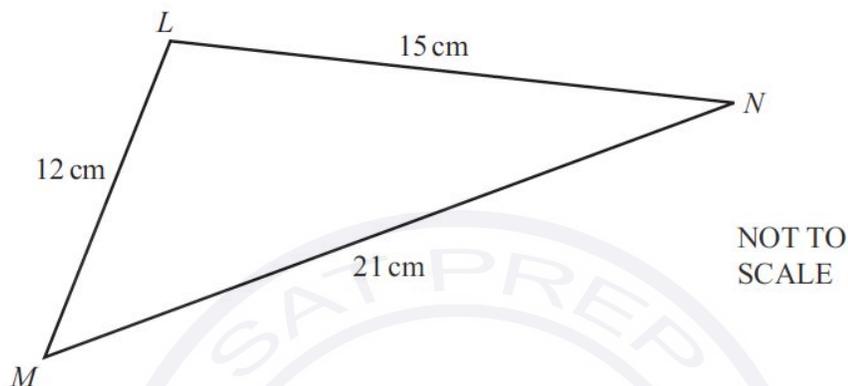


Extended Mathematics
Topic :Trigonometry
Year :May 2013 -May 2024
Paper -4 Questions

Question 1

(a)



The diagram shows triangle LMN with $LM = 12$ cm, $LN = 15$ cm and $MN = 21$ cm.

- (i) Calculate angle LMN .
Show that this rounds to 44.4° , correct to 1 decimal place.

Answer(a)(i)

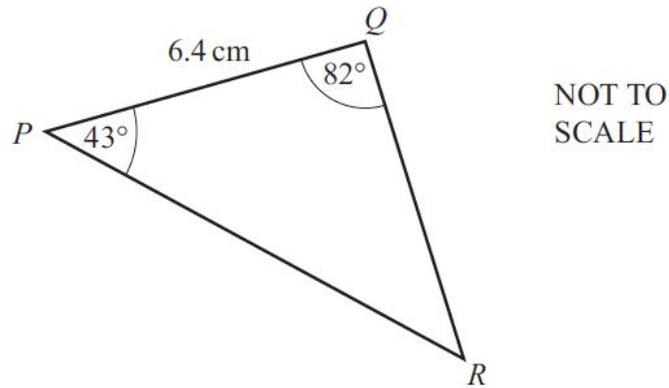
[4]

- (ii) Calculate the area of triangle LMN .

Answer(a)(ii) cm^2 [2]

Continue on the next page..

(b)



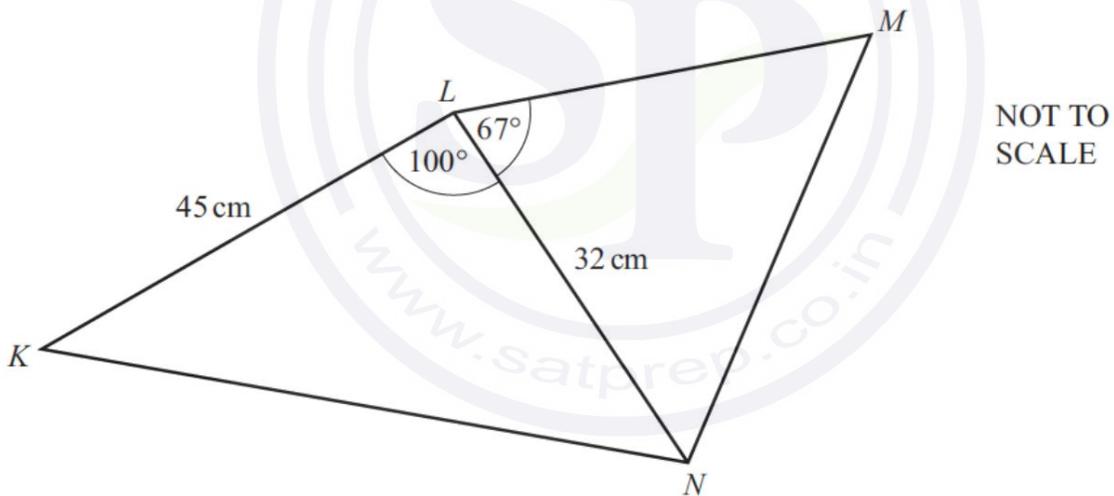
NOT TO SCALE

The diagram shows triangle PQR with $PQ = 6.4$ cm, angle $PQR = 82^\circ$ and angle $QPR = 43^\circ$.

Calculate the length of PR .

Answer(b) $PR = \dots\dots\dots$ cm [4]

Question 2



NOT TO SCALE

The diagram shows quadrilateral $KLMN$.

$KL = 45$ cm, $LN = 32$ cm, angle $KLN = 100^\circ$ and angle $NLM = 67^\circ$.

(i) Calculate the length KN .

Answer (i) $KN = \dots\dots\dots$ cm [4]

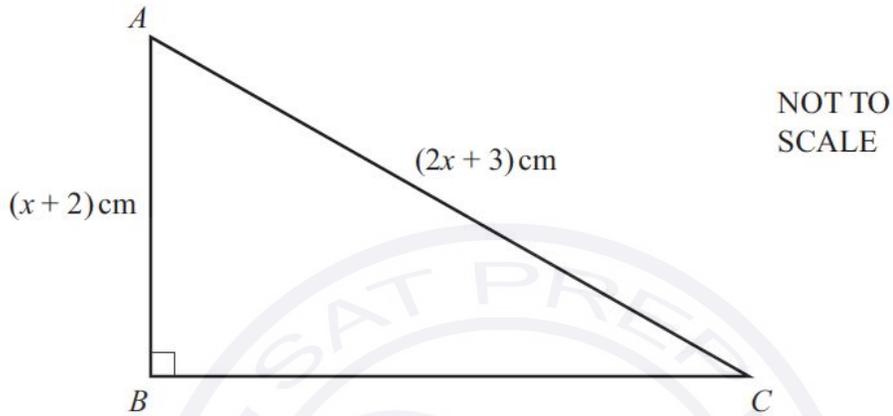
Continue on the next page..

(ii) The area of triangle LMN is 324 cm^2 .

Calculate the length LM .

Answer (i) $LM = \dots\dots\dots \text{ cm}$ [3]

Question 3



In triangle ABC , $AB = (x + 2) \text{ cm}$ and $AC = (2x + 3) \text{ cm}$.

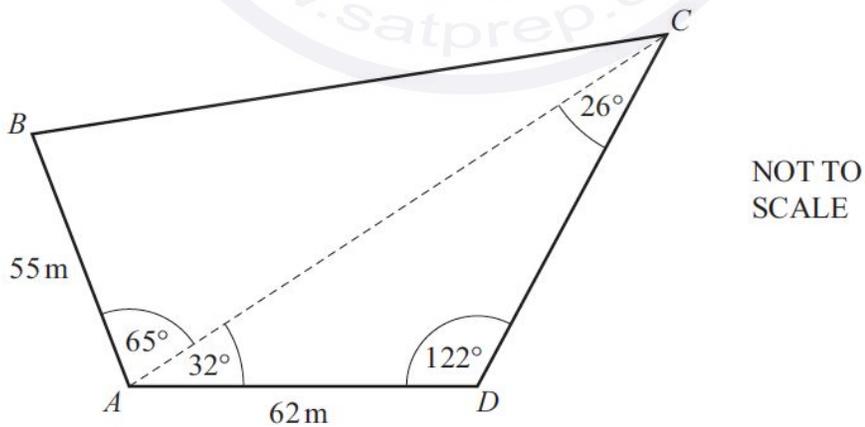
$$\sin ACB = \frac{9}{16}$$

Find the length of BC .

Answer $BC = \dots\dots\dots \text{ cm}$ [6]

Question 4

A field, $ABCD$, is in the shape of a quadrilateral.
A footpath crosses the field from A to C .



Continue on the next page..

- (a) Use the sine rule to calculate the distance AC and show that it rounds to 119.9m, correct to 1 decimal place.

Answer(a)

[3]

- (b) Calculate the length of BC .

Answer(b) $BC = \dots\dots\dots$ m [4]

- (c) Calculate the area of triangle ACD .

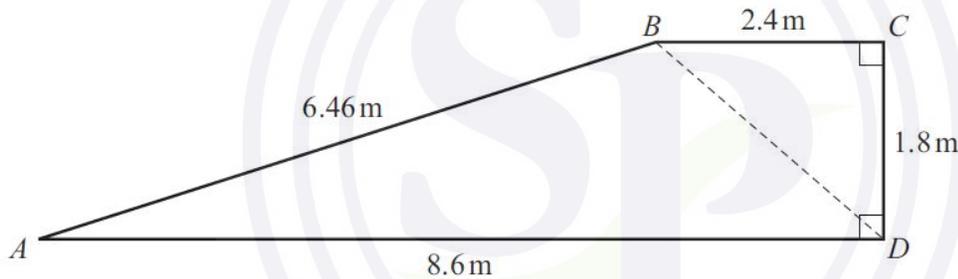
Answer(c) $\dots\dots\dots$ m² [2]

- (d) The field is for sale at \$4.50 per square metre.

Calculate the cost of the field.

Answer(d) \$ $\dots\dots\dots$ [3]

Question 5



NOT TO SCALE

The diagram shows the cross section, $ABCD$, of a ramp.

- (a) Calculate angle DBC .

Answer(a) Angle $DBC = \dots\dots\dots$ [2]

- (b) (i) Show that BD is exactly 3 m.

Answer(b)(i)

[2]

- (ii) Use the cosine rule to calculate angle ABD .

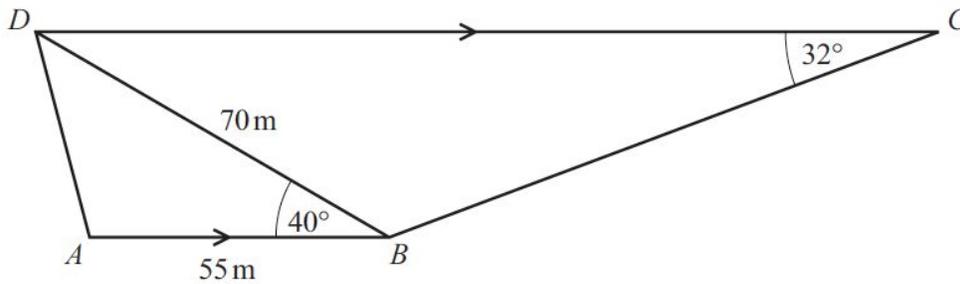
Answer(b)(ii) Angle $ABD = \dots\dots\dots$ [4]

- (c) The ramp is a prism of width 4 m.

Calculate the volume of this prism.

Answer(c) $\dots\dots\dots$ m³ [3]

Question 6



NOT TO SCALE

The diagram shows a school playground $ABCD$.

$ABCD$ is a trapezium.

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

(a) Calculate AD .

Answer(a) $AD = \dots\dots\dots$ m [4]

(b) Calculate BC .

Answer(b) $BC = \dots\dots\dots$ m [4]

(c) (i) Calculate the area of the playground $ABCD$.

Answer(c)(i) $\dots\dots\dots$ m² [3]

(ii) An accurate plan of the school playground is to be drawn to a scale of 1:200 .

Calculate the area of the school playground on the plan.

Give your answer in cm².

Answer(c)(ii) $\dots\dots\dots$ cm² [2]

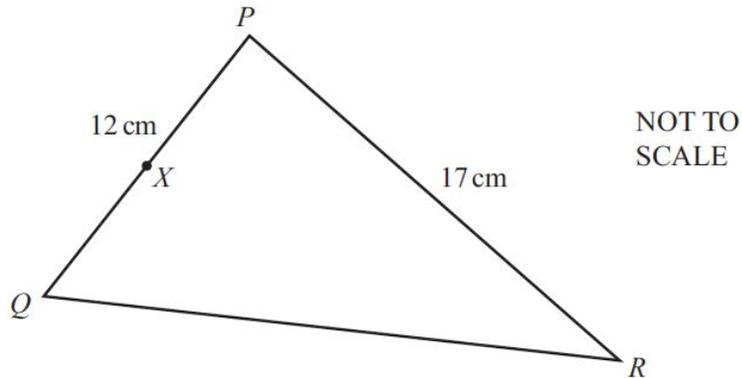
(d) A fence, BD , divides the playground into two areas.

Calculate the shortest distance from A to BD .

Answer(d) $\dots\dots\dots$ m [2]

Question 7

(a)



The diagram shows triangle PQR with $PQ = 12$ cm and $PR = 17$ cm. The area of triangle PQR is 97 cm² and angle QPR is acute.

(i) Calculate angle QPR .

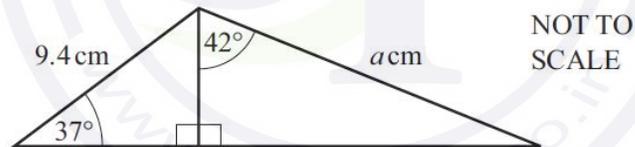
Answer(a)(i) Angle $QPR = \dots\dots\dots$ [3]

(ii) The midpoint of PQ is X .

Use the cosine rule to calculate the length of XR .

Answer(a)(ii) $XR = \dots\dots\dots$ cm [4]

(b)



Calculate the value of a .

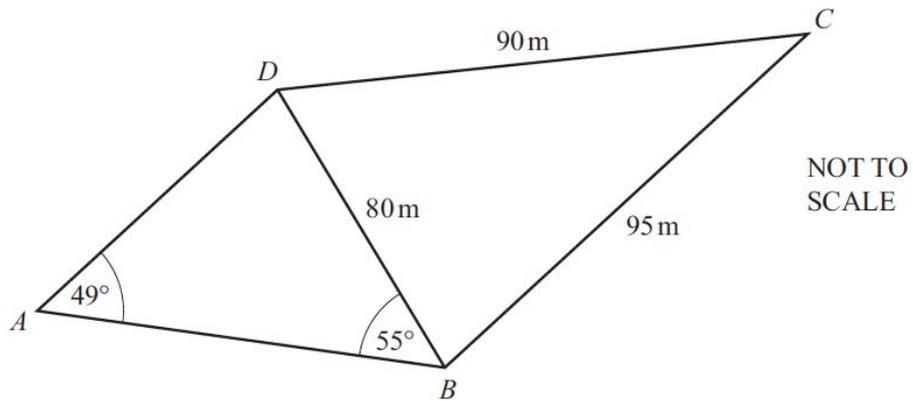
Answer(b) $a = \dots\dots\dots$ [4]

(c) $\sin x = \cos 40^\circ$, $0^\circ \leq x \leq 180^\circ$

Find the two values of x .

Answer(c) $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

Question 8



The diagram shows a quadrilateral $ABCD$.
 Angle $BAD = 49^\circ$ and angle $ABD = 55^\circ$.
 $BD = 80\text{ m}$, $BC = 95\text{ m}$ and $CD = 90\text{ m}$.

- (a) Use the sine rule to calculate the length of AD .

Answer(a) $AD = \dots\dots\dots\text{ m}$ [3]

- (b) Use the cosine rule to calculate angle BCD .

Answer(b) Angle $BCD = \dots\dots\dots$ [4]

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

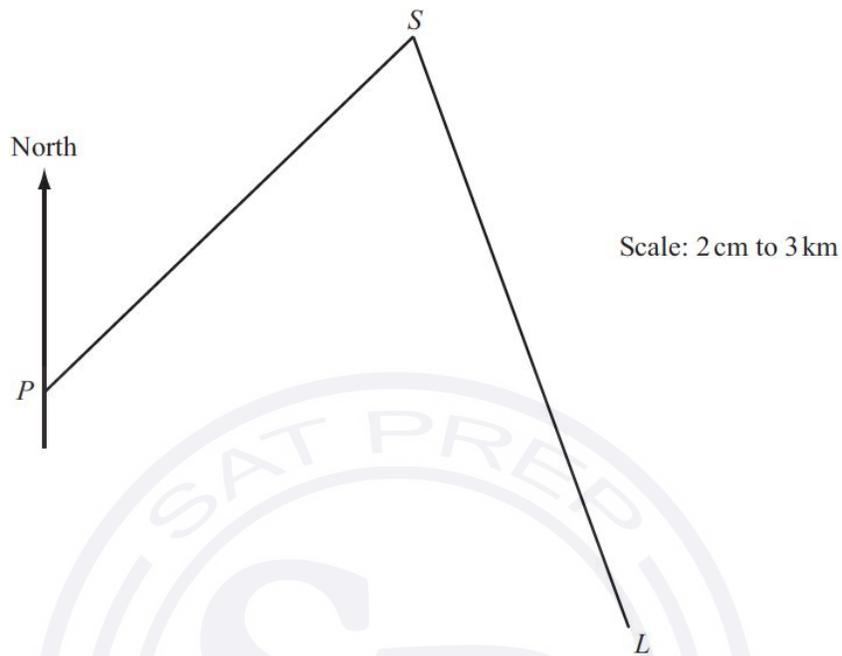
Answer(c) $\dots\dots\dots\text{ m}^2$ [3]

- (d) The quadrilateral represents a field.
 Corn seeds are sown across the whole field at a cost of \$3250 per hectare.

Calculate the cost of the corn seeds used.
 1 hectare = $10\,000\text{ m}^2$

Answer(d) \$ $\dots\dots\dots$ [3]

Question 9



In the scale drawing, P is a port, L is a lighthouse and S is a ship.
The scale is 2 centimetres represents 3 kilometres.

- (a) Measure the bearing of S from P .

Answer(a) [1]

- (b) Find the actual distance of S from L .

Answer(b) km [2]

- (c) The bearing of L from S is 160° .

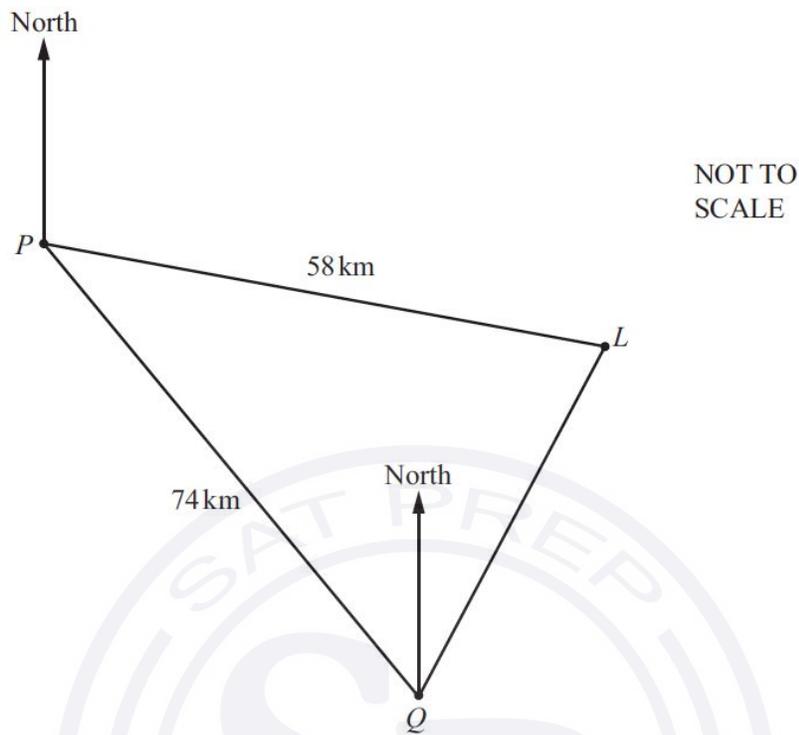
Calculate the bearing of S from L .

Answer(c) [1]

- (d) Work out the scale of the map in the form $1 : n$.

Answer(d) 1 : [2]

Question 10



A ship sails from port P to port Q .
 Q is 74 km from P on a bearing of 142° .
 A lighthouse, L , is 58 km from P on a bearing of 110° .

- (a) Show that the distance LQ is 39.5 km correct to 1 decimal place.

Answer(a)

[5]

- (b) Use the sine rule to calculate angle PQL .

Answer(b) Angle $PQL = \dots\dots\dots$ [3]

- (c) Find the bearing of

- (i) P from Q ,

Answer(c)(i) $\dots\dots\dots$ [2]

- (ii) L from Q .

Answer(c)(ii) $\dots\dots\dots$ [1]

Continue on the next page..

(d) The ship takes 2 hours and 15 minutes to sail the 74 km from P to Q .

Calculate the average speed in knots.
[1 knot = 1.85 km/h]

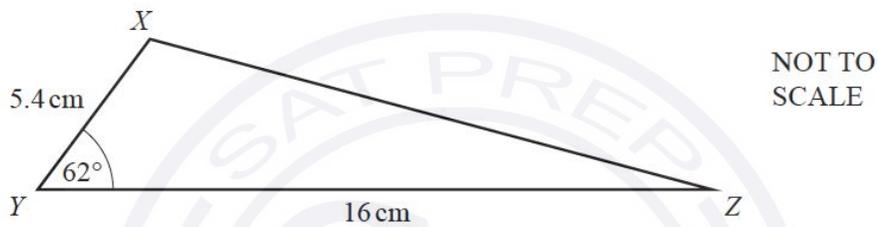
Answer(d) knots [3]

(e) Calculate the shortest distance from the lighthouse to the path of the ship.

Answer(e) km [3]

Question 11

(a)

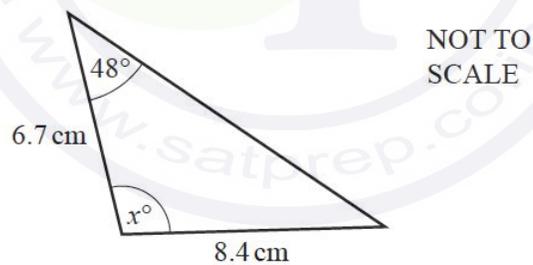


Show that the area of triangle XYZ is 38.1 cm^2 , correct to 1 decimal place.

Answer(a)

[2]

(b)

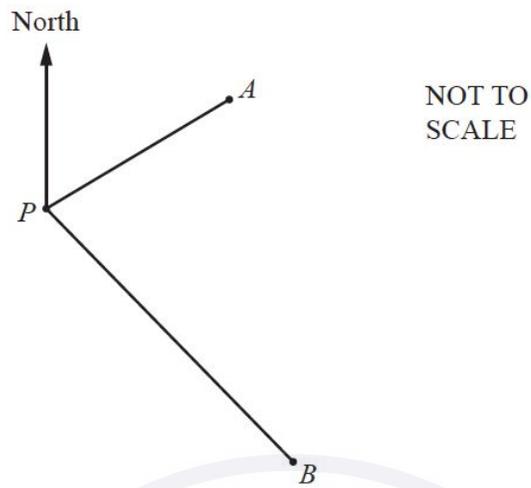


Calculate the value of x .

Answer(b) $x =$ [4]

Continue on the next page..

(c)



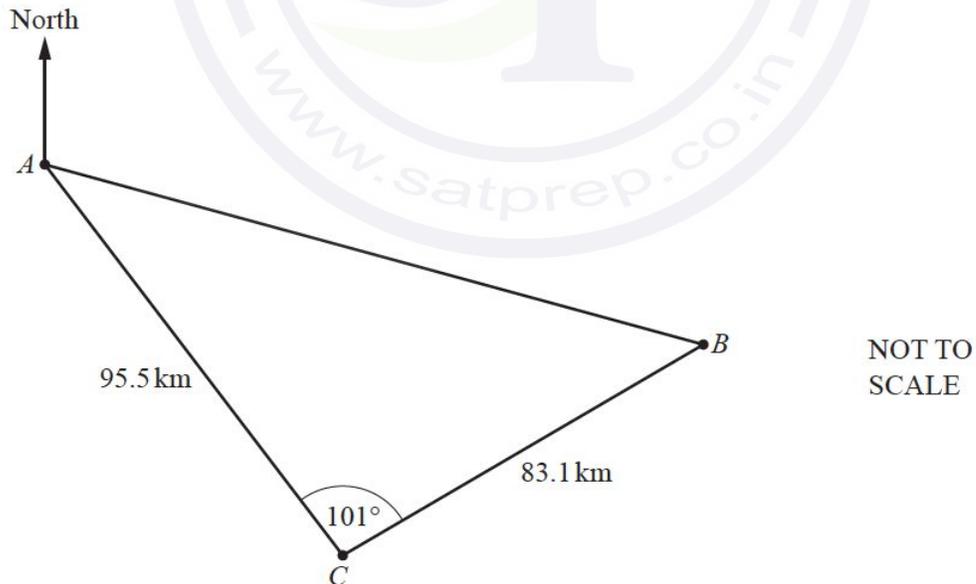
Ship A is 180 kilometres from port P on a bearing of 063° .
Ship B is 245 kilometres from P on a bearing of 146° .

