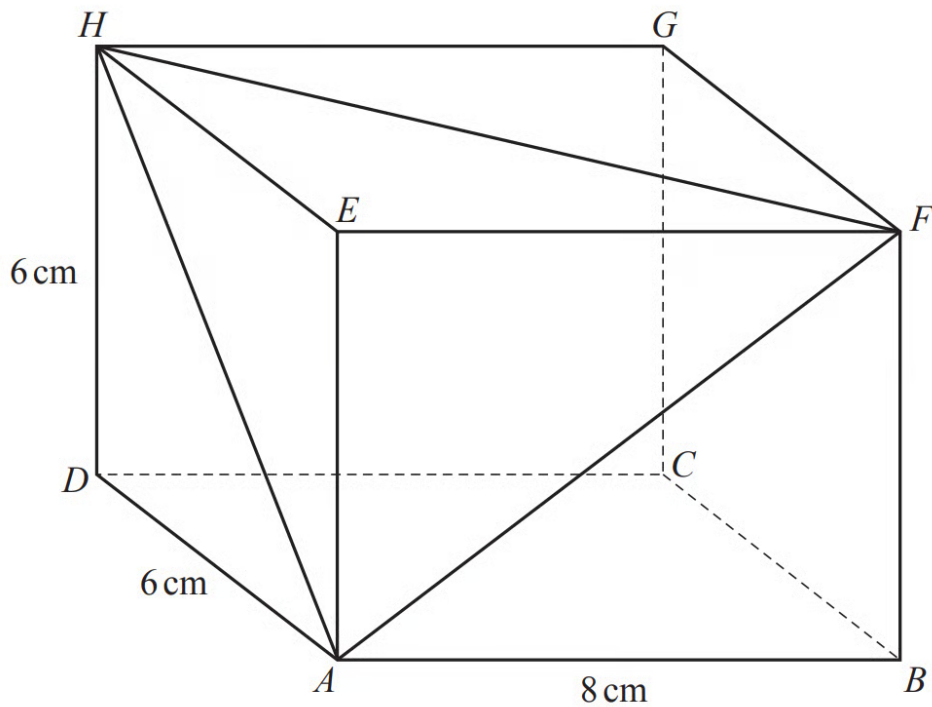
Very Hard Questions

- 1 Find the area of a regular hexagon with side length 7.4 cm.

..... cm²

(3 marks)

2



NOT TO
SCALE

The diagram shows a cuboid.

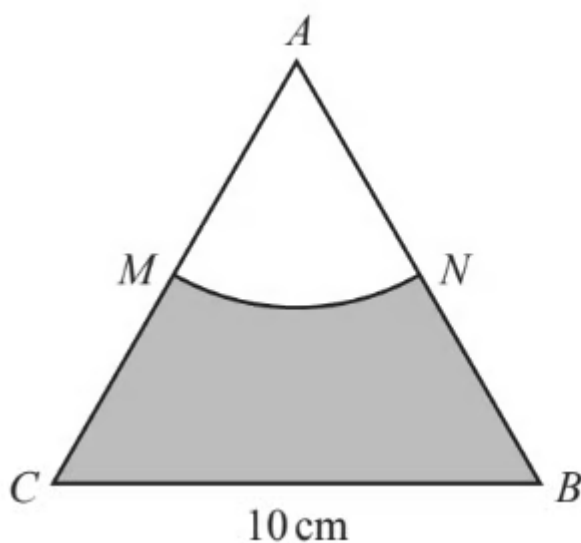
$AB = 8$ cm, $AD = 6$ cm and $DH = 6$ cm.

Calculate angle HAF .

Angle $HAF =$

(6 marks)

3



NOT TO
SCALE

The diagram shows an equilateral triangle ABC with sides of length 10 cm .

AMN is a sector of a circle, centre A .

M is the mid-point of AC .