Calculate AB , the distance between the two ships.

Answer(c) km [5]

Question 12

The diagram shows the positions of two ships, A and B , and a coastguard station, C .



Continue on the next page..

- (a) Calculate the distance, AB , between the two ships.
Show that it rounds to 138 km, correct to the nearest kilometre.

Answer(a)

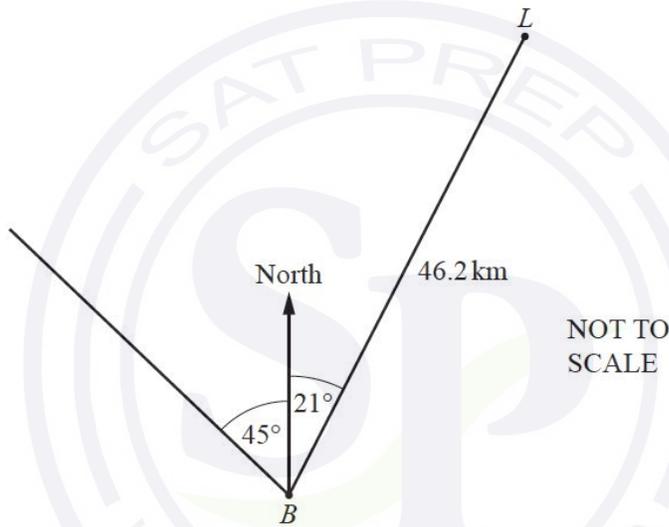
[4]

- (b) The bearing of the coastguard station C from ship A is 146° .

Calculate the bearing of ship B from ship A .

Answer(b) [4]

- (c)



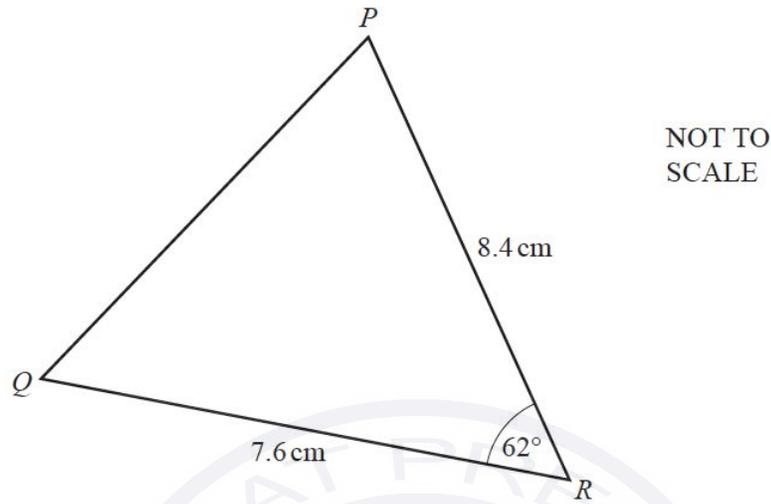
At noon, a lighthouse, L , is 46.2 km from ship B on the bearing 021° .
Ship B sails north west.

Calculate the distance ship B must sail from its position at noon to be at its closest distance to the lighthouse.

Answer(c) km [2]

Question 13

(a)



In the triangle PQR , $QR = 7.6$ cm and $PR = 8.4$ cm.
Angle $QRP = 62^\circ$.

Calculate

(i) PQ ,

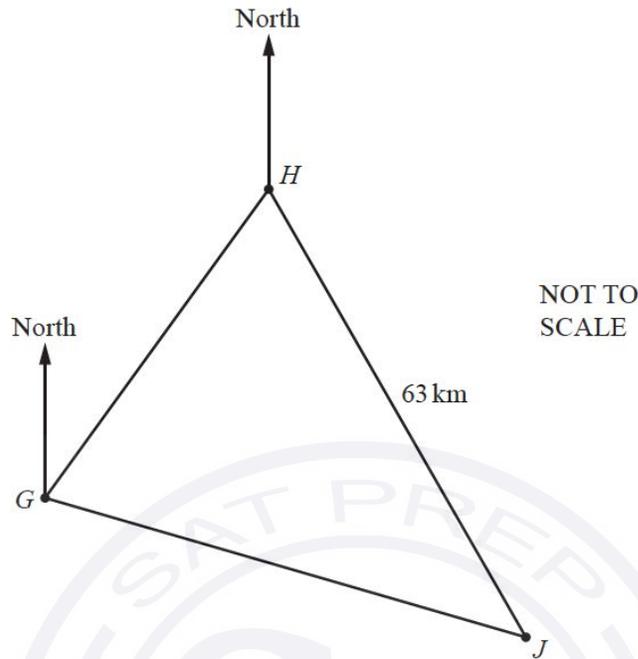
Answer(a)(i) $PQ = \dots\dots\dots$ cm [4]

(ii) the area of triangle PQR .

Answer(a)(ii) $\dots\dots\dots$ cm² [2]

Continue on the next page..

(b)



The diagram shows the positions of three small islands G , H and J .
The bearing of H from G is 045° .
The bearing of J from G is 126° .
The bearing of J from H is 164° .
The distance HJ is 63 km.

Calculate the distance GJ .

Answer(b) $GJ = \dots\dots\dots$ km [5]

Question 14

(a) Andrei stands on level horizontal ground, 294 m from the foot of a vertical tower which is 55 m high.

(i) Calculate the angle of elevation of the top of the tower.

Answer(a)(i) $\dots\dots\dots$ [2]

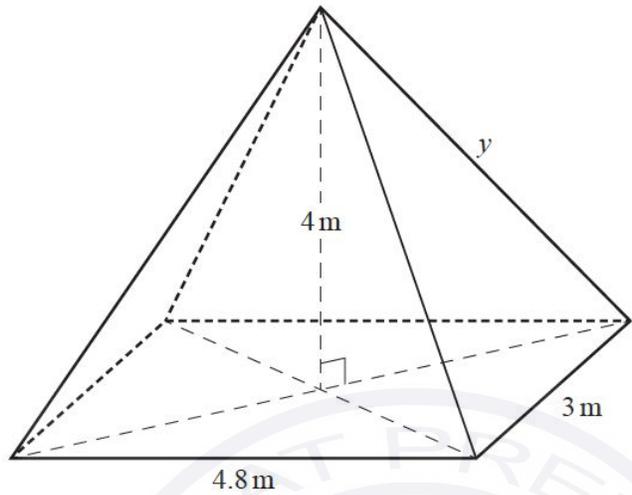
(ii) Andrei walks a distance x metres directly towards the tower.
The angle of elevation of the top of the tower is now 24.8° .

Calculate the value of x .

Answer(a)(ii) $x = \dots\dots\dots$ [4]

Continue on the next page..

(b) The diagram shows a pyramid with a horizontal rectangular base.



NOT TO
SCALE

The rectangular base has length 4.8 m and width 3 m and the height of the pyramid is 4 m.

Calculate

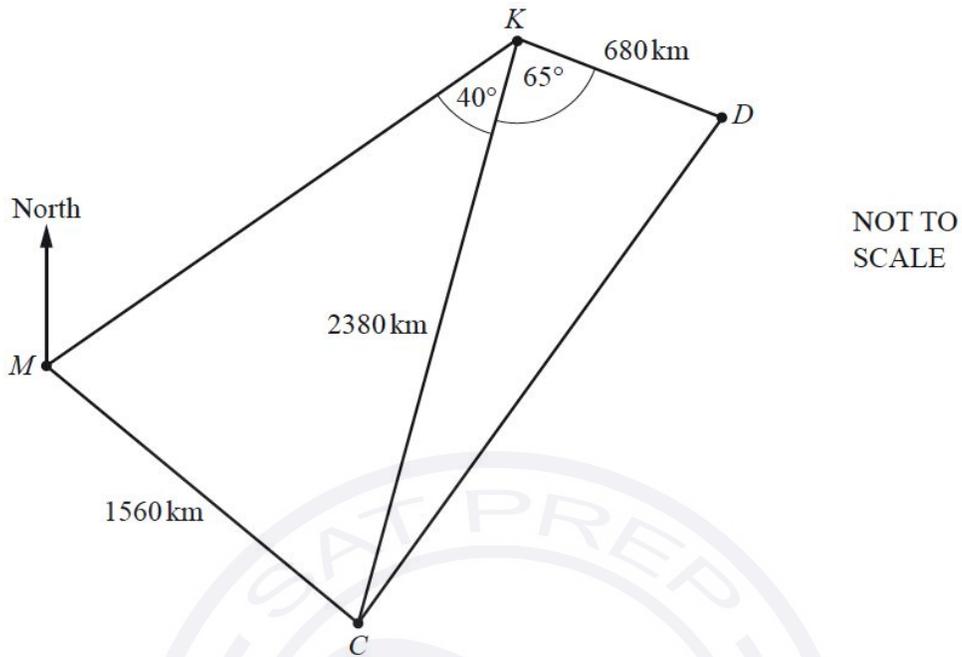
(i) y , the length of a sloping edge of the pyramid,

Answer(b)(i) $y = \dots\dots\dots$ m [4]

(ii) the angle between a sloping edge and the rectangular base of the pyramid.

Answer(b)(ii) $\dots\dots\dots$ [2]

Question 15



The diagram shows some distances between Mumbai (M), Kathmandu (K), Dhaka (D) and Colombo (C).

- (a) Angle $CKD = 65^\circ$.

Use the cosine rule to calculate the distance CD .

Answer(a) $CD = \dots\dots\dots$ km [4]

- (b) Angle $MKC = 40^\circ$.

Use the sine rule to calculate the acute angle KMC .

Answer(b) Angle $KMC = \dots\dots\dots$ [3]

- (c) The bearing of K from M is 050° .

Find the bearing of M from C .

Answer(c) $\dots\dots\dots$ [2]

Continue on the next page...

(d) A plane from Colombo to Mumbai leaves at 21 15 and the journey takes 2 hours 24 minutes.

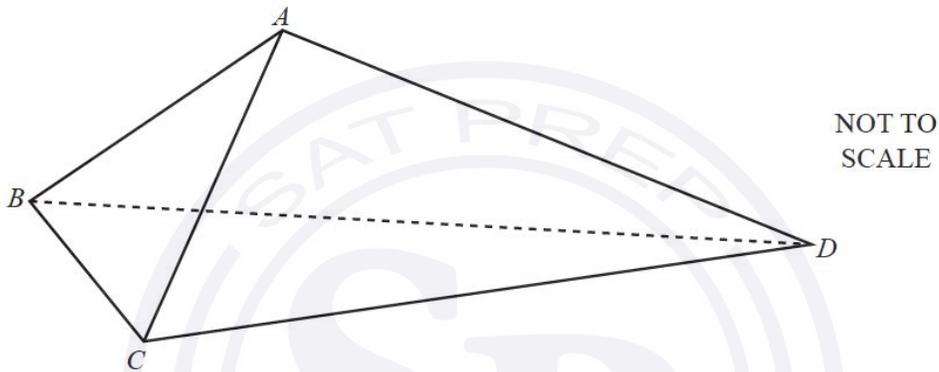
(i) Find the time the plane arrives at Mumbai.

Answer(d)(i) [1]

(ii) Calculate the average speed of the plane.

Answer(d)(ii) km/h [2]

Question 16



The diagram shows a tent $ABCD$.
 The front of the tent is an isosceles triangle ABC , with $AB = AC$.
 The sides of the tent are congruent triangles ABD and ACD .

(a) $BC = 1.2$ m and angle $ABC = 68^\circ$.

Find AC .

Answer(a) $AC =$ m [3]

(b) $CD = 2.3$ m and $AD = 1.9$ m.

Find angle ADC .

Answer(b) Angle $ADC =$ [4]

(c) The floor of the tent, triangle BCD , is also an isosceles triangle with $BD = CD$.

Calculate the area of the floor of the tent.

Continue on the next page...

Answer(c)m² [4]

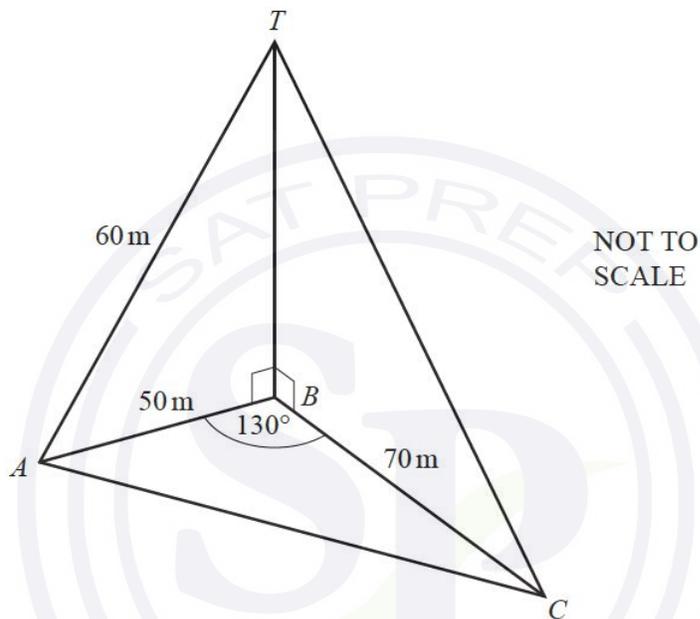
(d) When the tent is on horizontal ground, A is a vertical distance 1.25 m above the ground.

Calculate the angle between AD and the ground.

Answer(d) [3]

Question 17

(a)



A , B and C are points on horizontal ground.
 BT is a vertical pole.
 $AT = 60$ m, $AB = 50$ m, $BC = 70$ m and angle $ABC = 130^\circ$.

(i) Calculate the angle of elevation of T from C .

Answer(a)(i) [5]

(ii) Calculate the length AC .

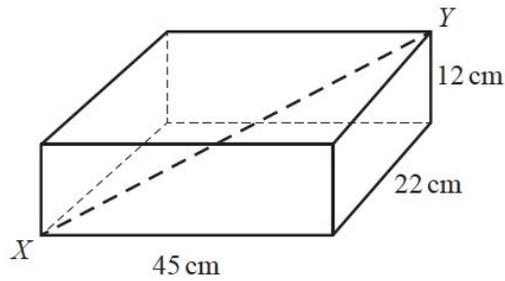
Answer(a)(ii) $AC =$ m [4]

(iii) Calculate the area of triangle ABC .

Answer(a)(iii) m² [2]

Continue on the next page...

(b)



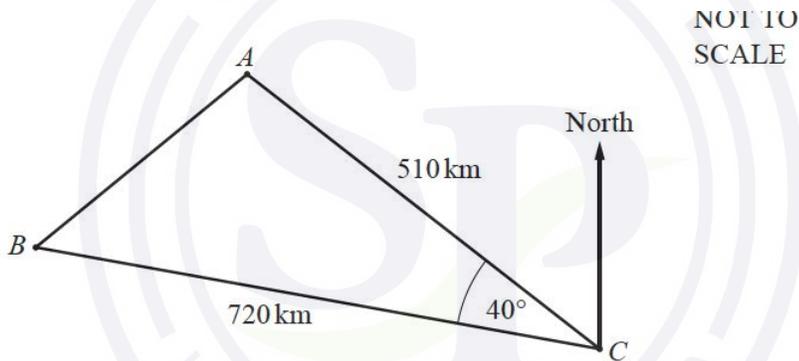
NOT TO SCALE

A cuboid has length 45 cm, width 22 cm and height 12 cm.

Calculate the length of the straight line XY .

Answer(b) $XY = \dots\dots\dots$ cm [4]

Question 18



A plane flies from A to C and then from C to B .
 $AC = 510$ km and $CB = 720$ km.
The bearing of C from A is 135° and angle $ACB = 40^\circ$.

Continue on the next page...

(a) Find the bearing of

(i) B from C ,

..... [2]

(ii) C from B .

..... [2]

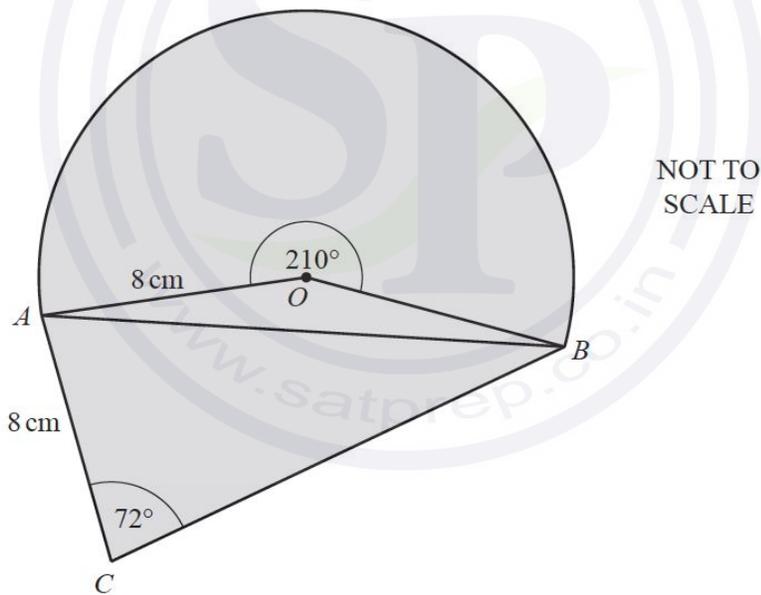
(b) Calculate AB and show that it rounds to 464.7 km, correct to 1 decimal place.

[4]

(c) Calculate angle ABC .

Angle $ABC =$ [3]

Question 19



The diagram shows a design for a logo made from a sector and two triangles.

The sector, centre O , has radius 8 cm and sector angle 210° .

$AC = 8\text{ cm}$ and angle $ACB = 72^\circ$.

(a) Show that angle $OAB = 15^\circ$.

[2]

Continue on the next page...

(b) Calculate the length of the straight line AB .

$AB = \dots\dots\dots \text{cm}$ [4]

(c) Calculate angle ABC .

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

(d) Calculate the total area of the logo design.

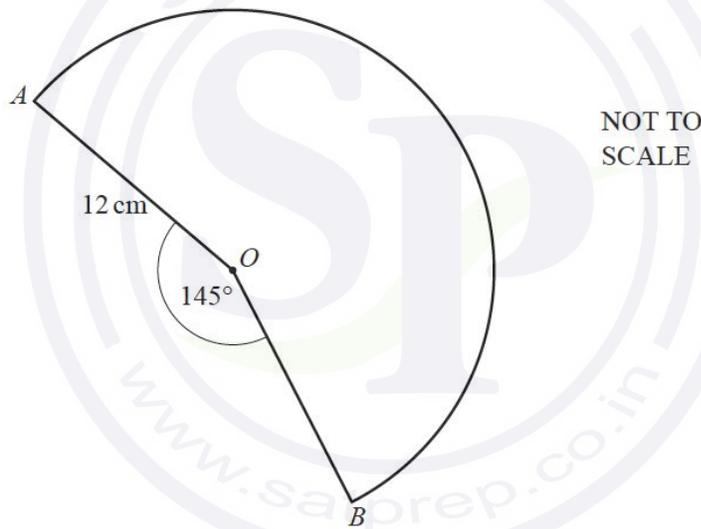
$\dots\dots\dots \text{cm}^2$ [6]

(e) The logo design is an enlargement with scale factor 4 of the actual logo.

Calculate the area of the actual logo.

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

Question 20



The diagram shows a sector, centre O , and radius 12 cm.

(a) Calculate the area of the sector.

$\dots\dots\dots \text{cm}^2$ [3]

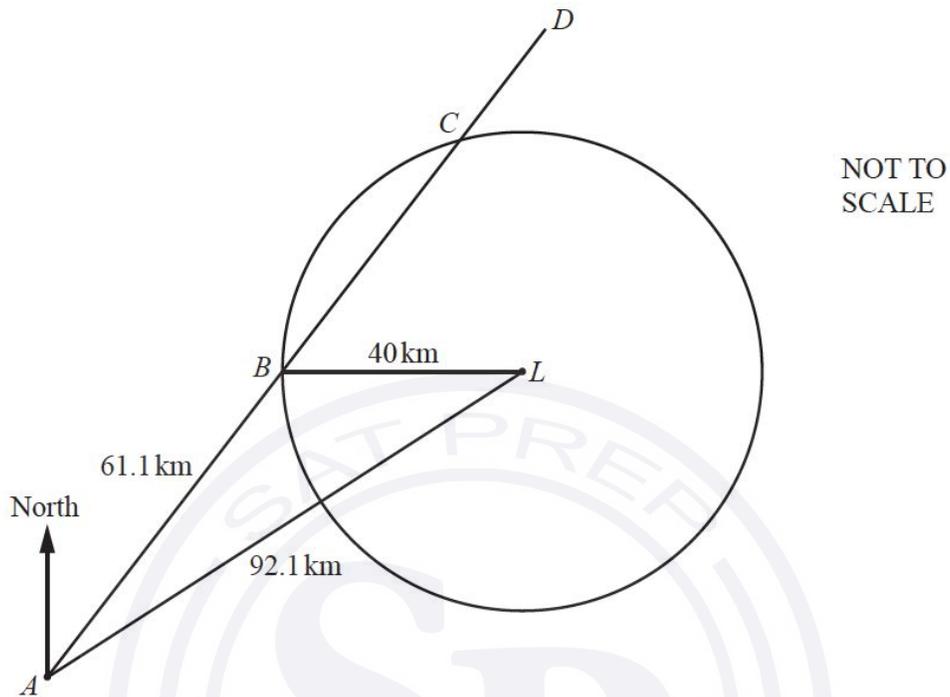
(b) The sector is made into a cone by joining OA to OB .

Calculate the volume of the cone.

[The volume, V , of a cone with base radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$\dots\dots\dots \text{cm}^3$ [6]

Question 21



The diagram shows the position of a port, A , and a lighthouse, L .
 The circle, centre L and radius 40 km , shows the region where the light from the lighthouse can be seen.
 The straight line, $ABCD$, represents the course taken by a ship after leaving the port.
 When the ship reaches position B it is due west of the lighthouse.

$AL = 92.1\text{ km}$, $AB = 61.1\text{ km}$ and $BL = 40\text{ km}$.

(a) Use the cosine rule to show that angle $ABL = 130.1^\circ$, correct to 1 decimal place.

[4]

(b) Calculate the bearing of the lighthouse, L , from the port, A .

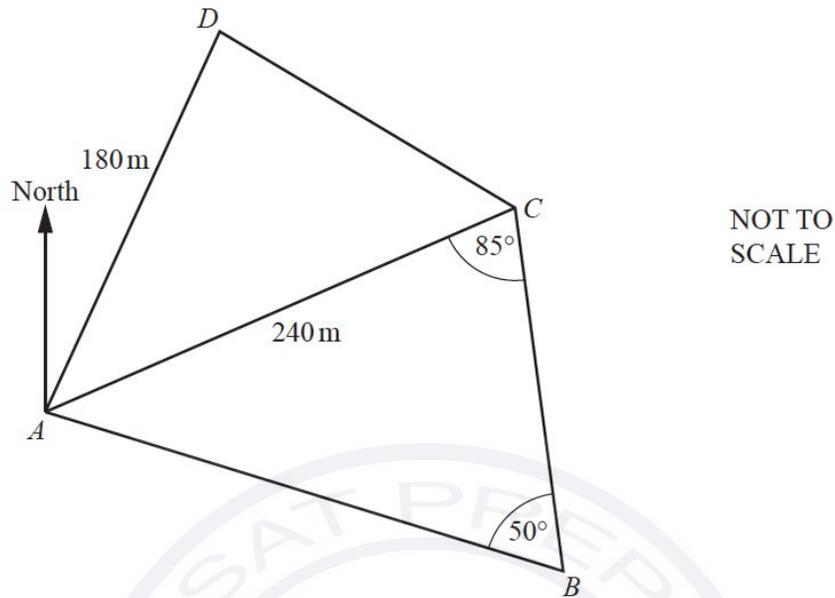
..... [4]

(c) The ship sails at a speed of 28 km/h .

Calculate the length of time for which the light from the lighthouse can be seen from the ship.
 Give your answer correct to the nearest minute.

..... h min [5]

Question 22



The diagram shows a field, $ABCD$.
 $AD = 180\text{ m}$ and $AC = 240\text{ m}$.
 Angle $ABC = 50^\circ$ and angle $ACB = 85^\circ$.

(a) Use the sine rule to calculate AB .

$AB = \dots\dots\dots\text{ m [3]}$

(b) The area of triangle $ACD = 12\,000\text{ m}^2$.

Show that angle $CAD = 33.75^\circ$, correct to 2 decimal places.

[3]

(c) Calculate BD .

$BD = \dots\dots\dots\text{ m [5]}$

(d) The bearing of D from A is 030° .

Find the bearing of

(i) B from A ,

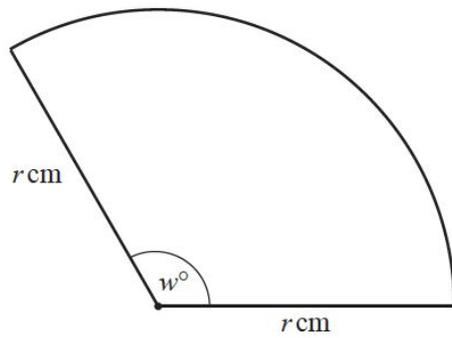
$\dots\dots\dots [1]$

(ii) A from B .

$\dots\dots\dots [2]$

Question 23

(a)



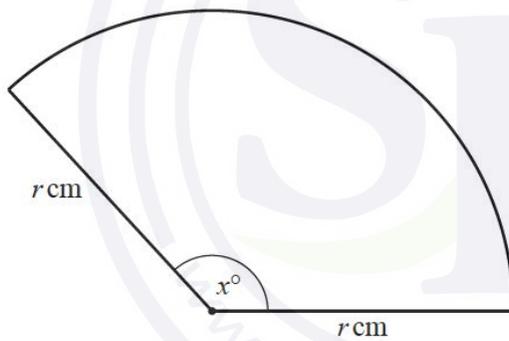
NOT TO SCALE

The area of this sector is r^2 square centimetres.

Find the value of w .

$w = \dots\dots\dots [3]$

(b)



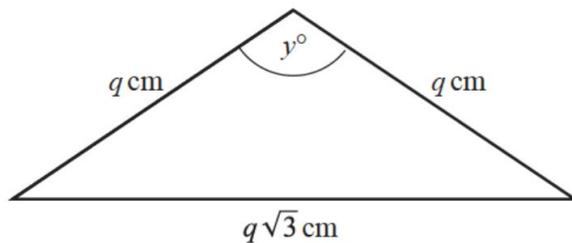
NOT TO SCALE

The perimeter of this sector is $2r + \frac{7\pi r}{10}$ centimetres.

Find the value of x .

$x = \dots\dots\dots [3]$

(c)



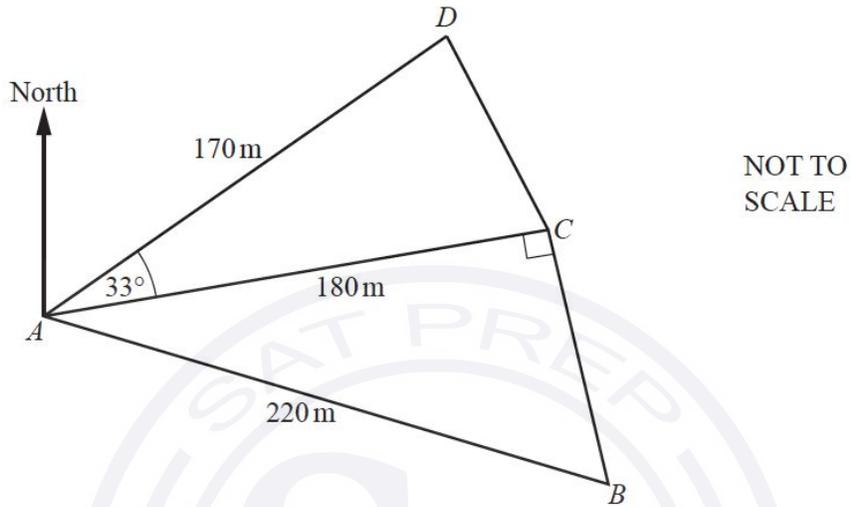
NOT TO SCALE

The perimeter of the isosceles triangle is $2q + q\sqrt{3}$ centimetres.

Find the value of y .

$y = \dots\dots\dots$ [4]

Question 24



The diagram shows five straight footpaths in a park.
 $AB = 220$ m, $AC = 180$ m and $AD = 170$ m.
 Angle $ACB = 90^\circ$ and angle $DAC = 33^\circ$.

(a) Calculate BC .

$BC = \dots\dots\dots$ m [3]

(b) Calculate CD .

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

(c) Calculate the shortest distance from D to AC .

$\dots\dots\dots$ m [2]

(d) The bearing of D from A is 047° .

Calculate the bearing of B from A .

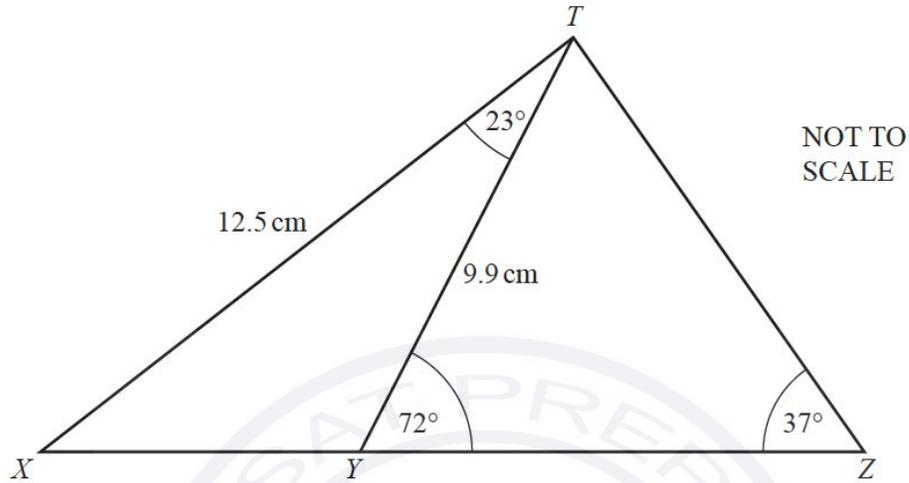
$\dots\dots\dots$ [3]

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

$\dots\dots\dots$ m² [3]

Question 25

- (a) In triangle TXZ , $TX = 12.5$ cm and angle $TZX = 37^\circ$.
 Y is a point on the line XZ such that $TY = 9.9$ cm, angle $XTY = 23^\circ$ and angle $TYZ = 72^\circ$.



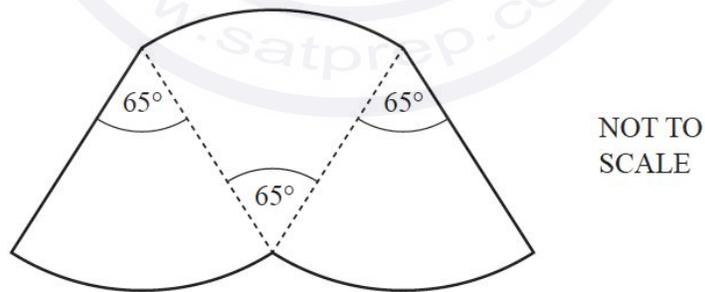
- (i) Calculate XY .

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

- (ii) Calculate TZ .

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

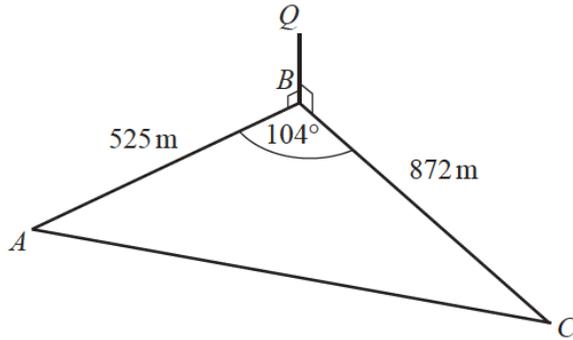
- (b) The diagram shows a shape made up of three identical sectors of a circle, each with sector angle 65° . The perimeter of the shape is 20.5 cm.



Calculate the radius of the circle.

$\dots\dots\dots$ cm [4]

Question 26



NOT TO SCALE

ABC is a triangular field on horizontal ground.
 There is a vertical pole BQ at B .
 $AB = 525$ m, $BC = 872$ m and angle $ABC = 104^\circ$.

- (a) Use the cosine rule to calculate the distance AC .

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

- (b) The angle of elevation of Q from C is 1.0° .

Showing all your working, calculate the angle of elevation of Q from A .

$\dots\dots\dots$ [4]

- (c) (i) Calculate the area of the field.

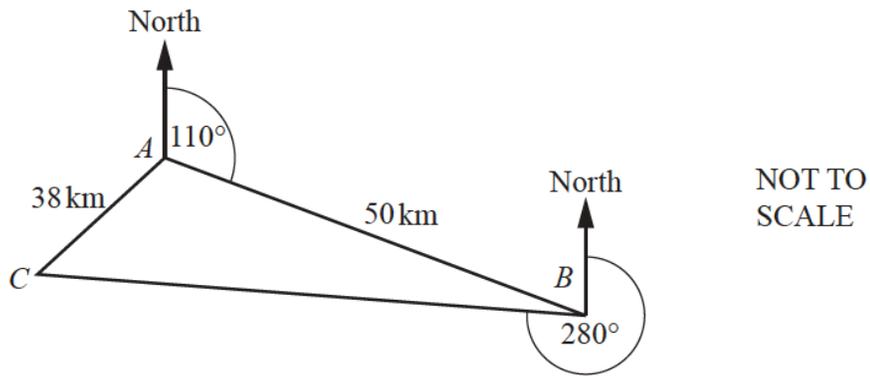
$\dots\dots\dots$ m² [2]

- (ii) The field is drawn on a map with the scale 1 : 20 000.

Calculate the area of the field on the map in cm².

$\dots\dots\dots$ cm² [2]

Question 27



A , B and C are three towns.
 The bearing of B from A is 110° .
 The bearing of C from B is 280° .
 $AC = 38$ km and $AB = 50$ km.

(i) Find the bearing of A from B .

..... [2]

(ii) Calculate angle BAC .

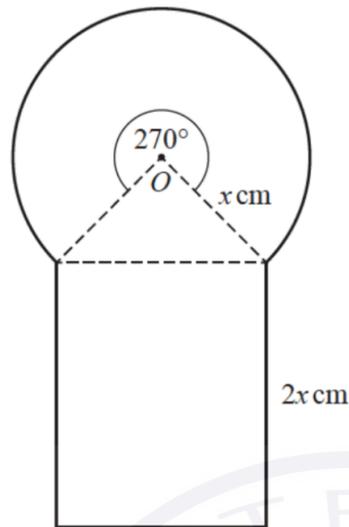
Angle $BAC =$ [5]

(iii) A road is built from A to join the straight road BC .

Calculate the shortest possible length of this new road.

..... km [3]

Question 28



NOT TO
SCALE

The diagram shows a sector of a circle, a triangle and a rectangle.
The sector has centre O , radius x cm and angle 270° .
The rectangle has length $2x$ cm.

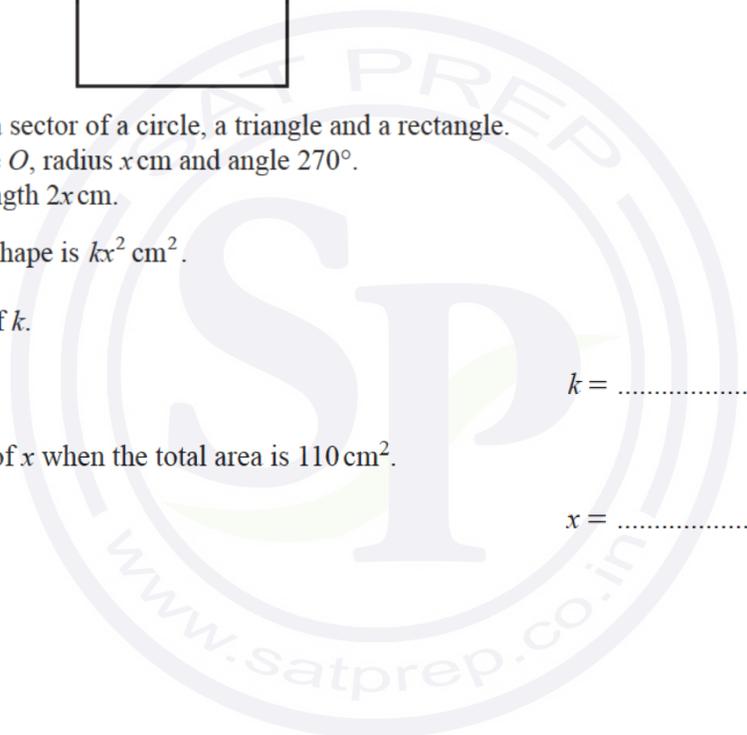
The total area of the shape is kx^2 cm².

(a) Find the value of k .

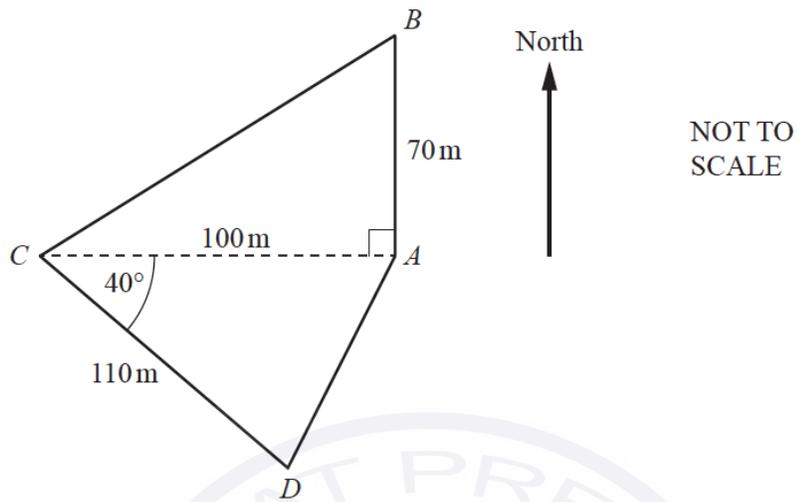
$k = \dots\dots\dots [5]$

(b) Find the value of x when the total area is 110 cm².

$x = \dots\dots\dots [2]$



Question 29



The diagram shows a field $ABCD$.

(a) Calculate the area of the field $ABCD$.

.....m² [3]

(b) Calculate the perimeter of the field $ABCD$.

..... m [5]

(c) Calculate the shortest distance from A to CD .

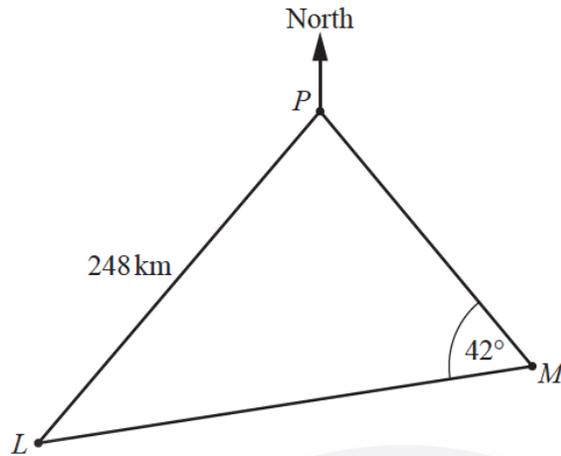
..... m [2]

(d) B is due north of A .

Find the bearing of C from B .

..... [3]

Question 30



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 $PML = 42^\circ$.

- (a) Use the sine rule to calculate LM .

$LM = \dots\dots\dots$ km [4]

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

- (i) Calculate the shortest distance from M to LP .

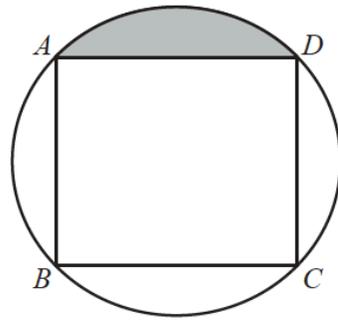
$\dots\dots\dots$ km [3]

- (ii) The ship leaves L at 2045 and travels at a speed of 40 km/h.

Calculate the time the next day that the ship arrives at P .

$\dots\dots\dots$ [3]

Question 31



NOT TO
SCALE

The vertices of a square $ABCD$ lie on the circumference of a circle, radius 8 cm.

(a) Calculate the area of the square.

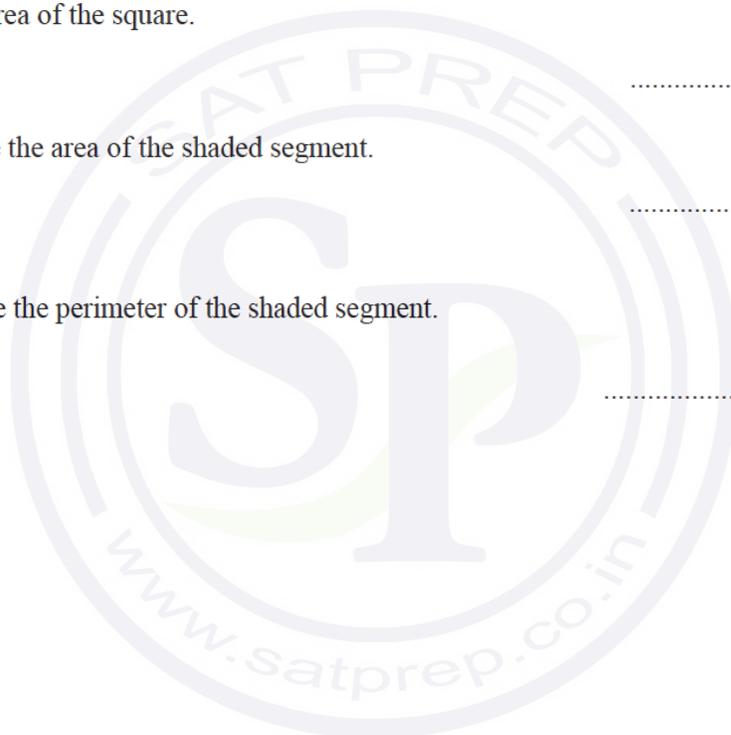
..... cm^2 [2]

(b) (i) Calculate the area of the shaded segment.

..... cm^2 [3]

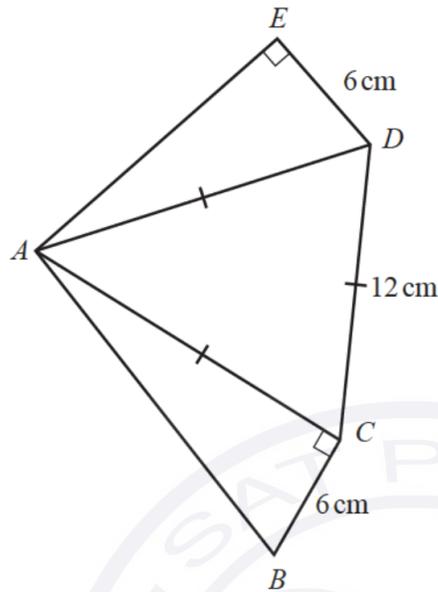
(ii) Calculate the perimeter of the shaded segment.

..... cm [4]



Question 32

(a)



NOT TO SCALE

In the pentagon $ABCDE$, angle $ACB = \text{angle } AED = 90^\circ$.
 Triangle ACD is equilateral with side length 12 cm.
 $DE = BC = 6$ cm.

(i) Calculate angle BAE .

Angle $BAE = \dots\dots\dots$ [4]

(ii) Calculate AB .

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

(iii) Calculate AE .

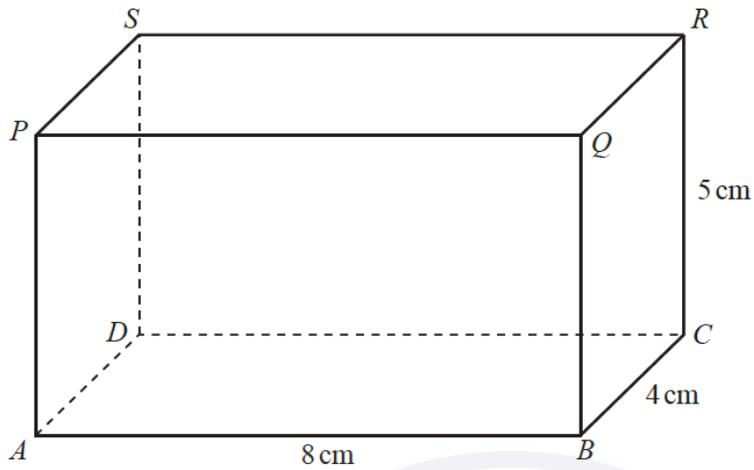
$AE = \dots\dots\dots$ cm [3]

(iv) Calculate the area of the pentagon.

$\dots\dots\dots$ cm^2 [4]

Continue on the next page...

(b)



NOT TO
SCALE

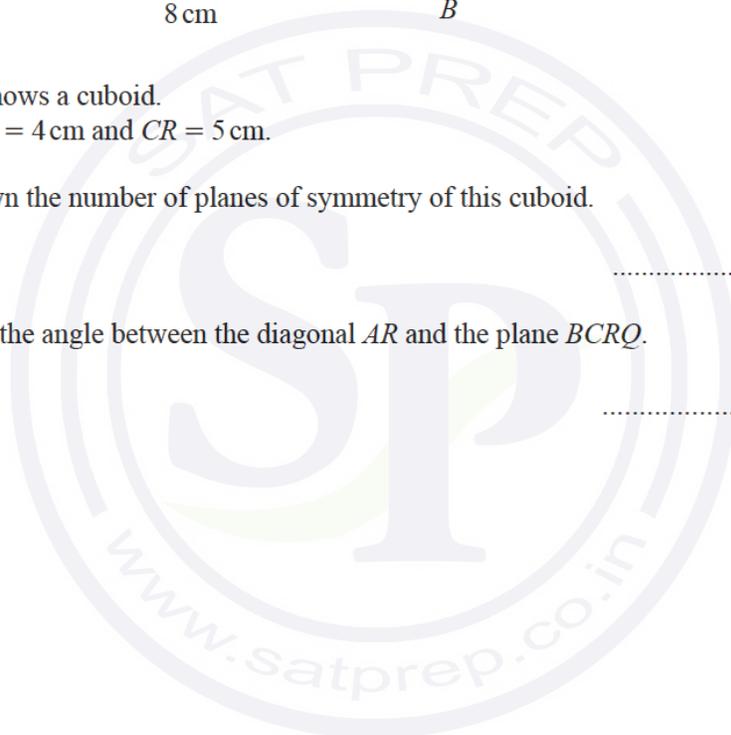
The diagram shows a cuboid.
 $AB = 8$ cm, $BC = 4$ cm and $CR = 5$ cm.

(i) Write down the number of planes of symmetry of this cuboid.

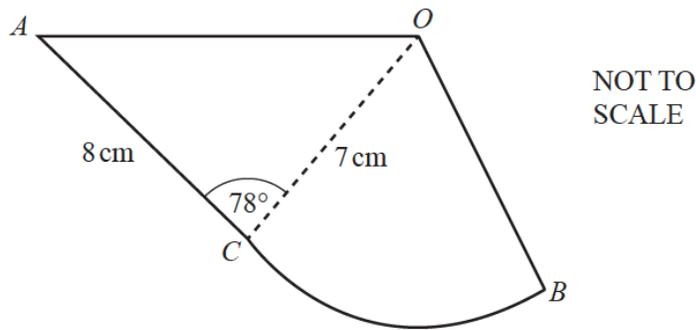
..... [1]

(ii) Calculate the angle between the diagonal AR and the plane $BCRQ$.

..... [4]



Question 33



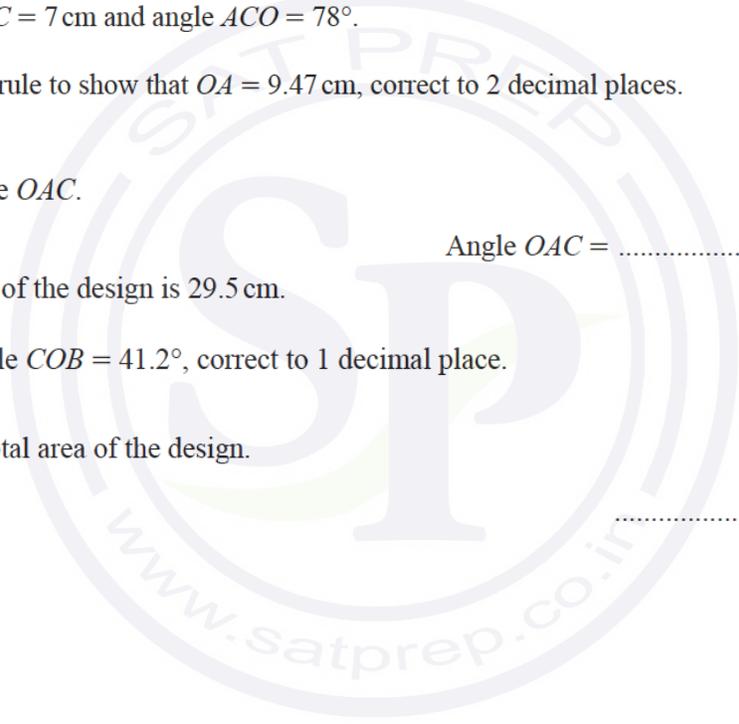
The diagram shows a design made from a triangle AOC joined to a sector OCB .
 $AC = 8$ cm, $OB = OC = 7$ cm and angle $ACO = 78^\circ$.