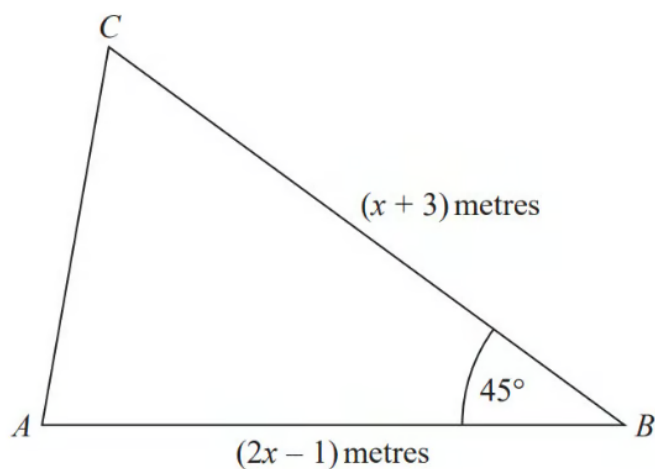
Work out the area of the shaded region.

Give your answer in the form $\left(a\sqrt{3} - \frac{b}{c}\pi\right)\text{cm}^2$ where a , b and c are integers.

..... cm^2

(4 marks)

4



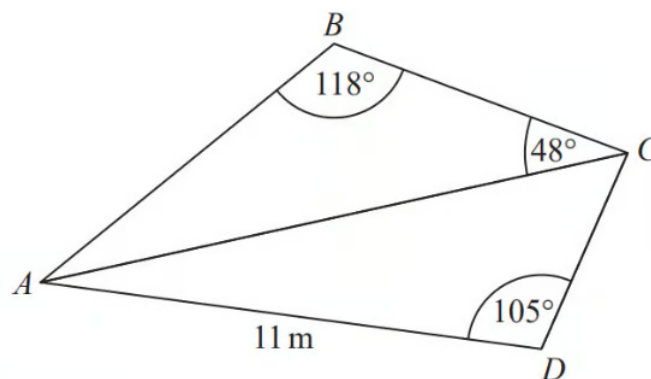
The area of triangle ABC is $6\sqrt{2}$ m².

Calculate the value of x .

Give your answer correct to 3 significant figures.

(5 marks)

5 ABC and ADC are triangles.



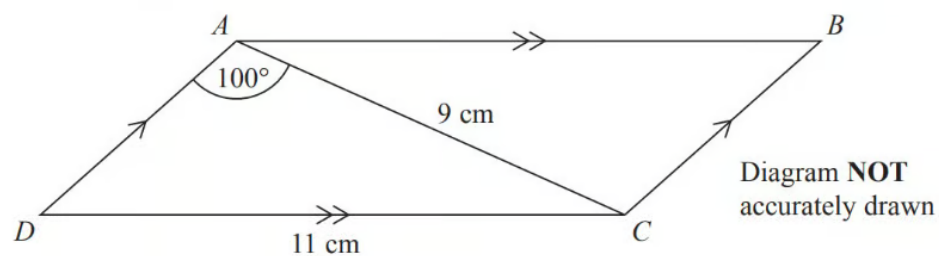
The area of triangle ADC is 56 m^2

Work out the length of AB .

Give your answer correct to 1 decimal place.

(5 marks)

6 $ABCD$ is a parallelogram.



$$AC = 9\text{ cm}$$

$$DC = 11\text{ cm}$$

Angle $DAC = 100^\circ$

Calculate the area of the parallelogram.

Give your answer correct to 3 significant figures.

(5 marks)

7

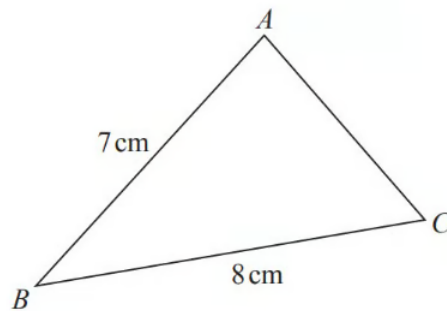


Diagram **NOT**
accurately drawn

ABC is an acute-angled triangle. $BA = 7\text{ cm}$ $BC = 8\text{ cm}$

The area of triangle ABC is 18 cm^2 .