- (a) Use the cosine rule to show that $OA = 9.47$ cm, correct to 2 decimal places. [4]

- (b) Calculate angle OAC .
Angle $OAC = \dots\dots\dots$ [3]

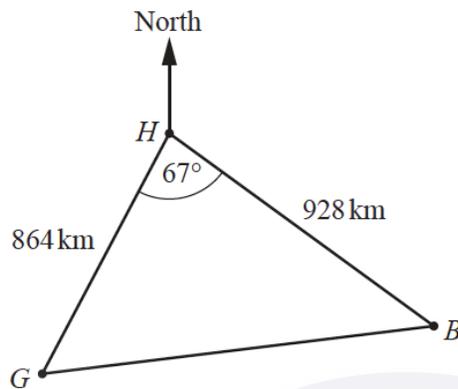
- (c) The perimeter of the design is 29.5 cm.
 Show that angle $COB = 41.2^\circ$, correct to 1 decimal place. [5]

- (d) Calculate the total area of the design.
 $\dots\dots\dots$ cm² [4]



Question 34

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



NOT TO SCALE

- (a) A plane flies from Geneva to Hamburg.
The flight takes 2 hours 20 minutes.

Calculate the average speed in kilometres per hour.

..... km/h [2]

- (b) Use the cosine rule to calculate the distance from Geneva to Budapest.

..... km [4]

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

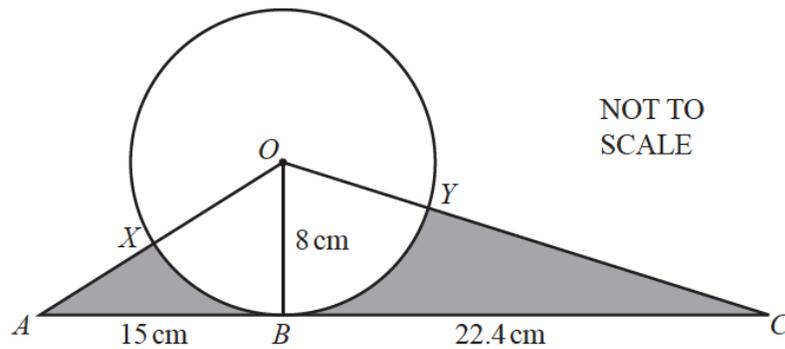
- (i) Find the bearing of Hamburg from Budapest.

..... [2]

- (ii) Calculate the bearing of Budapest from Geneva.

.....[4]

Question 35



The diagram shows a circle, centre O .
 The straight line ABC is a tangent to the circle at B .
 $OB = 8$ cm, $AB = 15$ cm and $BC = 22.4$ cm.
 AO crosses the circle at X and OC crosses the circle at Y .

(a) Calculate angle XOY .

Angle $XOY = \dots\dots\dots$ [5]

(b) Calculate the length of the arc XY .

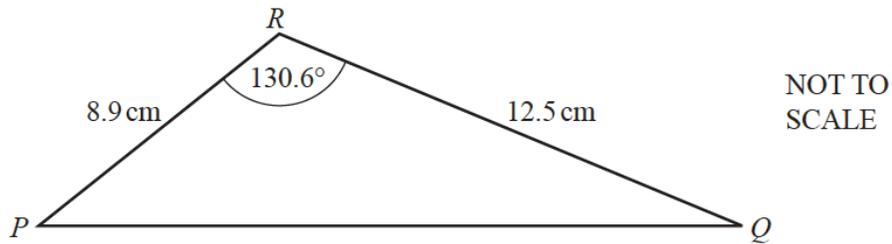
$\dots\dots\dots$ cm [2]

(c) Calculate the total area of the two shaded regions.

$\dots\dots\dots$ cm² [4]

Question 36

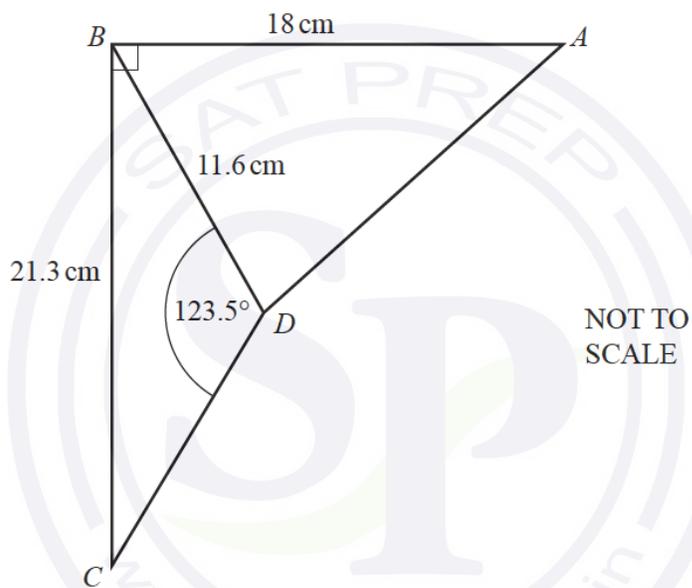
(a)



Calculate the area of triangle PQR .

..... cm^2 [2]

(b)



In the diagram, $AB = 18 \text{ cm}$, $BC = 21.3 \text{ cm}$ and $BD = 11.6 \text{ cm}$.
 Angle $BDC = 123.5^\circ$ and angle ABC is a right angle.

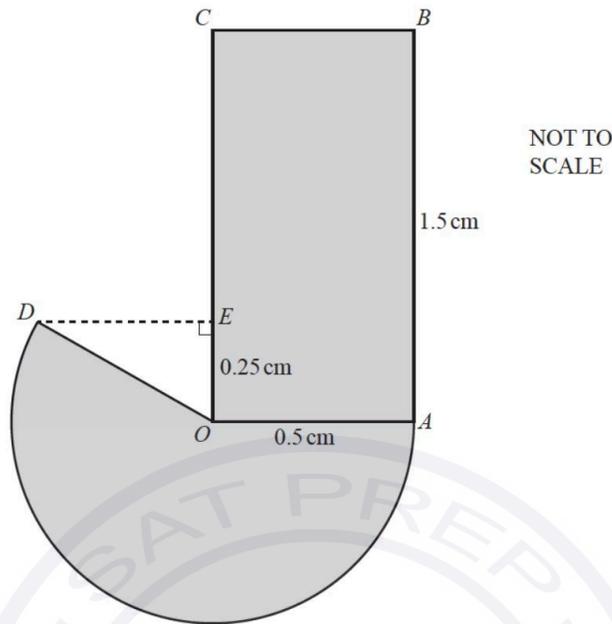
(i) Calculate angle BCD .

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

(ii) Calculate AD .

$AD = \dots\dots\dots \text{cm}$ [5]

Question 37



The diagram shows a company logo made from a rectangle and a major sector of a circle. The circle has centre O and radius OA . $OA = OD = 0.5$ cm and $AB = 1.5$ cm. E is a point on OC such that $OE = 0.25$ cm and angle $OED = 90^\circ$.

(a) Calculate the perimeter of the logo.

..... cm [5]

(b) Calculate the area of the logo.

..... cm² [3]

(c) A mathematically similar logo is drawn. The area of this logo is 77.44 cm².

(i) Calculate the radius of the major sector in this logo.

..... cm [3]

(ii) A gold model is made.

This model is a prism with a cross-section of area 77.44 cm².

This gold model is 15 mm thick.

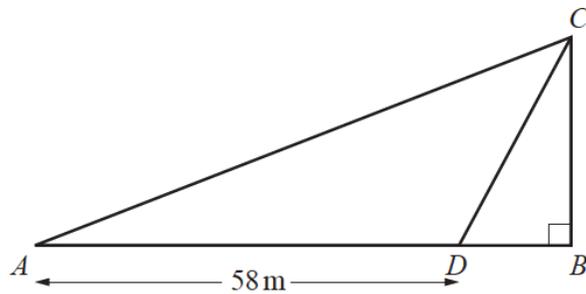
One cubic centimetre of gold has a mass of 19 grams.

Calculate the mass of the gold model in kilograms.

..... kg [3]

Question 38

(a)



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]

(b) Triangle EFG has an area of 70 m^2 .
 $EF : FG = 1 : 2$ and angle $EFG = 40^\circ$.

(i) Calculate EF .

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

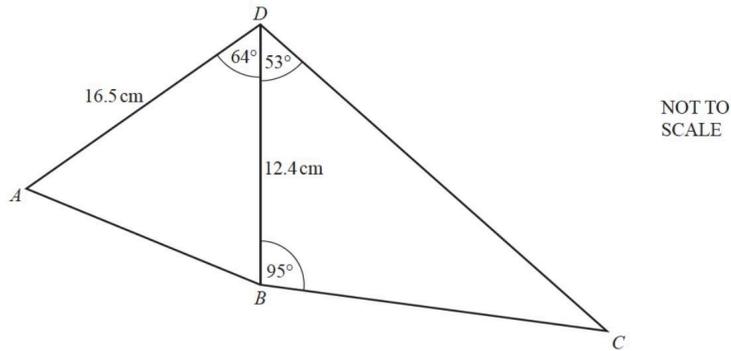
(ii) A **different** triangle PQR also has an area of 70 m^2 .
 $PQ : QR = 1 : 2$ and $PQ = EF$.

Find angle PQR .

Angle $PQR = \dots\dots\dots$ [1]

Question 39

(a)

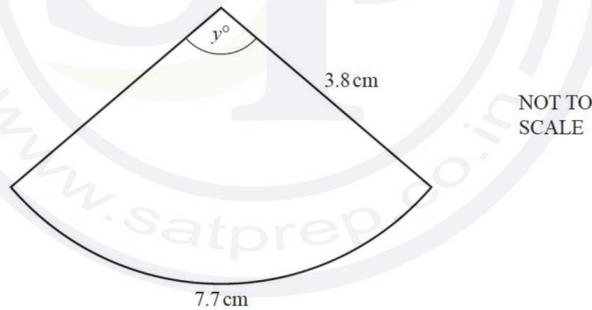


The diagram shows two triangles ABD and BCD .
 $AD = 16.5$ cm and $BD = 12.4$ cm.
 Angle $ADB = 64^\circ$, angle $BDC = 53^\circ$ and angle $DBC = 95^\circ$.

(i) Find AB .

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

(b)



The diagram shows a sector of a circle of radius 3.8 cm.
 The arc length is 7.7 cm.

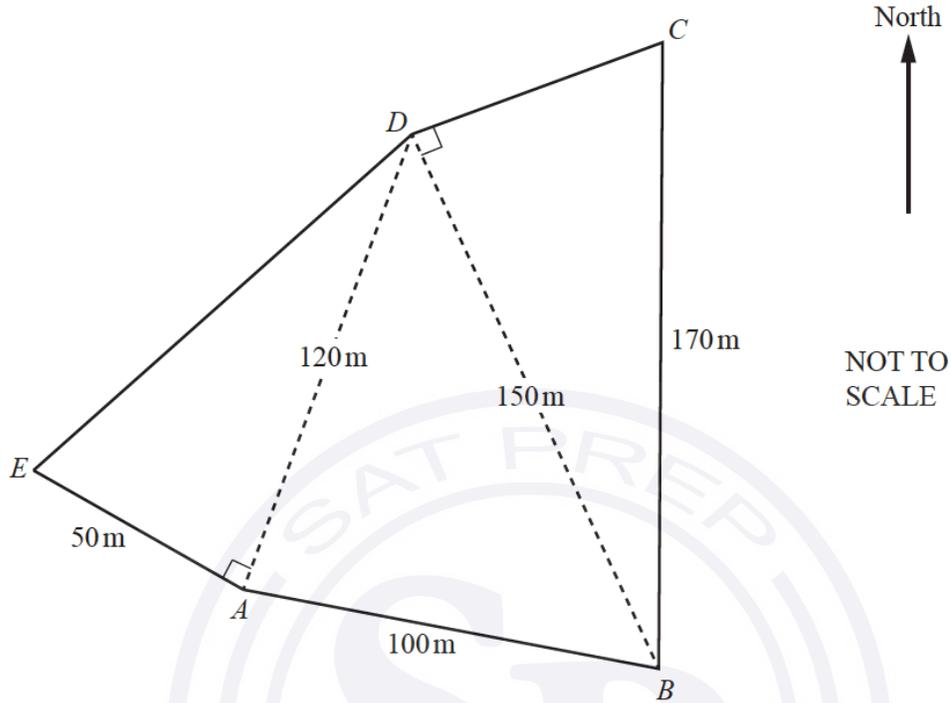
(i) Calculate the value of y .

$y = \dots\dots\dots$ [2]

(ii) Calculate the area of the sector.

$\dots\dots\dots$ cm^2 [2]

Question 40



The diagram shows a field $ABCDE$.

(a) Calculate the perimeter of the field $ABCDE$.

..... m [4]

(b) Calculate angle ABD .

Angle $ABD =$ [4]

(c) (i) Calculate angle CBD .

Angle $CBD =$ [2]

(ii) The point C is due north of the point B .

Find the bearing of D from B .

..... [2]

Continue on the next page...

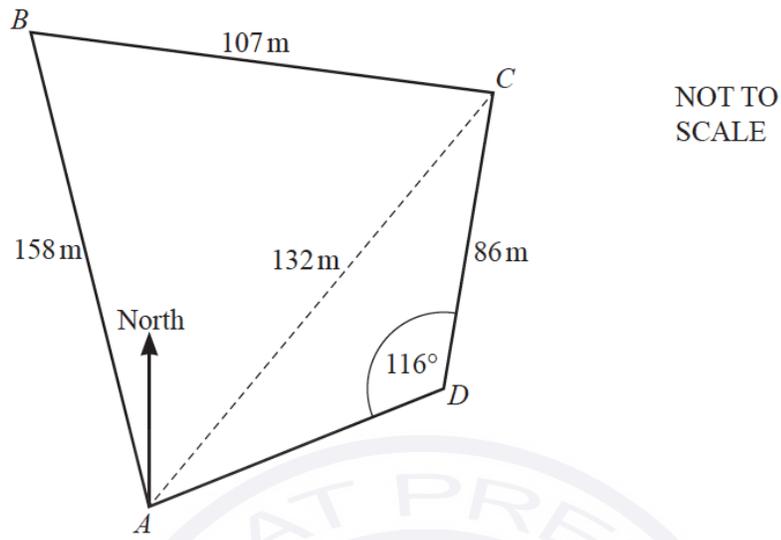
(d) Calculate the area of the field $ABCDE$.

Give your answer in hectares.

[1 hectare = $10\,000\text{m}^2$]

..... hectares [4]

Question 41



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

- (a) There is a vertical post at C .
From B , the angle of elevation of the top of the post is 19° .

Find the height of the post.

..... [2]

- (b) Use the cosine rule to find angle BAC .

Angle $BAC =$ [4]

- (c) Use the sine rule to find angle CAD .

Angle $CAD =$ [3]

- (d) Calculate the area of the field.

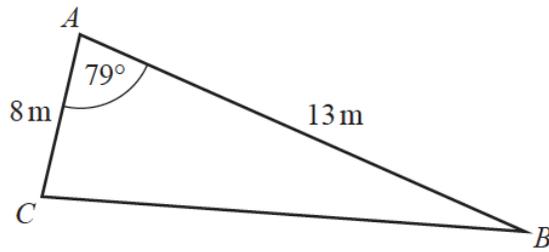
..... m^2 [3]

- (e) The bearing of D from A is 070° .

Find the bearing of A from C .

..... [2]

Question 42



NOT TO
SCALE

The diagram shows triangle ABC .

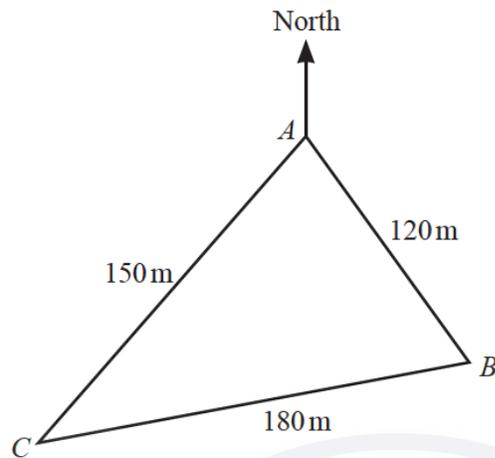
- (i) Use the cosine rule to calculate BC .

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

- (ii) Use the sine rule to calculate angle ACB .

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

Question 43



NOT TO SCALE

The diagram shows a triangular field, ABC , on horizontal ground.

- (a) Olav runs from A to B at a constant speed of 4 m/s and then from B to C at a constant speed of 3 m/s . He then runs at a constant speed from C to A . His average speed for the whole journey is 3.6 m/s .

Calculate his speed when he runs from C to A .

..... m/s [3]

- (b) Use the cosine rule to find angle BAC .

Angle $BAC =$ [4]

- (c) The bearing of C from A is 210° .

- (i) Find the bearing of B from A .

..... [1]

- (ii) Find the bearing of A from B .

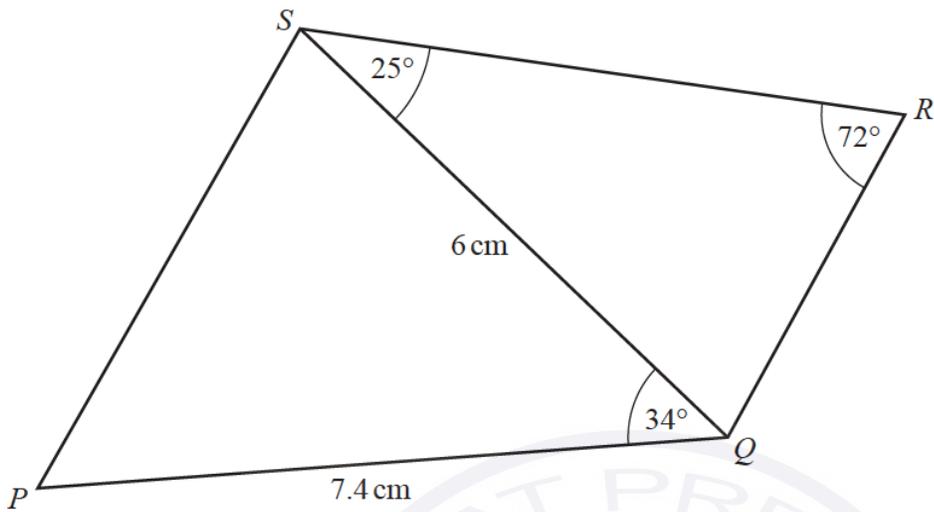
..... [2]

- (d) D is the point on AC that is nearest to B .

Calculate the distance from D to A .

..... m [2]

Question 44



NOT TO SCALE

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

Calculate

(i) QR ,

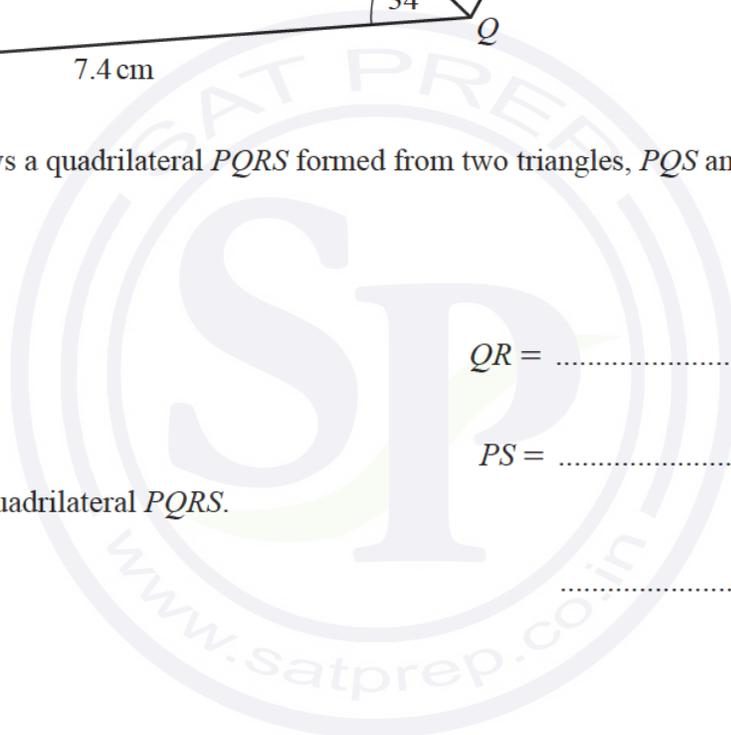
$QR = \dots\dots\dots\text{ cm}$ [3]

(ii) PS ,

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

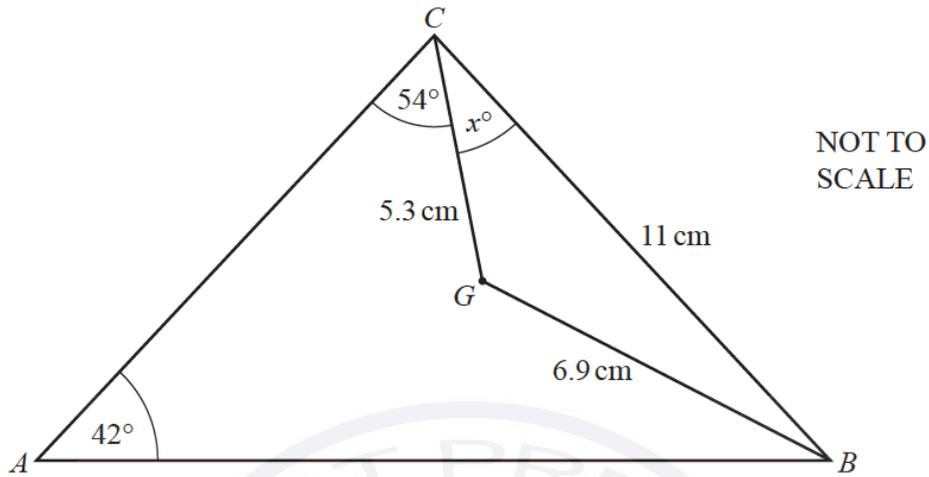
(iii) the area of quadrilateral $PQRS$.

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



Question 45

(a)



The diagram shows triangle ABC with point G inside.
 $CB = 11$ cm, $CG = 5.3$ cm and $BG = 6.9$ cm.
 Angle $CAB = 42^\circ$ and angle $ACG = 54^\circ$.

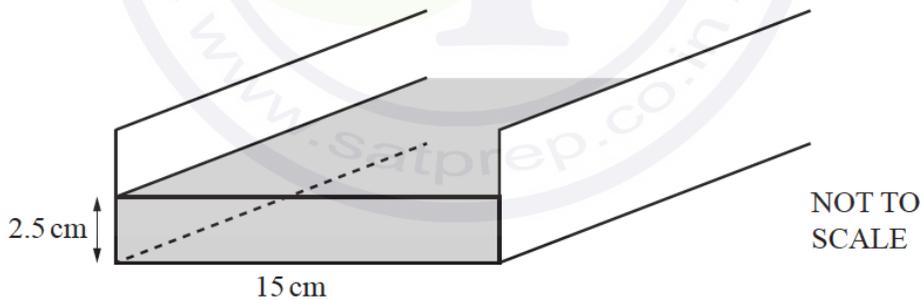
(i) Calculate the value of x .

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

(ii) Calculate AC

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

(b)

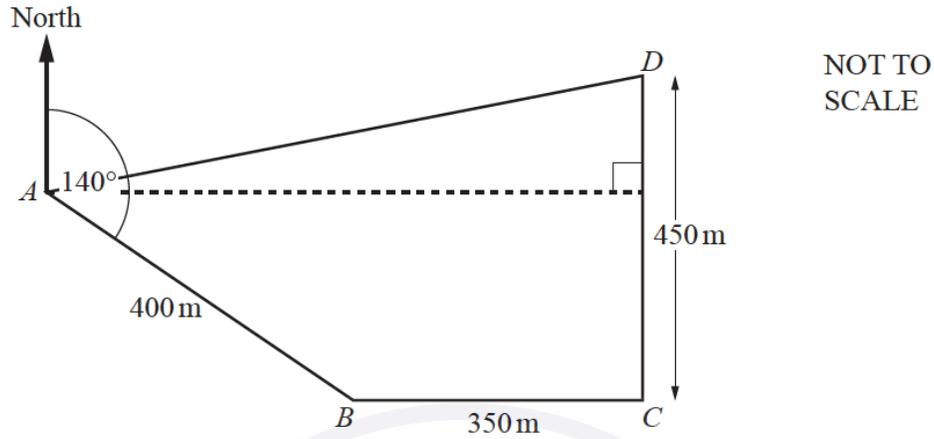


Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
 The width of the channel is 15 cm.
 The depth of the water is 2.5 cm.

Calculate the amount of water that flows from the channel into the lake in 1 hour.
 Give your answer in litres.

$\dots\dots\dots$ litres [4]

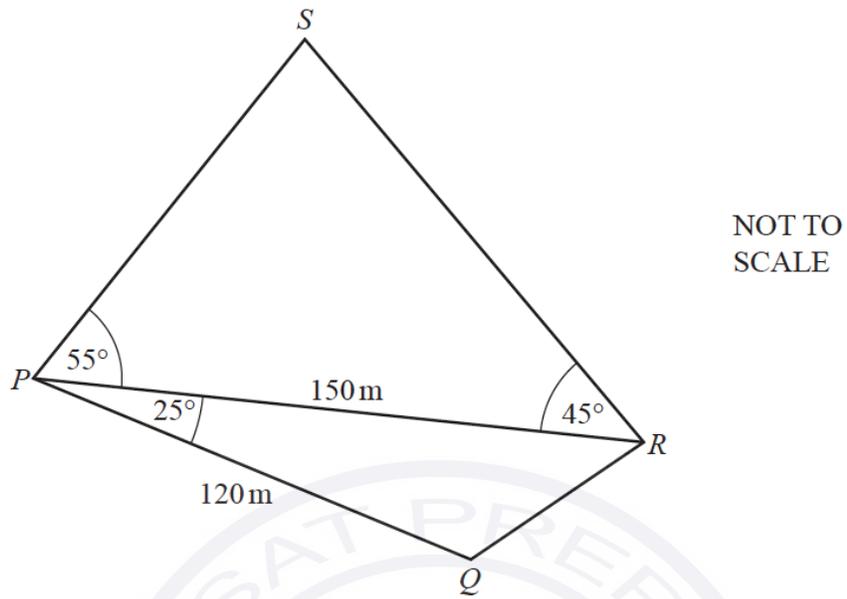
Question 46



The diagram shows a field $ABCD$.
 The bearing of B from A is 140° .
 C is due east of B and D is due north of C .
 $AB = 400$ m, $BC = 350$ m and $CD = 450$ m.

- (a) Find the bearing of D from B .
 [2]
- (b) Calculate the distance from D to A .
 m [6]
- (c) Jono runs around the field from A to B , B to C , C to D and D to A .
 He runs at a speed of 3 m/s.
 Calculate the total time Jono takes to run around the field.
 Give your answer in minutes and seconds, correct to the nearest second.
 min s [4]

Question 47



The diagram shows two triangles.

(a) Calculate QR .

$QR = \dots\dots\dots$ m [3]

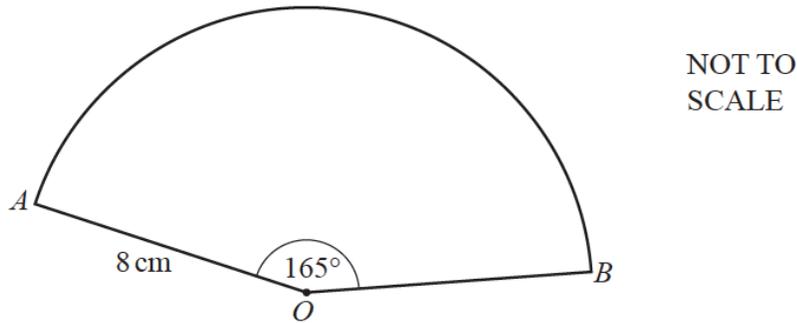
(b) Calculate RS .

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

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

$\dots\dots\dots$ m^2 [3]

Question 48



The diagram shows a sector of a circle with centre O , radius 8 cm and sector angle 165° .

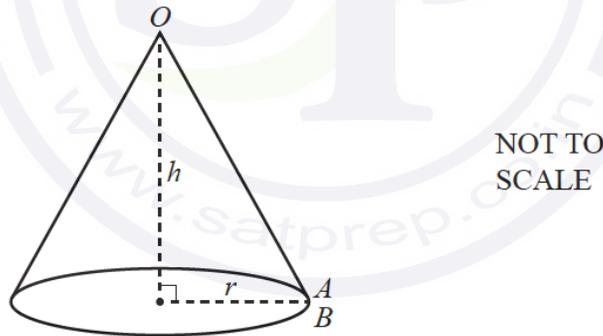
- (a) Calculate the total perimeter of the sector.
 cm [3]

- (b) The surface area of a sphere is the same as the area of the sector.

Calculate the radius of the sphere.

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

- (c) cm [4]



A cone is made from the sector by joining OA to OB .

- (i) Calculate the radius, r , of the cone.

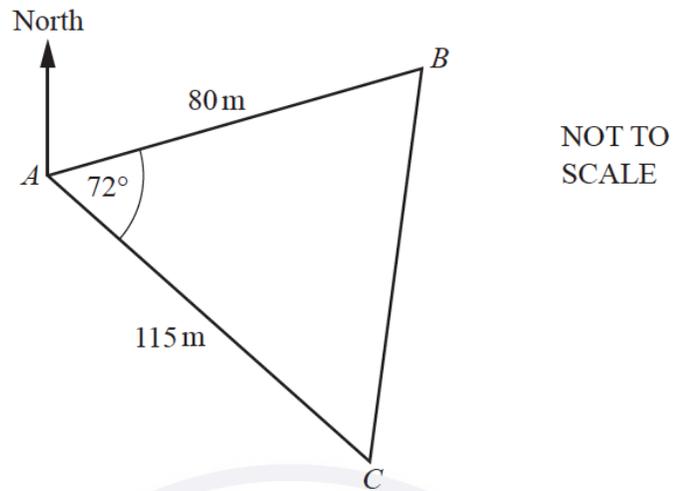
$r =$ cm [2]

- (ii) Calculate the volume of the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

Question 49



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

(a) Show that BC is 118.1 m, correct to 1 decimal place. [3]

(b) Calculate angle ABC .
 Angle $ABC = \dots\dots\dots$ [3]

(c) The bearing of C from A is 147° .
 Find the bearing of

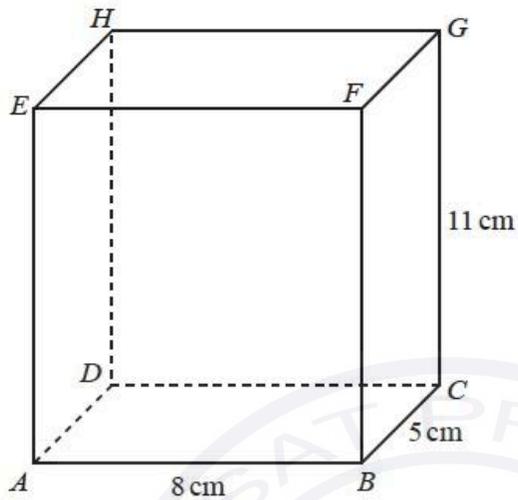
(i) A from B ,

(ii) B from C
 [2]

(d) Mitchell takes 35 seconds to run from A to C .
 Calculate his average running speed in kilometres per hour.
 km/h [3]

(e) Calculate the shortest distance from point B to AC .
 m [3]

Question 50



NOT TO SCALE

$ABCDEFGH$ is a cuboid.
 $AB = 8$ cm, $BC = 5$ cm and $CG = 11$ cm.

(a) Work out the volume of the cuboid.

..... cm^3 [2]

(b) Ivana has a pencil of length 13 cm.

Does this pencil fit completely inside the cuboid?
 Show how you decide.

[4]

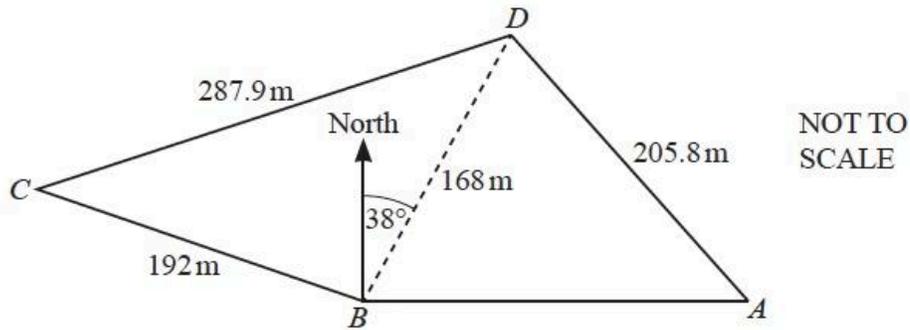
(c) (i) Calculate angle CAB .

Angle $CAB =$ [2]

(ii) Calculate angle GAC .

Angle $GAC =$ [2]

Question 51



The diagram shows a field, $ABCD$, on horizontal ground.
 $BC = 192\text{ m}$, $CD = 287.9\text{ m}$, $BD = 168\text{ m}$ and $AD = 205.8\text{ m}$.

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

[4]

(ii) The bearing of D from B is 038° .

Find the bearing of C from B .

..... [1]

(iii) A is **due east** of B .

Calculate the bearing of D from A .

..... [5]

(b) (i) Calculate the area of triangle BCD .

..... m^2 [2]

(ii) Tomas buys the triangular part of the field, BCD .
 The cost is \$35 750 per hectare.

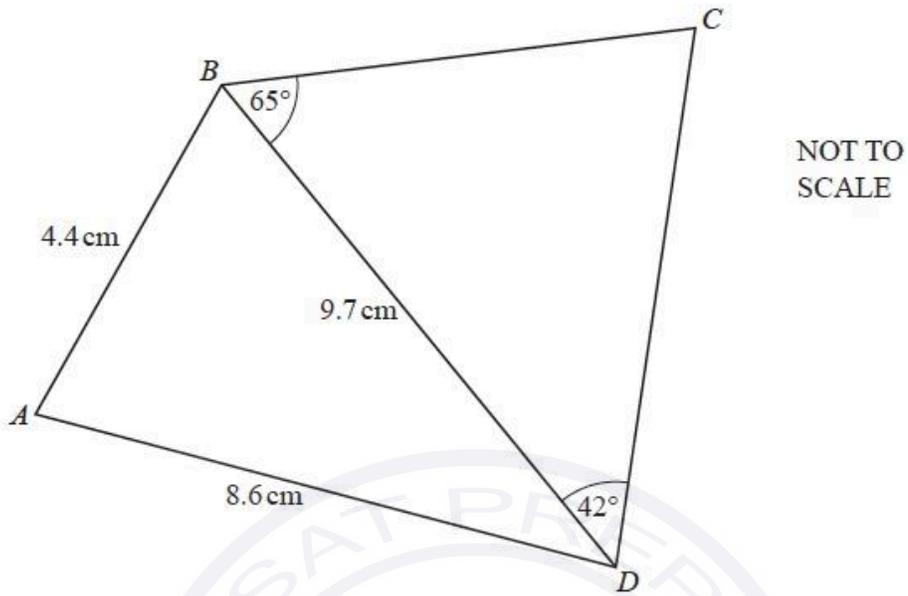
Calculate the amount he pays.

Give your answer correct to the nearest \$100.

[1 hectare = $10\,000\text{ m}^2$]

\$ [2]

Question 52



(a) Calculate angle ADB .

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

(b) Calculate DC .

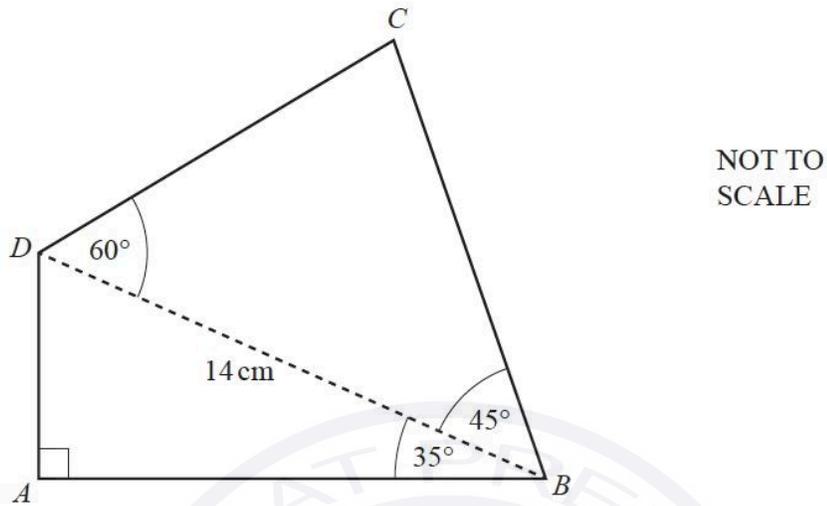
$DC = \dots\dots\dots$ cm [4]

(c) Calculate the shortest distance from C to BD .

$\dots\dots\dots$ cm [3]

Question 53

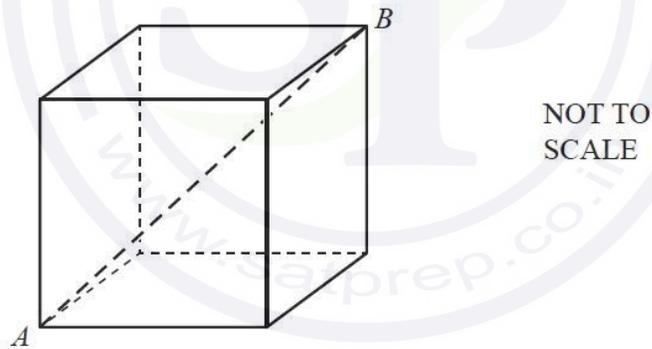
(a)



Calculate the perimeter of the quadrilateral $ABCD$.

..... cm [7]

(b)



The diagram shows a cube.
The length of the diagonal AB is 8.5 cm.

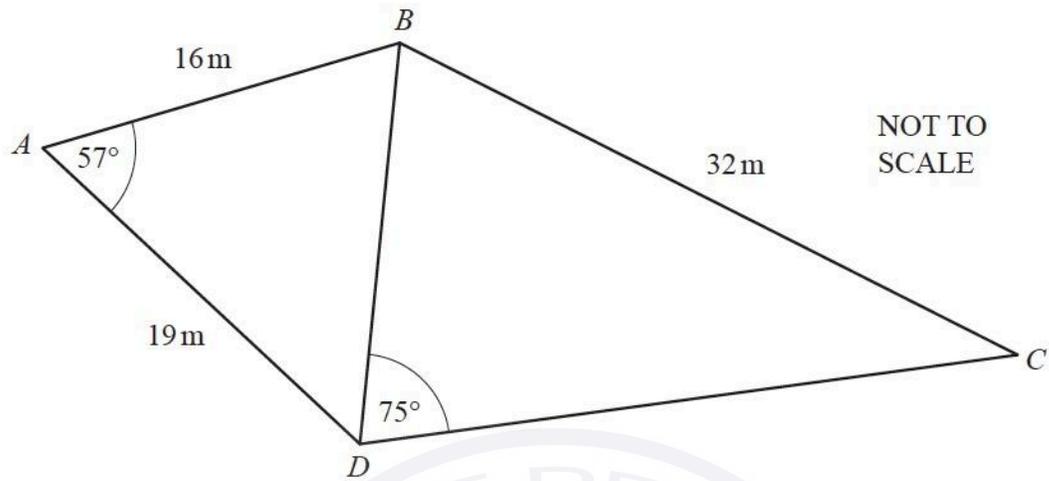
(i) Calculate the length of an edge of the cube.

..... cm [3]

(ii) Calculate the angle between AB and the base of the cube.

..... [3]

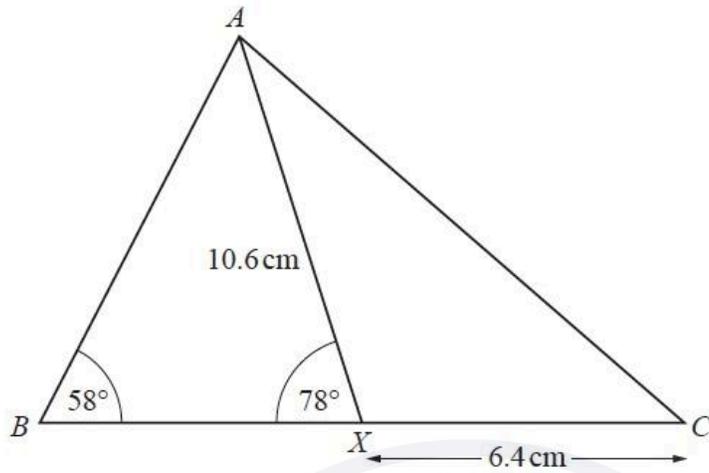
Question 54



The diagram shows a quadrilateral $ABCD$ made from two triangles, ABD and BCD .

- (a) Show that $BD = 16.9\text{ m}$, correct to 1 decimal place. [3]
- (b) Calculate angle CBD .
 Angle $CBD = \dots\dots\dots$ [4]
- (c) Find the area of the quadrilateral $ABCD$.
 m^2 [3]
- (d) Find the shortest distance from B to AD .
 m [3]

Question 55



NOT TO
SCALE

The diagram shows triangle ABC .

X is a point on BC .

$AX = 10.6\text{ cm}$, $XC = 6.4\text{ cm}$, angle $ABC = 58^\circ$ and angle $AXB = 78^\circ$.

(a) Calculate AC .

$AC = \dots\dots\dots\text{ cm}$ [4]

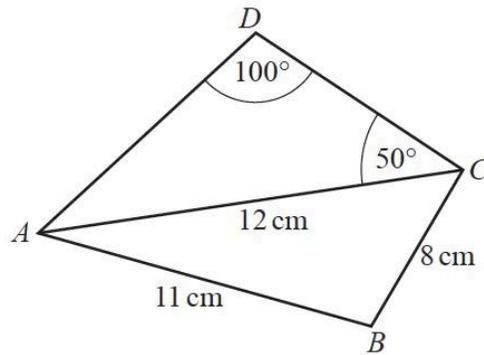
(b) Calculate BX .

$BX = \dots\dots\dots\text{ cm}$ [4]

(c) Calculate the area of triangle ABC .

$\dots\dots\dots\text{ cm}^2$ [3]

Question 56



NOT TO
SCALE

(a) Calculate AD .

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

(b) Calculate angle BAC and show that it rounds to 40.42° , correct to 2 decimal places.

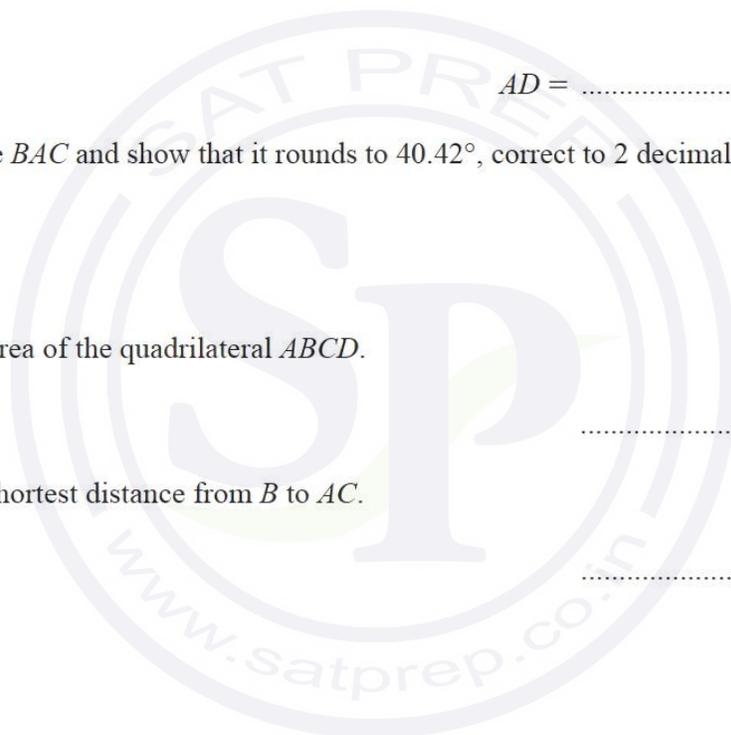
[4]

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

$\dots\dots\dots$ cm^2 [3]

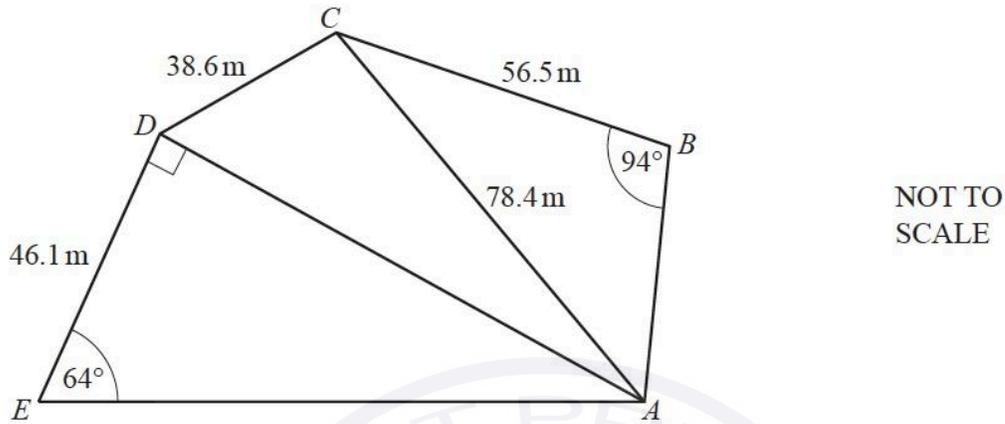
(d) Calculate the shortest distance from B to AC .

$\dots\dots\dots$ cm [3]



Question 57

(a)



NOT TO SCALE

ABCDE is a pentagon.

(i) Calculate *AD* and show that it rounds to 94.5 m, correct to 1 decimal place.

[2]

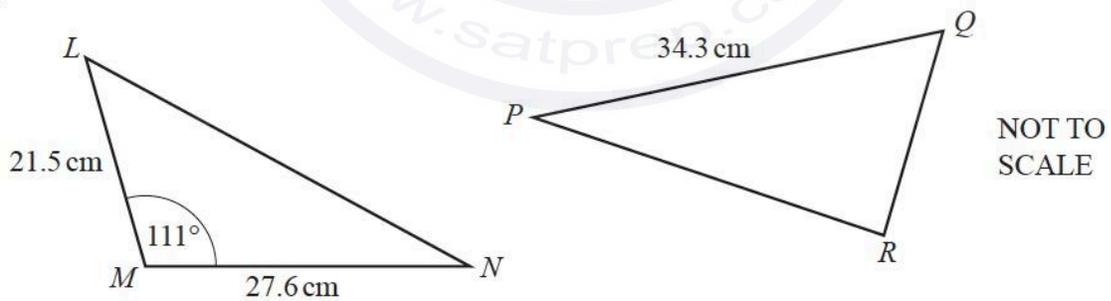
(ii) Calculate angle *BAC*.

Angle *BAC* = [3]

(iii) Calculate the largest angle in triangle *CAD*.

..... [4]

(b)



Triangle *PQR* has the same area as triangle *LMN*.

Calculate the shortest distance from *R* to the line *PQ*.

..... cm [3]

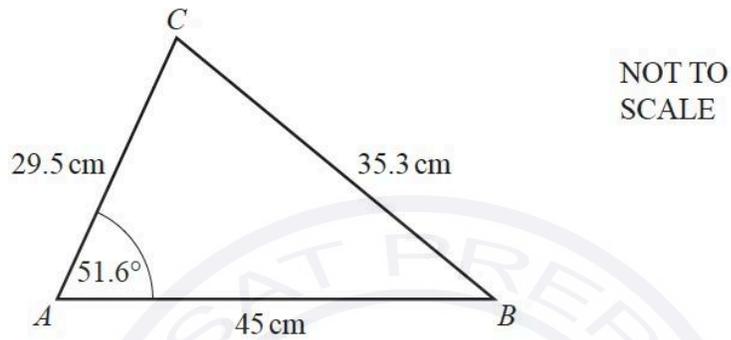
Question 58

Solve the equation $\tan x = 11.43$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

Question 59

(a)



In triangle ABC , $AB = 45$ cm, $AC = 29.5$ cm, $BC = 35.3$ cm and angle $CAB = 51.6^\circ$.