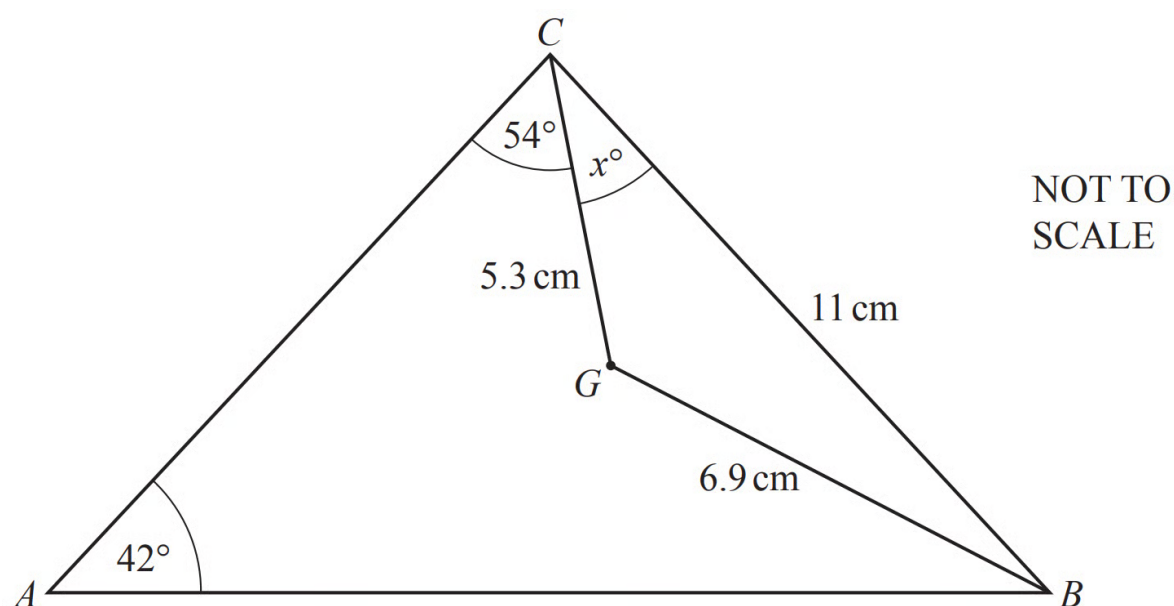
Work out the size of angle BAC .

Give your answer correct to 3 significant figures.

You must show all your working.

(6 marks)

8 (a)



The diagram shows triangle ABC with point G inside.

$CB = 11\text{ cm}$, $CG = 5.3\text{ cm}$ and $BG = 6.9\text{ cm}$.

Angle $CAB = 42^\circ$ and angle $ACG = 54^\circ$.

Calculate the value of x .

$x = \dots\dots\dots$

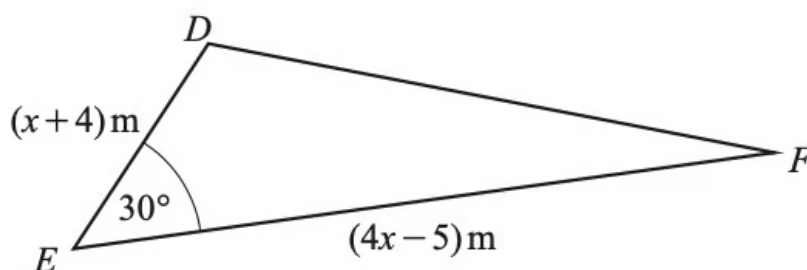
(4 marks)

(b) Calculate AC .

$AC = \dots\dots\dots\text{ cm}$

(4 marks)

9



NOT TO
SCALE

The area of triangle DEF is 70 m^2 .

i) Show that $4x^2 + 11x - 300 = 0$.

[4]

ii) Use the quadratic formula to solve $4x^2 + 11x - 300 = 0$.

Show all your working and give your answers correct to 2 decimal places.