(i) Calculate angle ABC .

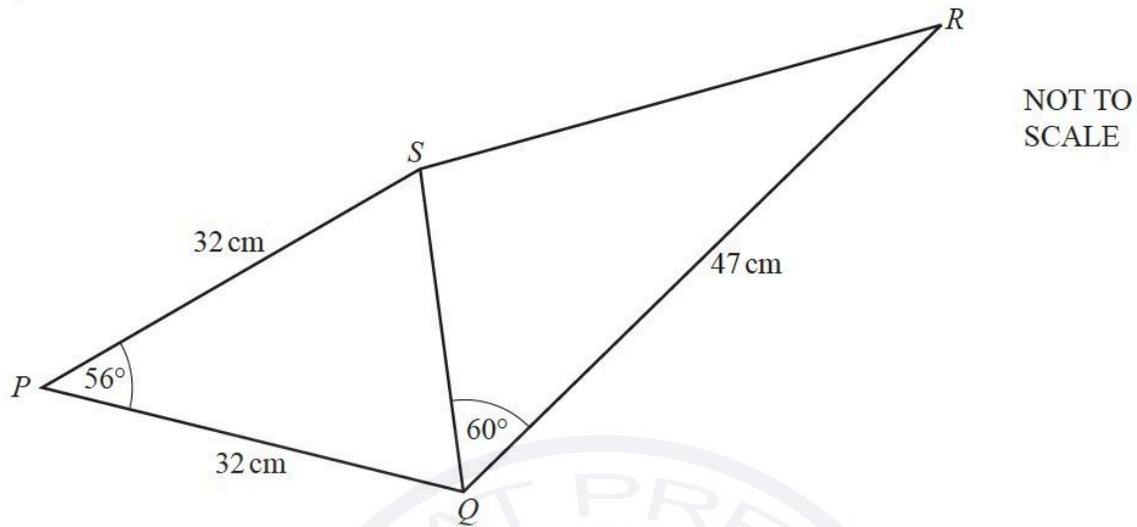
Angle $ABC = \dots\dots\dots$ [3]

(ii) Calculate the area of triangle ABC .

$\dots\dots\dots$ cm^2 [2]

Continue on the next page...

(b)



The diagram shows a quadrilateral $PQRS$ formed from two triangles, PQS and QRS . Triangle PQS is isosceles, with $PQ = PS = 32$ cm and angle $SPQ = 56^\circ$. $QR = 47$ cm and angle $SQR = 60^\circ$.

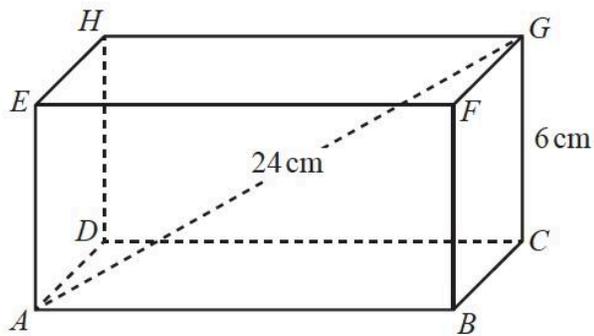
(i) Calculate SR .

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

(ii) Calculate the shortest distance from P to SQ .

$\dots\dots\dots$ cm [3]

Question 60



NOT TO
SCALE

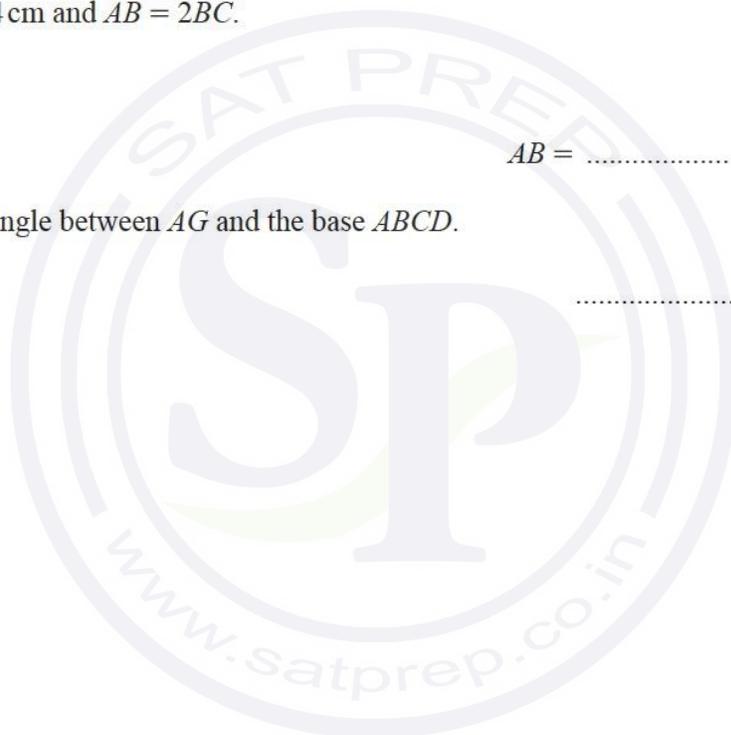
The diagram shows a cuboid $ABCDEFGH$.
 $CG = 6$ cm, $AG = 24$ cm and $AB = 2BC$.

(a) Calculate AB .

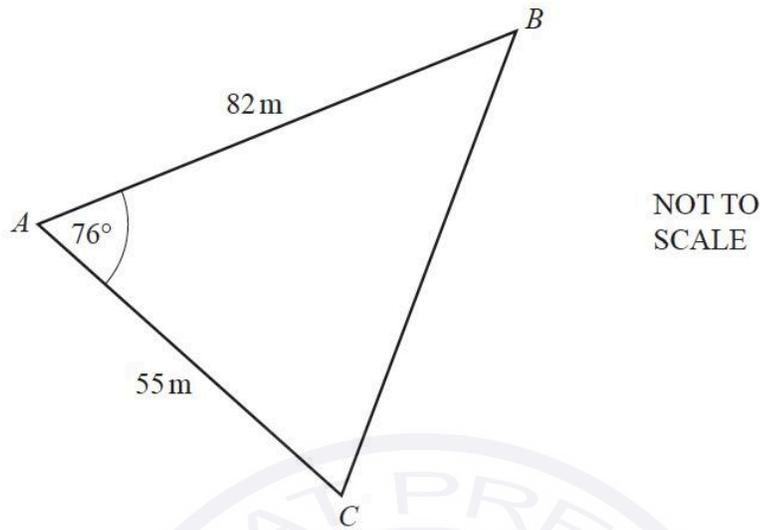
$AB = \dots\dots\dots$ cm [4]

(b) Calculate the angle between AG and the base $ABCD$.

$\dots\dots\dots$ [3]



Question 61



The diagram shows a field ABC .

- (a) Calculate BC .

$BC = \dots\dots\dots$ m [3]

- (b) Calculate angle ACB .

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

- (c) A gate, G , lies on AB at the shortest distance from C .

Calculate AG .

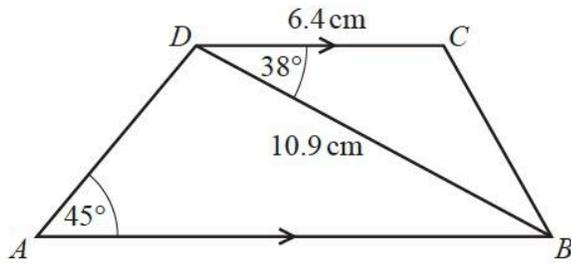
$AG = \dots\dots\dots$ m [3]

- (d) A different triangular field PQR has the same area as ABC .
 $PQ = 90$ m and $QR = 60$ m.

Work out the two possible values of angle PQR .

Angle $PQR = \dots\dots\dots$ or $\dots\dots\dots$ [5]

Question 62



NOT TO SCALE

ABCD is a trapezium with *DC* parallel to *AB*.
DC = 6.4 cm, *DB* = 10.9 cm, angle *CDB* = 38° and angle *DAB* = 45°.

(a) Find *CB*.

CB = cm [3]

(b) (i) Find angle *ADB*.

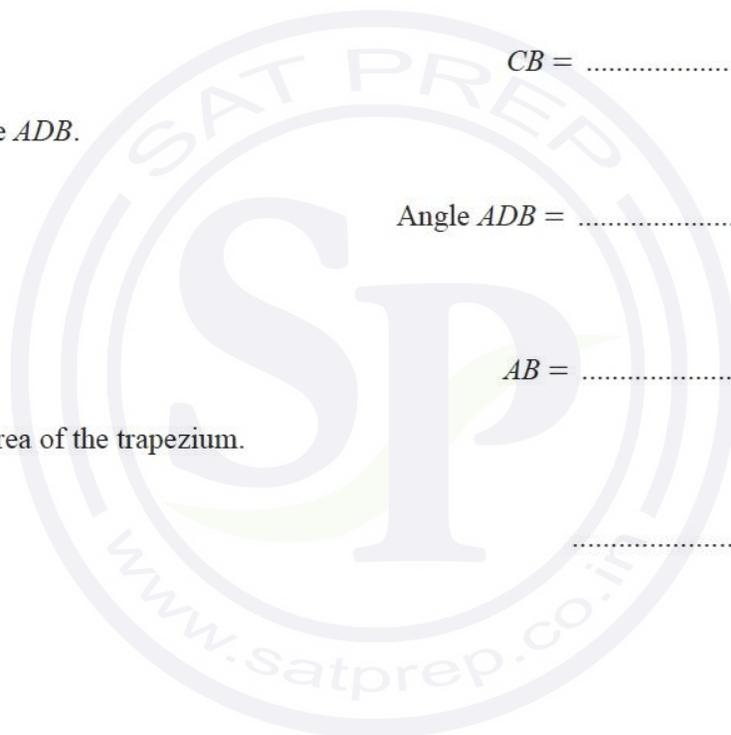
Angle *ADB* = [1]

(ii) Find *AB*.

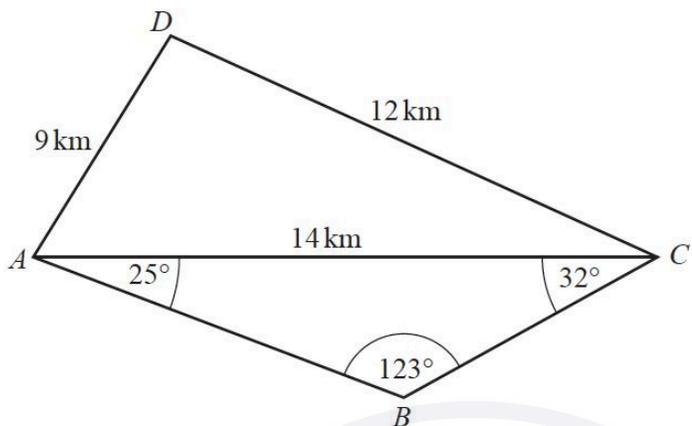
AB = cm [3]

(c) Calculate the area of the trapezium.

..... cm² [3]



Question 63



NOT TO SCALE

- (a) Calculate angle ACD .

Angle $ACD = \dots\dots\dots$ [4]

- (b) Show that $BC = 7.05$ km, correct to 2 decimal places.

[3]

- (c) Calculate the shortest distance from B to AC .

$\dots\dots\dots$ km [3]

- (d) Calculate the length of the straight line BD .

$BD = \dots\dots\dots$ km [4]

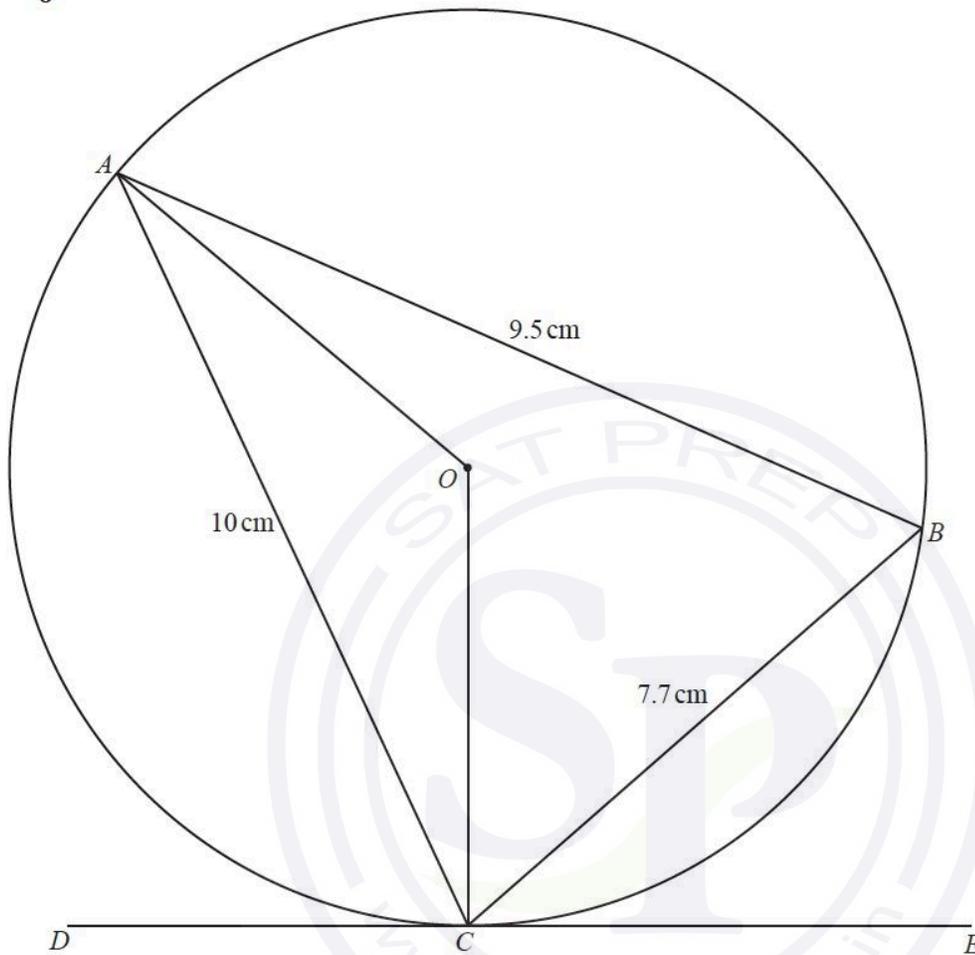
- (e) C is due east of A .

Find the bearing of D from C .

$\dots\dots\dots$ [2]

Question 64

8



NOT TO
SCALE

A , B and C are points on the circle, centre O .
 DE is a tangent to the circle at C .
 $AC = 10$ cm, $AB = 9.5$ cm and $BC = 7.7$ cm.

(a) Show that angle $ABC = 70.2^\circ$, correct to 1 decimal place.

[4]

Continue on the next page...

(b) Find

(i) angle AOC

Angle $AOC = \dots\dots\dots$ [1]

(ii) angle ACO

Angle $ACO = \dots\dots\dots$ [1]

(iii) angle ACD .

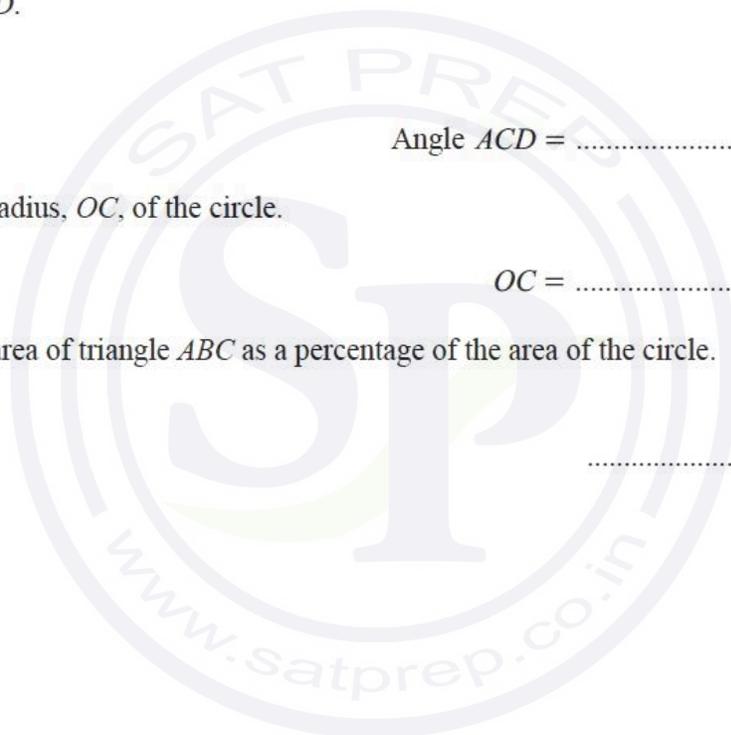
Angle $ACD = \dots\dots\dots$ [1]

(c) Calculate the radius, OC , of the circle.

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

(d) Calculate the area of triangle ABC as a percentage of the area of the circle.

$\dots\dots\dots\%$ [4]



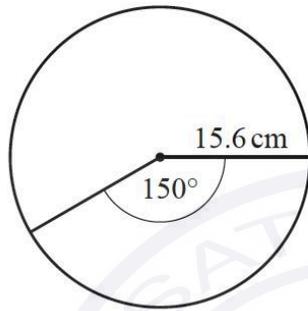
Question 65

- (a) The lengths of the sides of a triangle are 11.4 cm, 14.8 cm and 15.7 cm, all correct to 1 decimal place.

Calculate the upper bound of the perimeter of the triangle.

..... cm [2]

- (b)



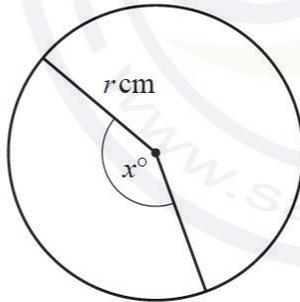
NOT TO SCALE

The diagram shows a circle, radius 15.6 cm.
The angle of the minor sector is 150°.

Calculate the area of the minor sector.

..... cm² [2]

- (c)



NOT TO SCALE

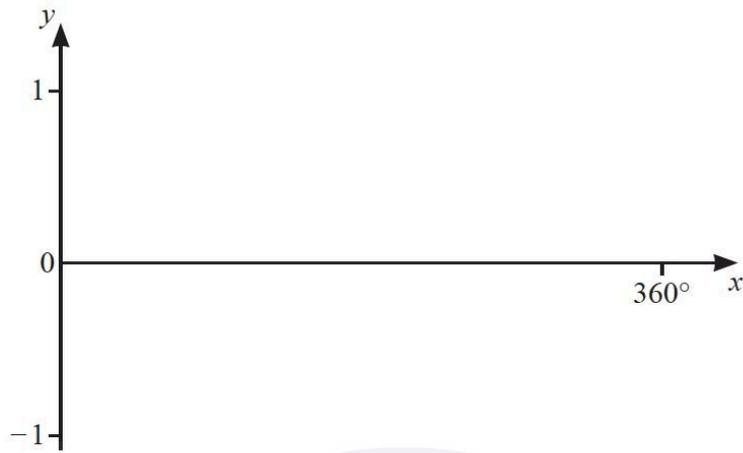
The diagram shows a circle, radius r cm and minor sector angle x° .

The **perimeter** of the major sector is three times the **perimeter** of the minor sector.

Show that $x = \frac{90(\pi - 2)}{\pi}$.

[4]

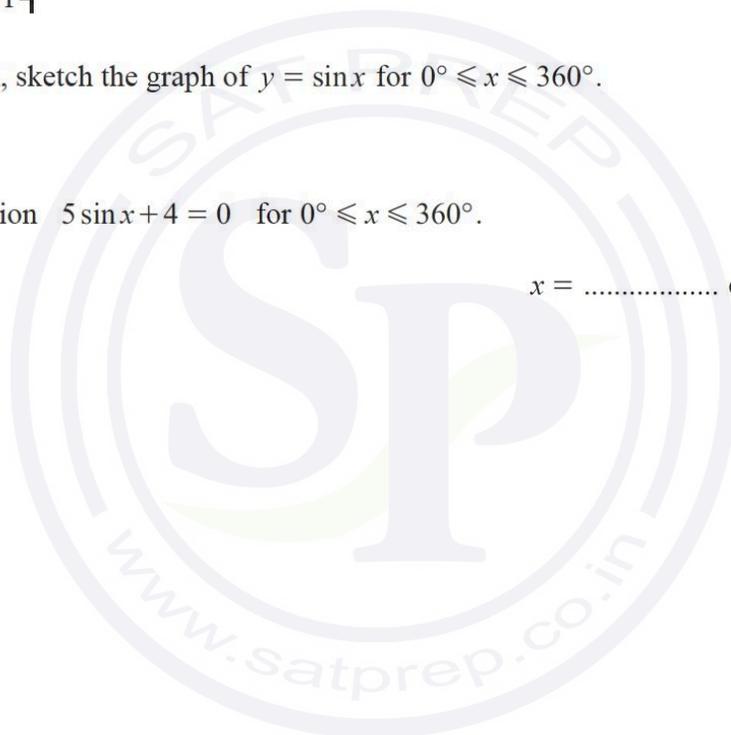
Question 66



(a) On the diagram, sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$. [2]

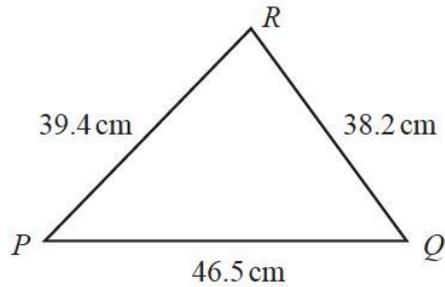
(b) Solve the equation $5 \sin x + 4 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]



Question 67

(a)



NOT TO SCALE

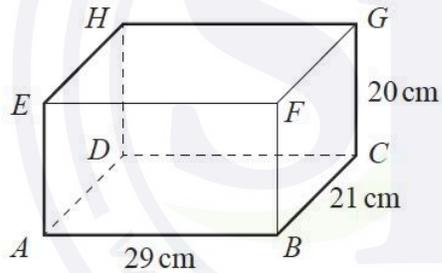
(i) Calculate angle QPR .

Angle $QPR = \dots\dots\dots$ [4]

(ii) Find the shortest distance from Q to PR .

$\dots\dots\dots$ cm [3]

(b) The diagram shows a cuboid.



NOT TO SCALE

(i) Calculate the length AG .

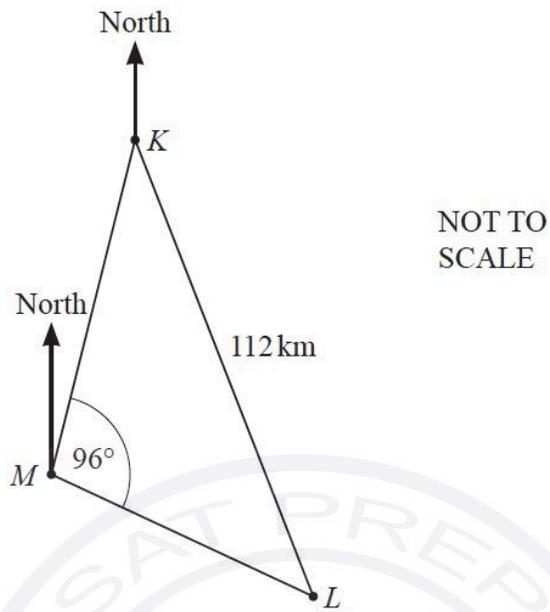
$AG = \dots\dots\dots$ cm [3]

(ii) Calculate the angle between AG and the base $ABCD$.

$\dots\dots\dots$ [3]

Continue on the next page...

(c)



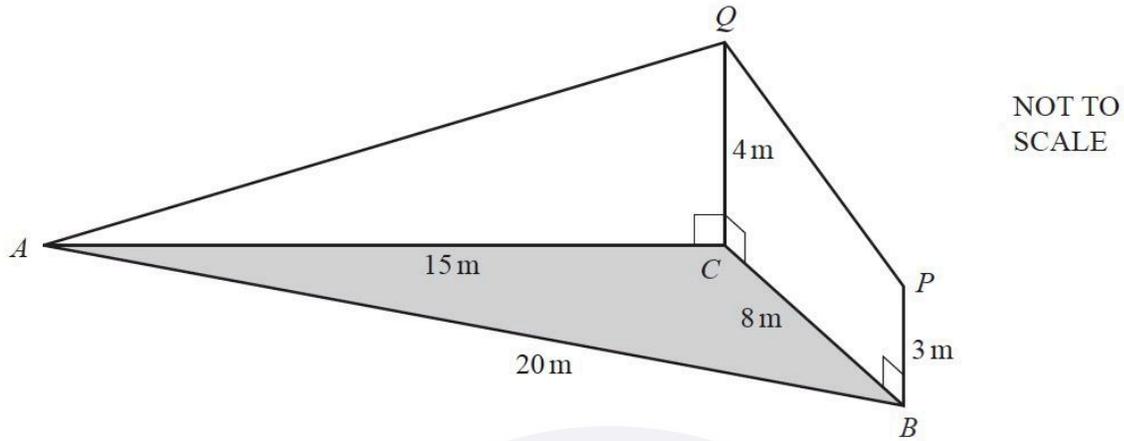
The diagram shows the positions of a lighthouse, L , and two ships, K and M .
The bearing of L from K is 155° and $KL = 112$ km.
The bearing of K from M is 010° and angle $KML = 96^\circ$.