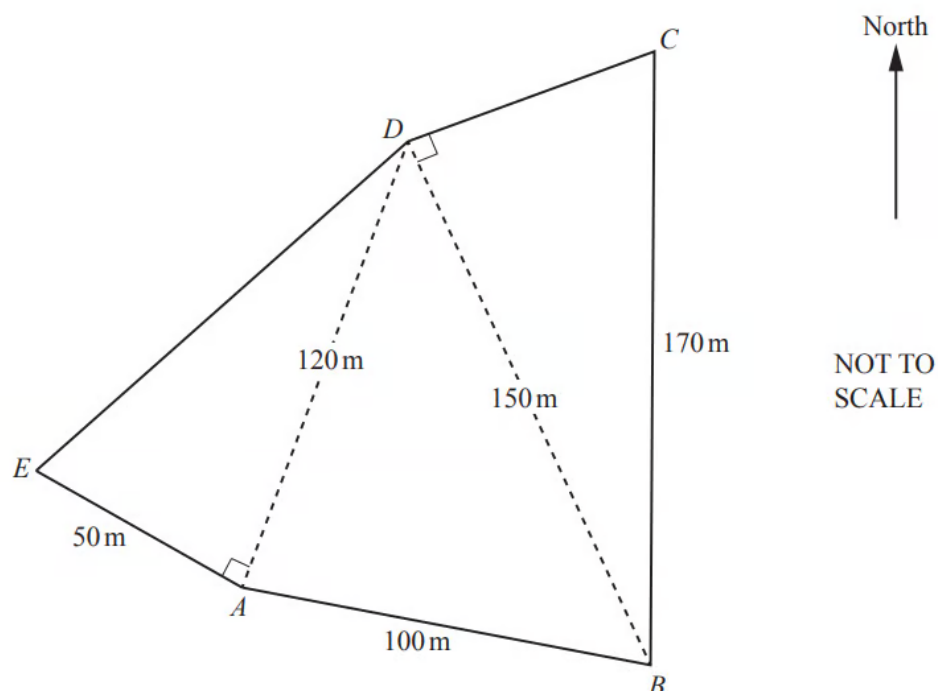
$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [4]

iii) Find the length of DE .

$DE = \dots\dots\dots \text{ m}$ [1]

(9 marks)

10 (a)



The diagram shows a field $ABCDE$.

Calculate the perimeter of the field $ABCDE$.

..... m

(4 marks)

(b) Calculate angle ABD .

Angle $ABD = \dots\dots\dots$

(4 marks)

(c) i) Calculate angle CBD .

Angle $CBD = \dots\dots\dots$ [2]

ii) The point C is due north of the point B . Find the bearing of D from B .

[2]

(4 marks)

(d) Calculate the area of the field $ABCDE$.

Give your answer in hectares. [1 hectare = $10\,000\text{m}^2$]

$\dots\dots\dots$ hectares

(4 marks)

11 (a) Triangle EFG has an area of 70 m^2 .

$EF:FG = 1:2$ and angle $EFG = 40^\circ$.

Calculate EF .

$EF = \dots\dots\dots \text{ m}$

(4 marks)

(b) A **different** triangle PQR also has an area of 70 m^2 .

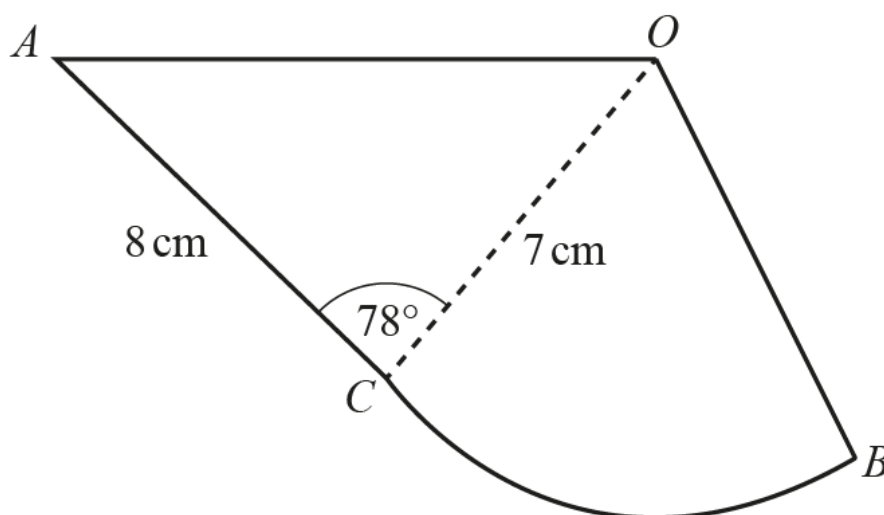
$PQ:QR = 1:2$ and $PQ = EF$

Find angle PQR .

Angle $PQR = \dots\dots\dots$

(1 mark)

12 (a)



NOT TO
SCALE

The diagram shows a design made from a triangle AOC joined to a sector OCB .

$AC = 8\text{ cm}$, $OB = OC = 7\text{ cm}$ and angle $ACO = 78^\circ$.

Use the cosine rule to show that $OA = 9.47\text{ cm}$, correct to 2 decimal places.