Find the bearing and distance of ship M from the lighthouse, L .

Bearing

Distance km [5]

Question 68



The diagram shows triangle ABC on horizontal ground.

$AC = 15\text{ m}$, $BC = 8\text{ m}$ and $AB = 20\text{ m}$.

BP and CQ are vertical poles of different heights.

$BP = 3\text{ m}$ and $CQ = 4\text{ m}$.

AQ and PQ are straight wires.

(a) Show that angle $ACB = 117.5^\circ$, correct to 1 decimal place.

[4]

(b) Calculate the area of triangle ABC .

..... m^2 [2]

(c) Calculate the length of AQ .

..... m [2]

(d) Calculate the angle of elevation of Q from P .

..... [3]

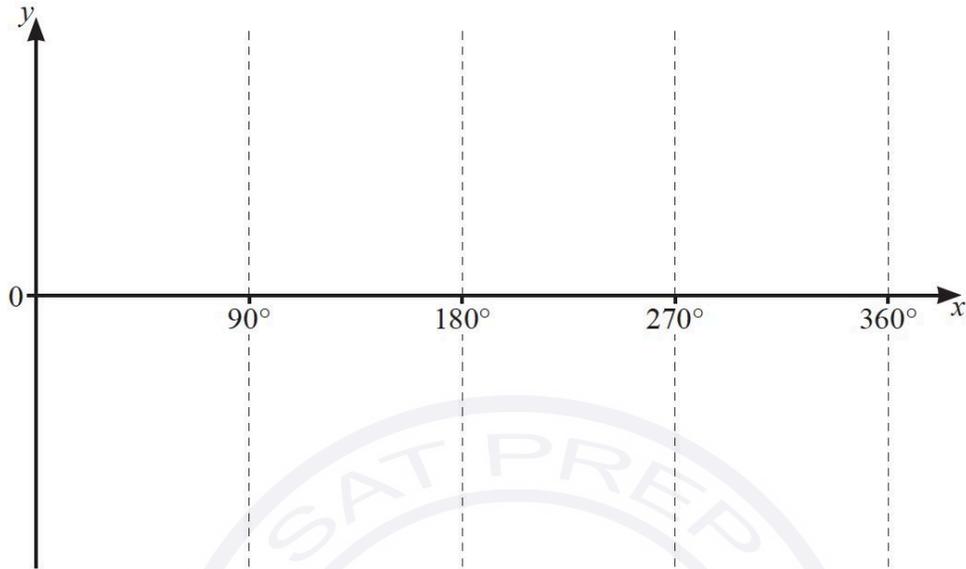
(e) Another straight wire connects A to the midpoint of PQ .

Calculate the angle between this wire and the horizontal ground.

..... [5]

Question 69

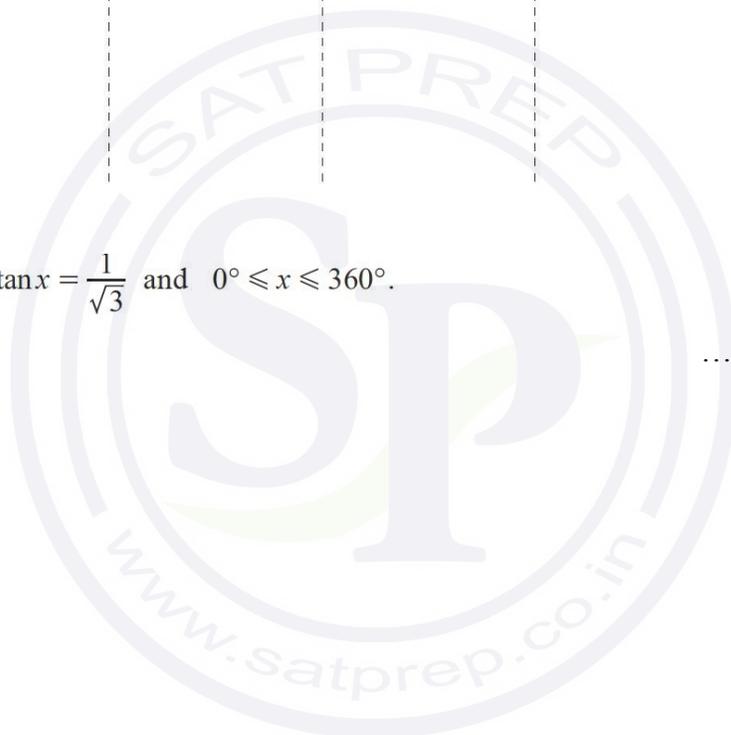
(a) Sketch the graph of $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$.



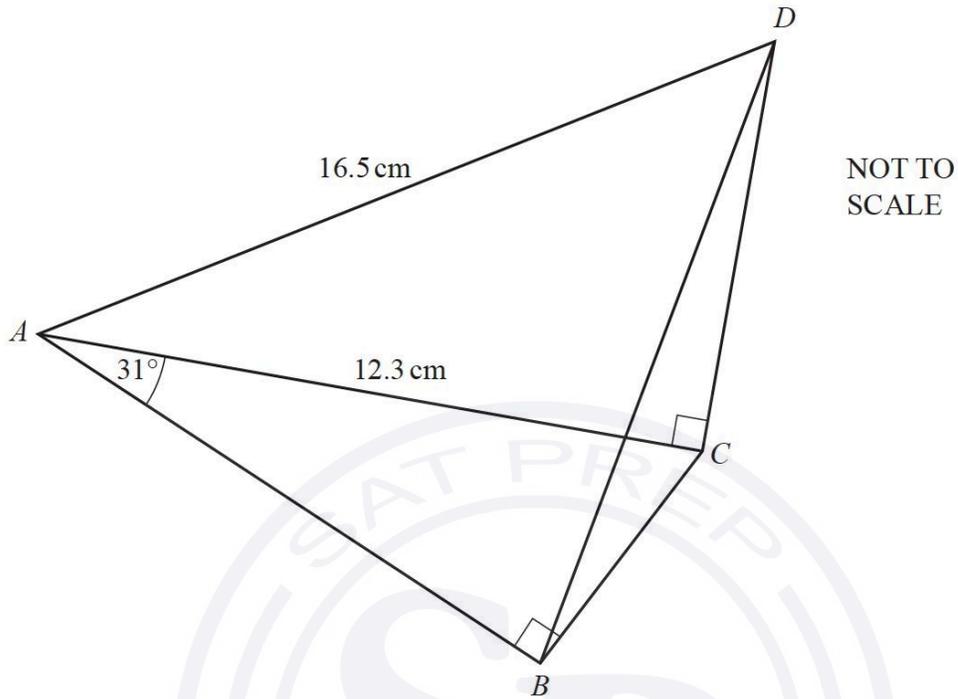
[2]

(b) Find x when $\tan x = \frac{1}{\sqrt{3}}$ and $0^\circ \leq x \leq 360^\circ$.

..... [2]



Question 70



The diagram shows a quadrilateral $ABCD$.
 $AC = 12.3$ cm and $AD = 16.5$ cm.
 Angle $BAC = 31^\circ$, angle $ABC = 90^\circ$ and angle $ACD = 90^\circ$.

(a) Show that $AB = 10.54$ cm, correct to 2 decimal places. [2]

(b) Show that angle $DAC = 41.80^\circ$ correct to 2 decimal places. [2]

(c) Calculate BD .

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

(d) Calculate angle CBD .

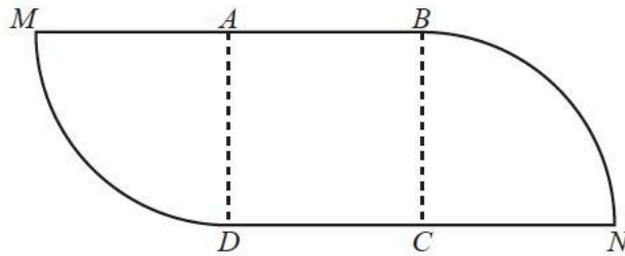
Angle $CBD = \dots\dots\dots$ [4]

(e) Calculate the shortest distance from C to BD .

$\dots\dots\dots$ cm [4]

Question 71

(a)



The diagram shows a shape made from a square $ABCD$ and two equal sectors of a circle. The square has side 11 cm. MAB and DCN are straight lines.

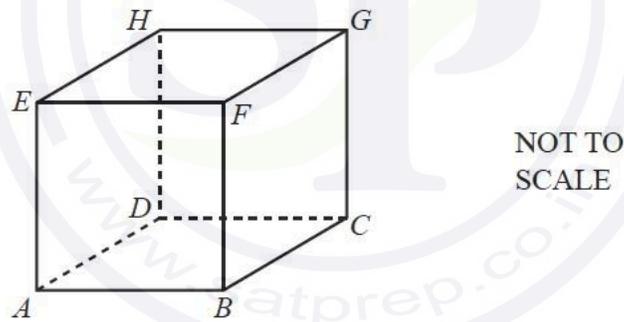
(i) Calculate the area of the shape.

..... cm² [3]

(ii) Calculate the perimeter of the shape.

..... cm [3]

(b)



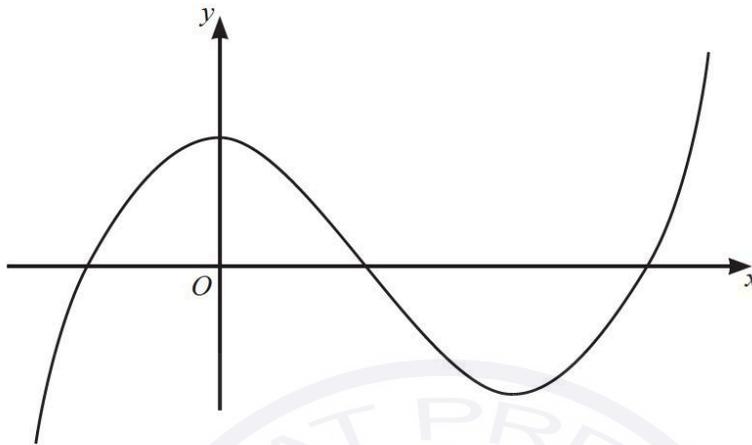
The diagram shows a cube $ABCDEFGH$ of edge 7 cm.

Calculate the angle between AG and the base of the cube.

..... [4]

Question 72

(a) The diagram shows the graph of a function.

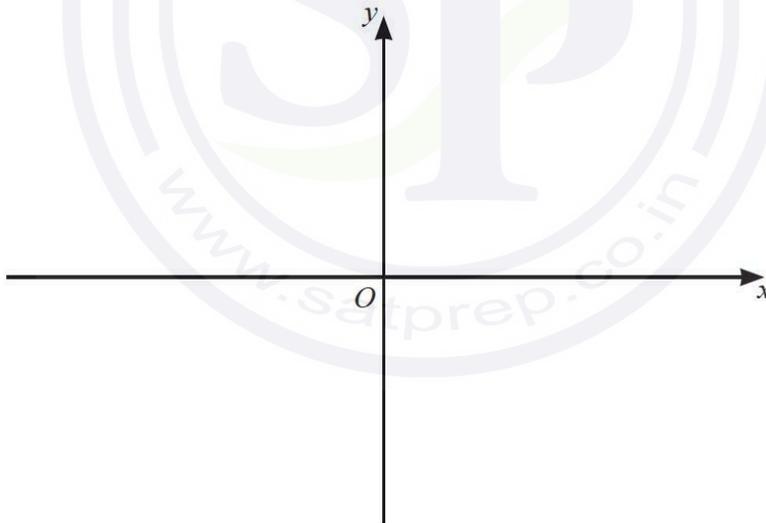


Put a ring around the word which correctly identifies the type of function.

reciprocal quadratic cubic exponential linear

[1]

(b) (i)



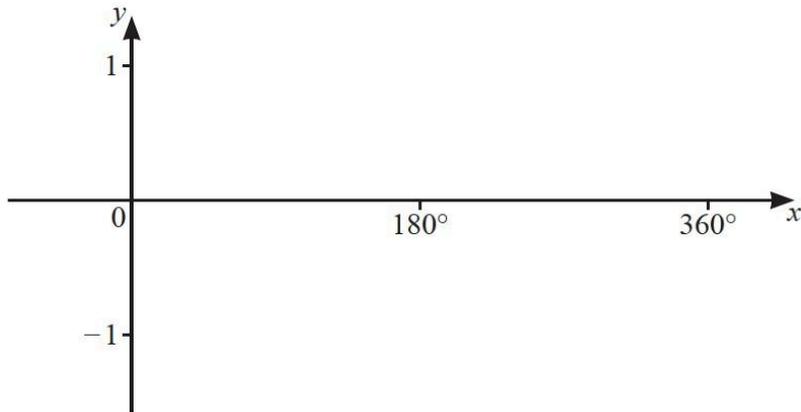
On the diagram, sketch the graph of $y = \frac{1}{2x}, x \neq 0$. [2]

(ii) Solve the equation $\frac{1}{2x} = 2x$.

$x = \dots\dots\dots$ and $x = \dots\dots\dots$ [2]

Continue on the next page...

(c) (i)



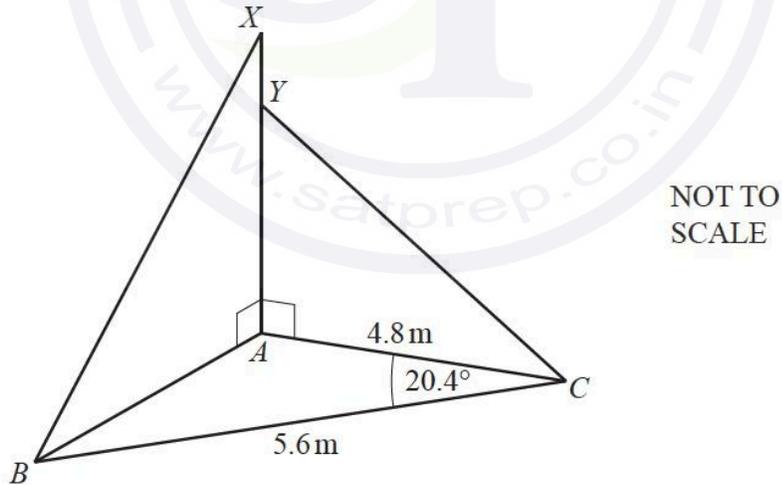
On the diagram, sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$. [2]

(ii) Solve the equation $3 \sin x + 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots$ and $x = \dots\dots\dots$ [3]

Question 73

(a)



ABC is a scalene triangle on horizontal ground.
 AYX is a straight vertical post, held in place by two straight wires XB and YC .
 $AC = 4.8\text{ m}$, $BC = 5.6\text{ m}$ and angle $ACB = 20.4^\circ$.

(i) Calculate AB .

Continue on the next page...

$AB = \dots\dots\dots$ m [3]

(ii) Angle $XBA = 64^\circ$.

Calculate AX .

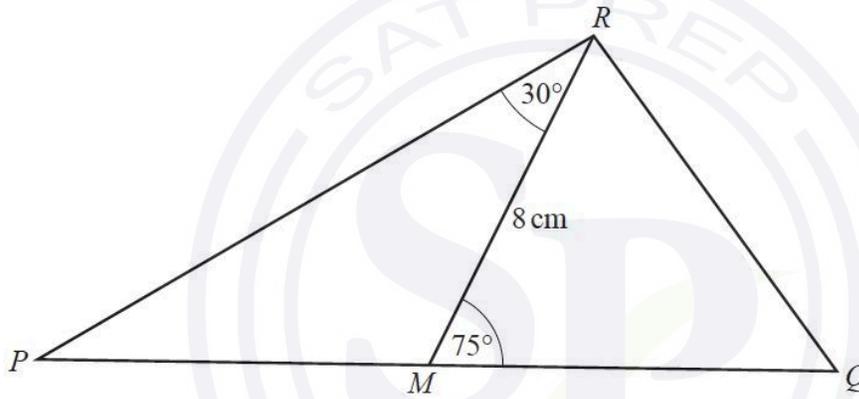
$AX = \dots\dots\dots$ m [2]

(iii) $AY = 2.9$ m.

Calculate the area of triangle YAC .

$\dots\dots\dots$ m² [2]

(b)



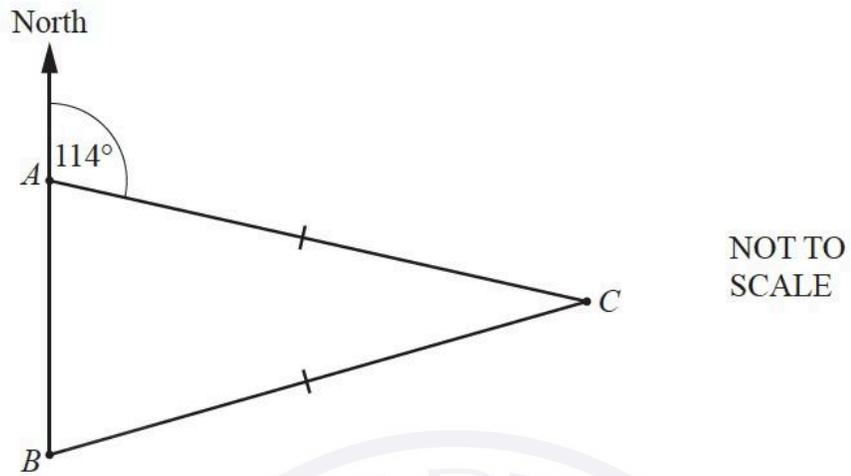
NOT TO SCALE

In triangle PQR , M is the midpoint of PQ .
 $RM = 8$ cm, angle $PRM = 30^\circ$ and angle $RMQ = 75^\circ$.

Calculate PQ .

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

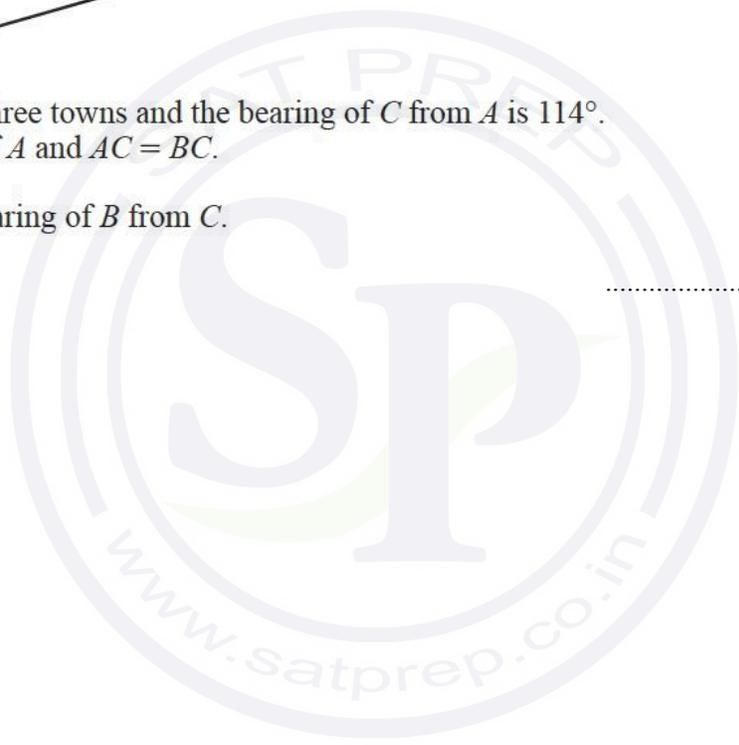
Question 74



A , B and C are three towns and the bearing of C from A is 114° .
 B is due south of A and $AC = BC$.

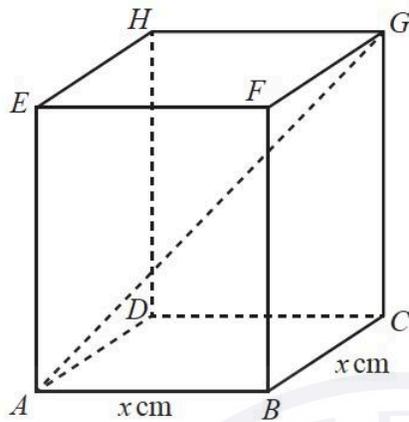
Calculate the bearing of B from C .

..... [3]



Question 75

(a)



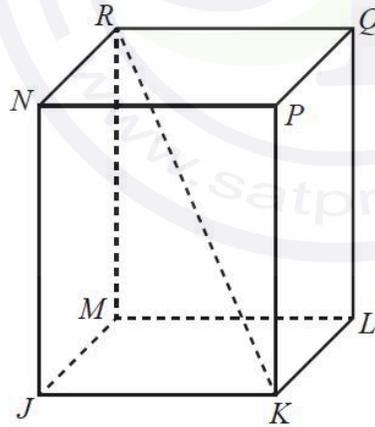
NOT TO SCALE

$ABCDEFGH$ is a cuboid with a square base of side x cm.
 $CG = 20$ cm and $AG = 28$ cm.

Calculate the value of x .

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

(b)



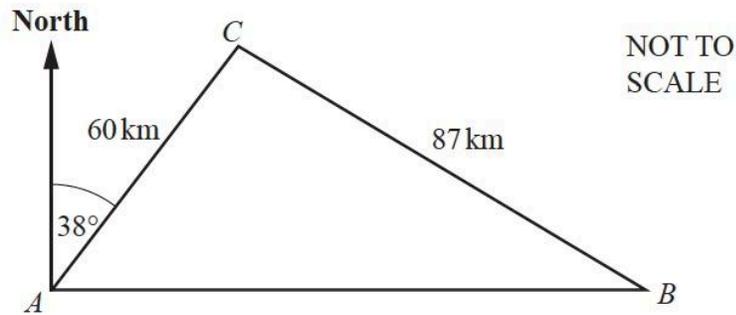
NOT TO SCALE

The diagram shows a different cuboid $JKLMNPQR$.
 $MR = 30$ cm correct to the nearest centimetre.
 $KR = 37$ cm correct to the nearest centimetre.

Calculate the lower bound of the angle between KR and the base $JKLM$ of the cuboid.

$\dots\dots\dots$ [4]

Question 76



The diagram shows the straight roads between town A , town B and town C .
 $AC = 60$ km, $CB = 87$ km and B is due east of A .
The bearing of C from A is 038° .

- (a) Show that angle $ACB = 95.1^\circ$, correct to 1 decimal place.

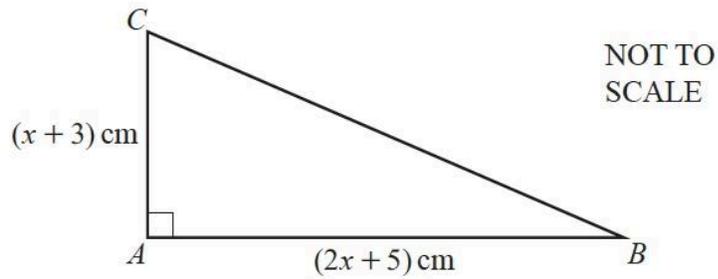
[5]

- (b) Without stopping, a car travels from town A to town C then to town B , before returning directly to town A .
The total time taken for the journey is 3 hours 20 minutes.

Calculate the average speed of the car for this journey.
Give your answer in kilometres per hour.

..... km/h [6]

Question 77



The diagram shows a right-angled triangle ABC .

- (a) (i) The area of the triangle is 60 cm^2 .

Show that $2x^2 + 11x - 105 = 0$.

[3]

- (ii) Solve by factorisation.

$$2x^2 + 11x - 105 = 0$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

- (iii) Calculate angle ACB .

$\dots\dots\dots$ [3]

- (b) Triangle ABC is similar to triangle DEF .

Triangle DEF has an area of 93.75 cm^2 .

- (i) Find the size of the smallest angle of triangle DEF .