(4 marks)

(b) Calculate angle OAC .

Angle $OAC = \dots\dots\dots$

(3 marks)

(c) The perimeter of the design is 29.5 cm .

Show that angle $COB = 41.2^\circ$, correct to 1 decimal place.

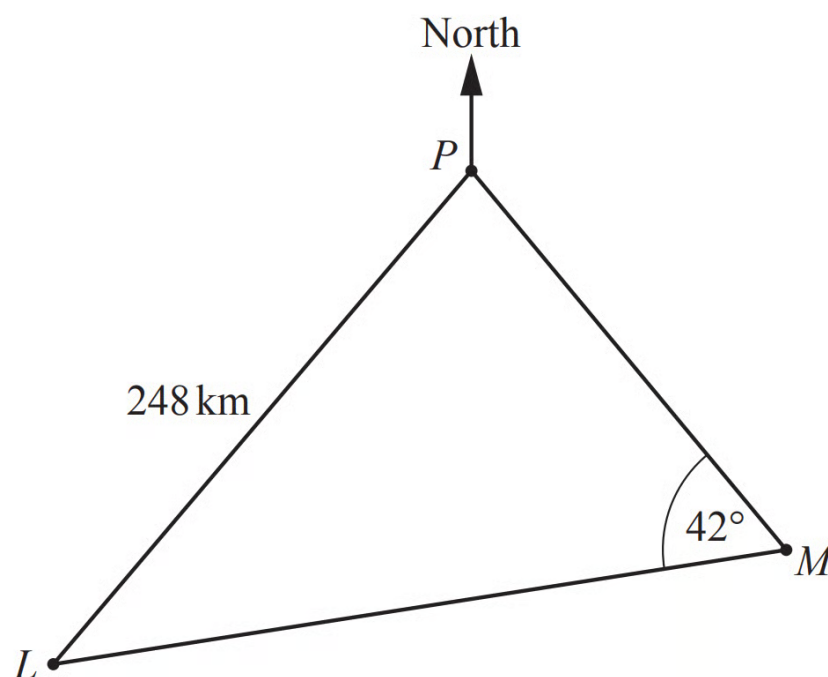
(5 marks)

(d) Calculate the total area of the design.

..... cm²

(4 marks)

13 (a)



NOT TO
SCALE

The diagram shows two ports, L and P , and a buoy, M .

The bearing of L from P is 201° and $LP = 248$ km.

The bearing of M from P is 127° . Angle $PML = 42^\circ$.

Use the sine rule to calculate LM .

$LM = \dots\dots\dots$ km

(4 marks)

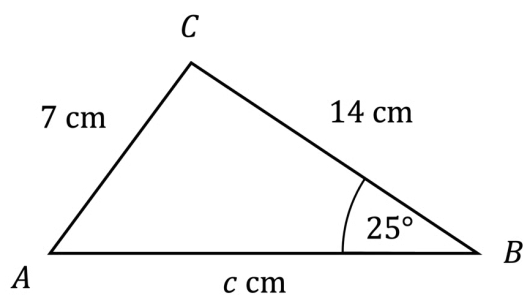
(b) A ship sails directly from L to P .

Calculate the shortest distance from M to LP .

$\dots\dots\dots$ km

(3 marks)

14 (a)



The diagram above shows triangle ABC .

BC is 14 cm and AC is 7 cm .

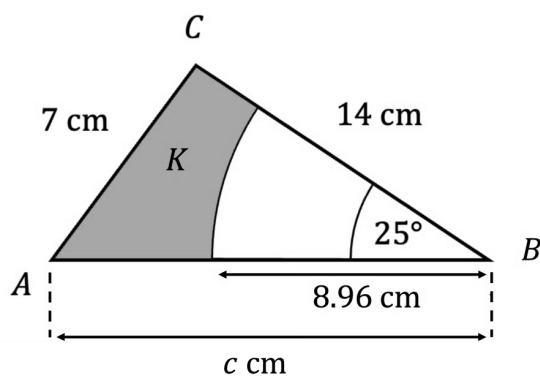
Angle ABC is 25° .

Given that the angle $\angle ACB$ is obtuse, find the value of c .

Leave your answers to three significant figures.

(5 marks)

(b)



Using your value for c , work out the area of the shaded section K .

(4 marks)