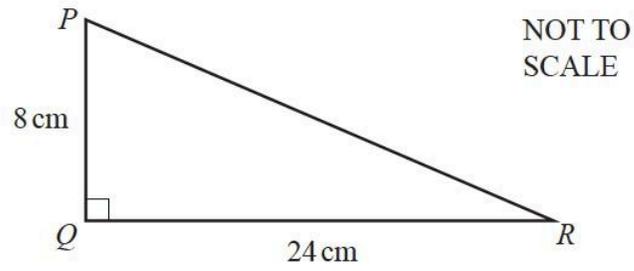
$\dots\dots\dots$ [1]

- (ii) Find the length of the shortest side of triangle DEF .

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

Question 78

(a)

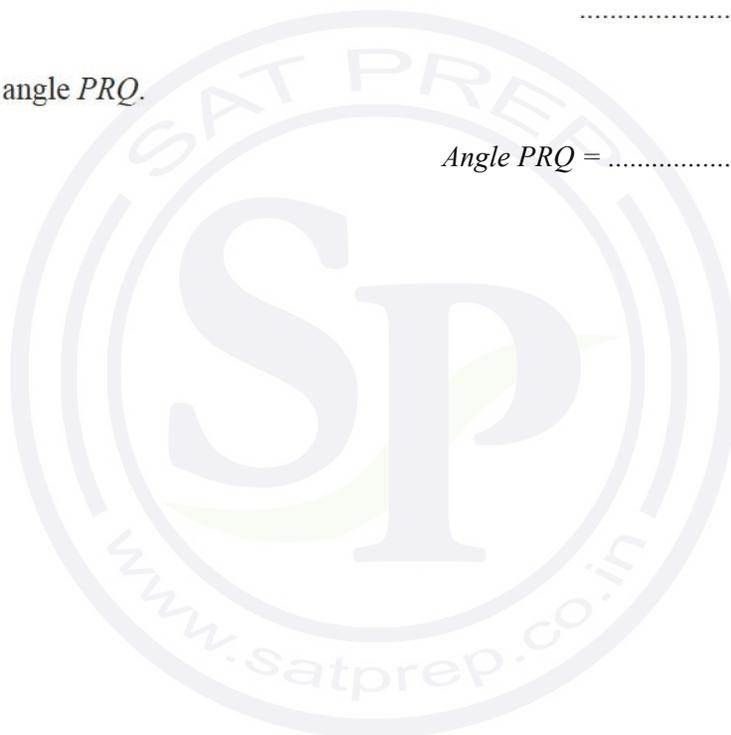


(i) Calculate the area of triangle PQR .

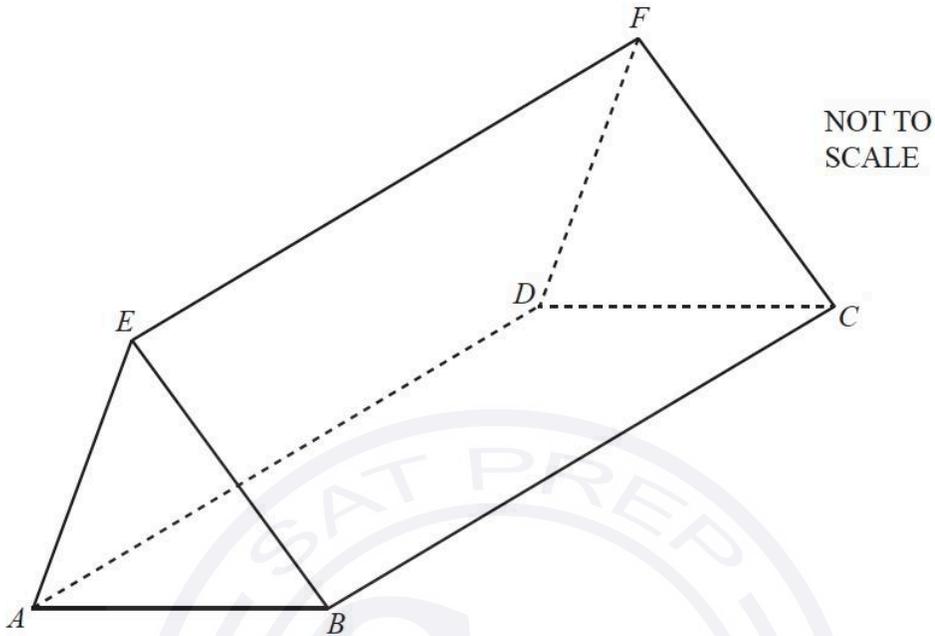
..... cm^2 [2]

(ii) Calculate angle PRQ .

Angle $PRQ =$ [2]



Question 79



The diagram shows a solid triangular prism $ABCDEF$ of length 15 cm.
 $AB = 6.4$ cm, $EB = 5.7$ cm and the volume of the prism is 145 cm^3 .

(a) Show that angle $EBA = 32^\circ$, correct to the nearest degree. [3]

(b) Find the length of EA .
 cm [3]

(c) Calculate the shortest distance from E to AB.
 cm [3]

(d) Calculate the angle BF makes with the base, ABCD, of the prism.
 [4]

(e) The prism is made of plastic with density 938 kg/m^3 .
 Calculate the mass of the prism in **grams**.
 [Density = mass \div volume]
 g [3]

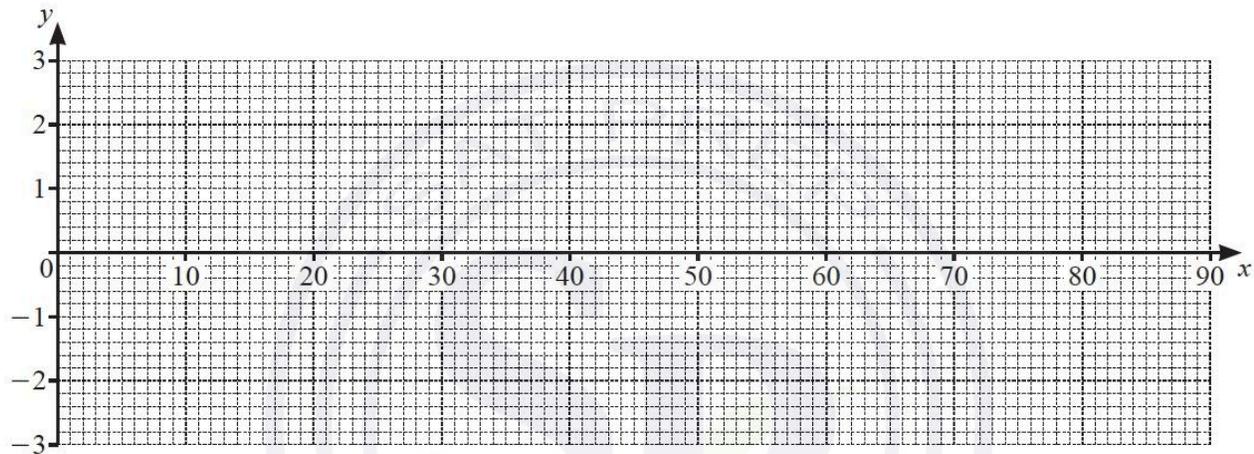
Question 80

- (a) Complete the table of values for $y = 3 \cos 2x^\circ$.
Values are given correct to 1 decimal place.

x	0	10	20	30	40	45	50	60	70	80	90
y	3.0	2.8	2.3	1.5	0.5		-0.5		-2.3		-3.0

[3]

- (b) Draw the graph of $y = 3 \cos 2x^\circ$ for $0 \leq x \leq 90$.



[4]

- (c) Use your graph to solve the equation $3 \cos 2x^\circ = -2$ for $0 \leq x \leq 90$.

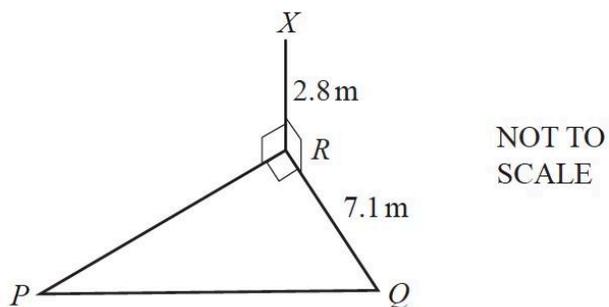
$x = \dots\dots\dots$ [1]

- (d) By drawing a suitable straight line, solve the equation $120 \cos 2x^\circ = 80 - x$ for $0 \leq x \leq 90$.

$x = \dots\dots\dots$ [3]

Question 81

(a)



The diagram shows a right-angled triangle PQR on horizontal ground. X is vertically above R and the angle of elevation of X from P is 21° . $XR = 2.8$ m and $RQ = 7.1$ m.

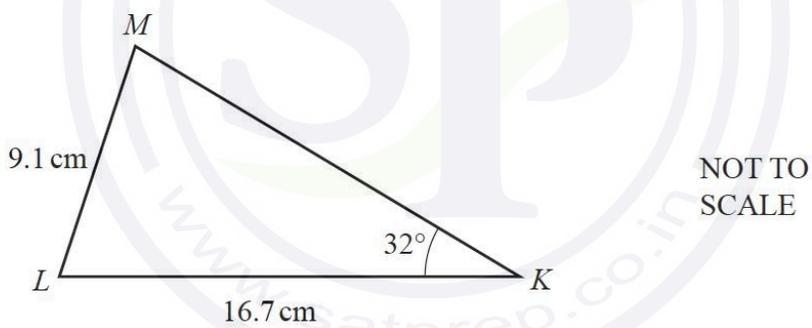
(i) Calculate the angle of elevation of X from Q .

..... [2]

(ii) Calculate PQ .

..... m [3]

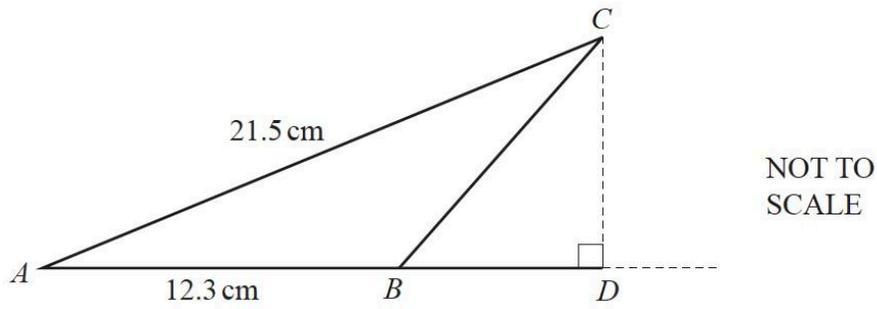
(b)



Angle $KML =$ [3]

Continue on the next page...

(c)



The area of triangle ABC is 62.89 cm^2 .

(i) Show that angle $BAC = 28.4^\circ$, correct to 1 decimal place.

[2]

(ii) Calculate BC .

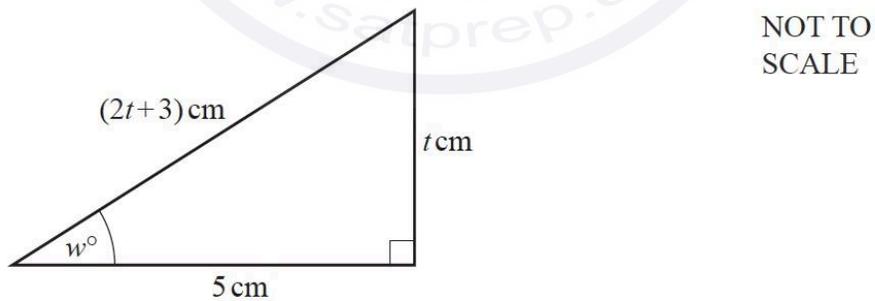
..... cm [3]

(iii) AB is extended to a point D such that angle $BDC = 90^\circ$.

Calculate BD .

..... cm [3]

Question 82

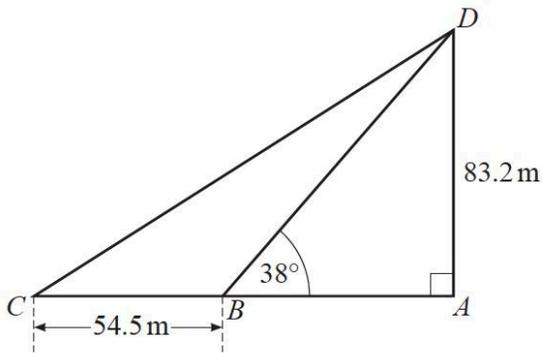


The diagram shows a right-angled triangle.

Find the value of w .

Question 83

(a)



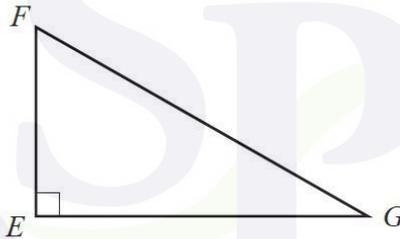
NOT TO SCALE

ACD is a right-angled triangle.
 B is on AC and $BC = 54.5$ m.
 $AD = 83.2$ m and angle $ABD = 38^\circ$.

Calculate angle ACD .

Angle $ACD = \dots\dots\dots$ [5]

(b)



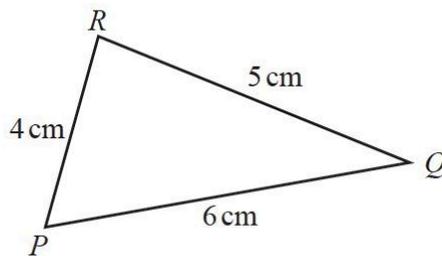
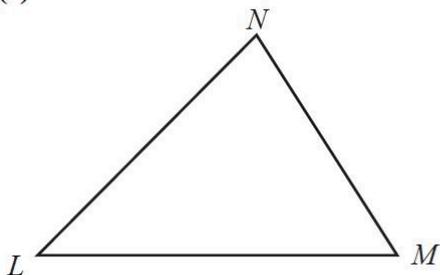
EFG is a right-angled triangle.
 A circle can be drawn that passes through the three vertices of the triangle.

On the diagram, mark the position of the centre of the circle with a cross.
 Explain how you decide.

.....

..... [2]

(c)



NOT TO SCALE

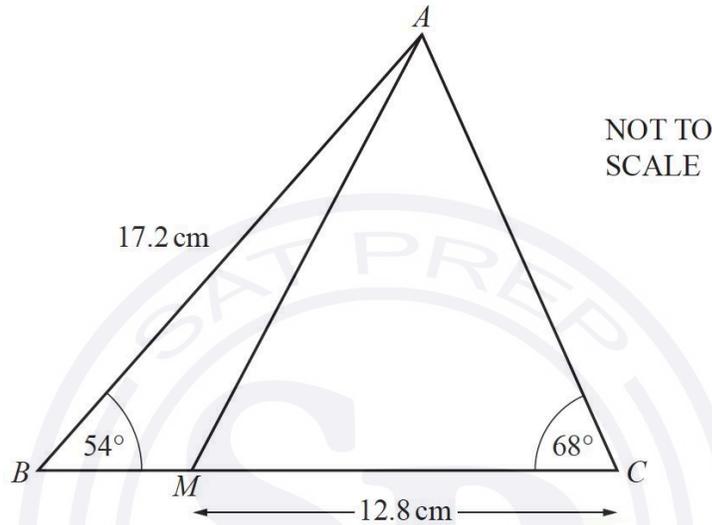
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In triangle LMN , the ratio angle L : angle M : angle $N = 4 : 5 : 6$.
 In triangle PQR , $PQ = 6$ cm, $PR = 4$ cm and $QR = 5$ cm.

Calculate the difference between the largest angle in triangle PQR and the largest angle in triangle LMN .

..... [7]

Question 84



The diagram shows triangle ABC with $AB = 17.2$ cm.
 Angle $ABC = 54^\circ$ and angle $ACB = 68^\circ$.

(a) Calculate AC .

$AC =$ cm [3]

(b) M lies on BC and $MC = 12.8$ cm.

Calculate AM .

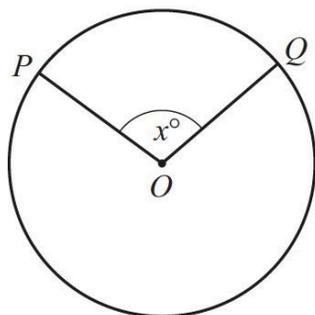
$AM =$ cm [3]

(c) Calculate the shortest distance from A to BC .

.....cm [3]

Question 85

(a)

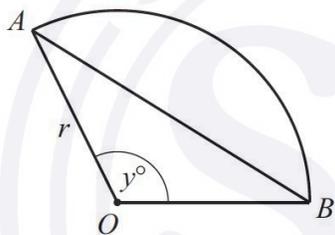


NOT TO
SCALE

In the circle, centre O , the length of the minor arc PQ is $\frac{3}{7}$ of the length of the major arc PQ .
Show that $x = 108$.

[3]

(b)



NOT TO
SCALE

The diagram shows a sector, OAB , of a circle with centre O and radius r .
The area of triangle OAB is half the area of the sector.
Angle $AOB = y^\circ$ and is obtuse.

(i) Show that $360 \sin y = \pi y$.

(ii) Complete the table, giving your answers correct to two decimal places.

y	$360 \sin y$	πy
108.4	341.60	340.55
108.5	341.40	340.86
108.6	341.20	
108.7		

[3]

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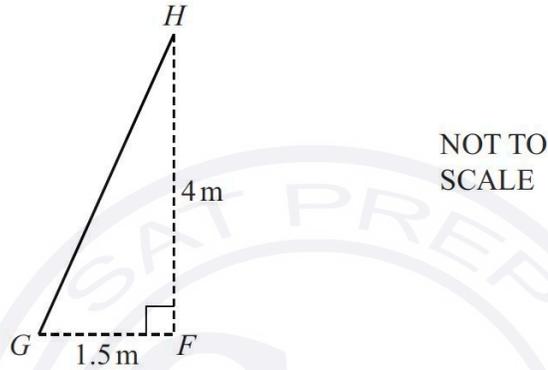
(iii) Complete the statement.

The value of y , correct to one decimal place, that satisfies the equation $360 \sin y = \pi y$ is

[1]

Question 86

(a)

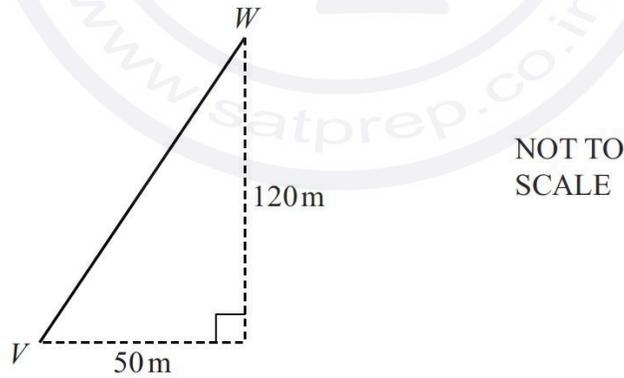


The diagram shows a ladder, GH , on horizontal ground, leaning against a vertical wall, HF . $GF = 1.5\text{ m}$ and $HF = 4\text{ m}$.

Calculate the length of the ladder, GH .

..... m [2]

(b)



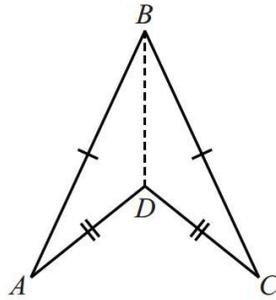
W is 120 m north of V and 50 m east of V .

Calculate the bearing of V from W .

..... [3]

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(c)



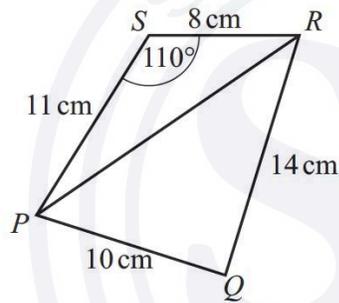
NOT TO SCALE

In the quadrilateral $ABCD$, $AD = DC = 5$ cm and $AB = BC$.
Angle $ABD = 25^\circ$ and angle $BAD = 15^\circ$.

Calculate the perimeter of the quadrilateral $ABCD$.

..... cm [5]

(d)



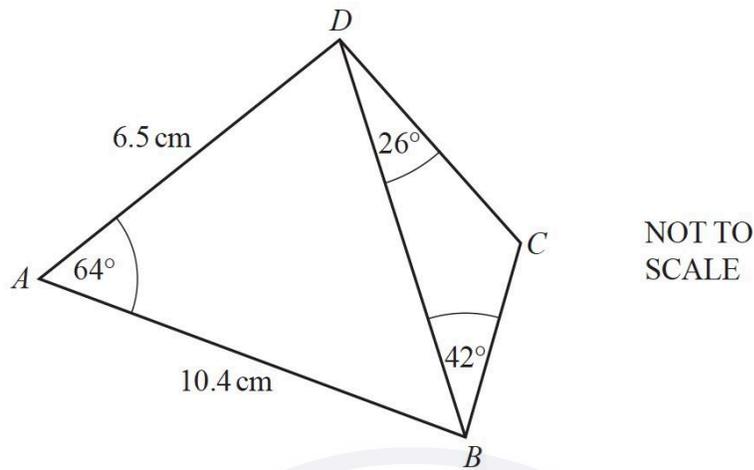
NOT TO SCALE

$PQRS$ is a quadrilateral.

Calculate angle PQR .

Angle $PQR =$ [5]

Question 87



$ABCD$ is a quadrilateral with $AB = 10.4$ cm and $AD = 6.5$ cm.
Angle $DAB = 64^\circ$, angle $BDC = 26^\circ$ and angle $DBC = 42^\circ$.

(a) Show that $BD = 9.55$ cm, correct to 2 decimal places.

[3]

(b) (i) Show that angle $BCD = 112^\circ$.

[1]

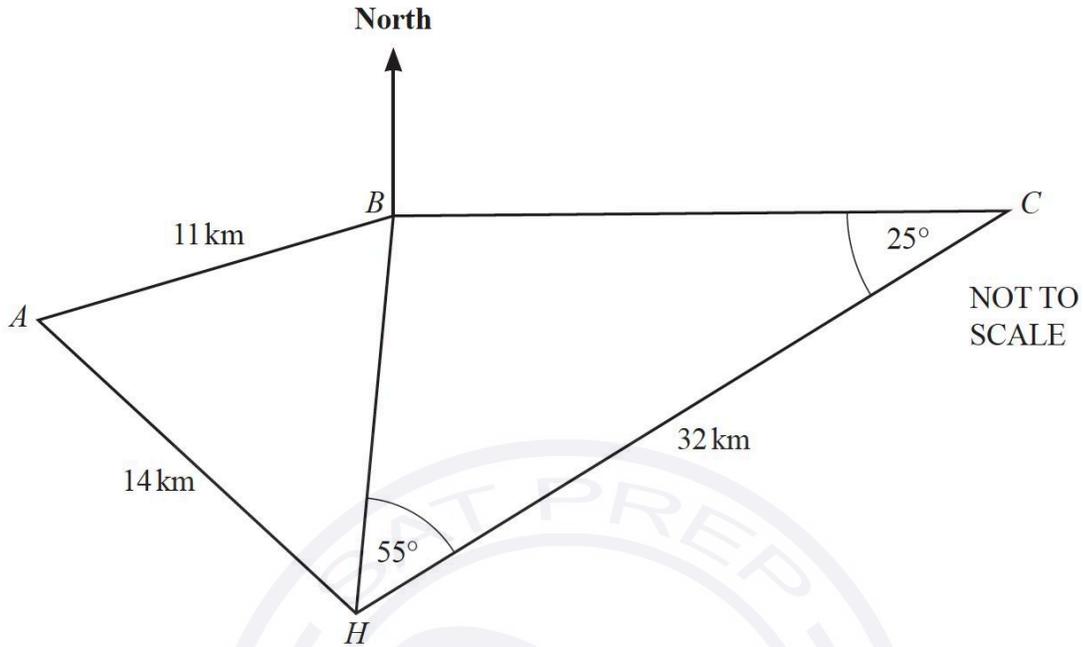
(ii) Calculate CD .

$CD = \dots\dots\dots$ [3]

(c) Find the shortest distance from D to AB .

$\dots\dots\dots$ cm [3]

Question 88



The diagram shows the positions of two lighthouses A and B , a boat C and a harbour H . C is due east of B .

- (a) Find the bearing of the harbour from boat C .
 [1]
- (b) (i) Show that angle $CBH = 100^\circ$.
 [1]
- (ii) Show that $BH = 13.7$ km, correct to 1 decimal place.
 [3]
- (c) Calculate the bearing of A from B .
 [5]
- (d) At 1 pm boat C sails 32 km directly to the harbour at a speed of 10 knots.
- (i) Calculate the time when boat C arrives at the harbour.
 Give this time correct to the nearest minute.
 [1 knot = 1.852 km/h]
 [4]
- (ii) Calculate the distance of boat C to the harbour when boat C is at the shortest distance from lighthouse B .
 km [3]