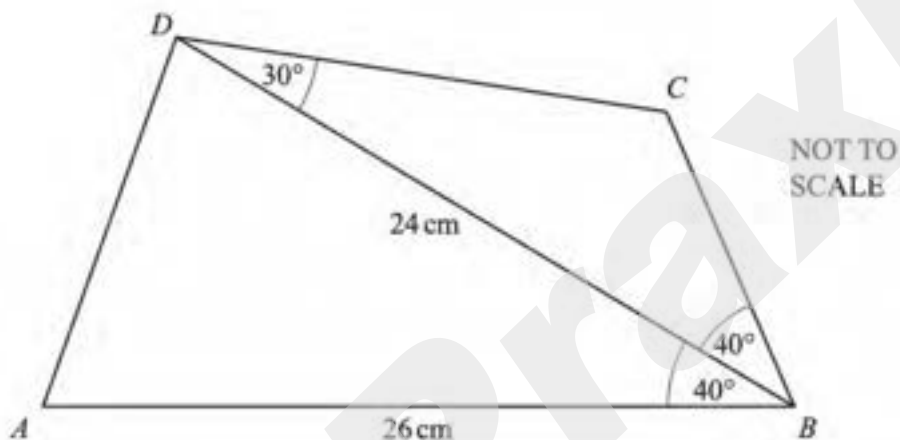


**Trigonometry**

(Past Year Topical Questions 2010-2015)

May/June 2010 (41)

5



$ABCD$  is a quadrilateral and  $BD$  is a diagonal.

$AB = 26$  cm,  $BD = 24$  cm, angle  $ABD = 40^\circ$ , angle  $CBD = 40^\circ$  and angle  $CDB = 30^\circ$ .

(a) Calculate the area of triangle  $ABD$ .

Answer(a) .....  $\text{cm}^2$  [2]

(b) Calculate the length of  $AD$ .

Answer(b) ..... cm [4]

(c) Calculate the length of  $BC$ .

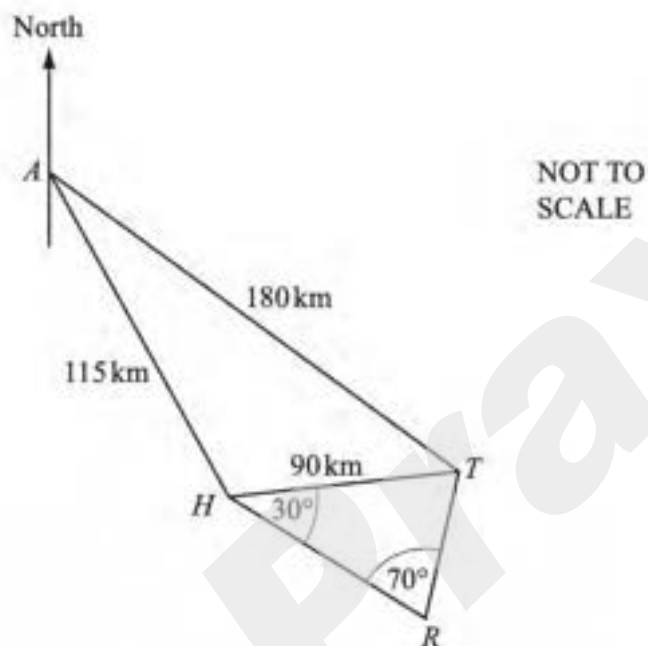
Answer(c) ..... cm [4]

(d) Calculate the shortest distance from the point  $C$  to the line  $BD$ .

Answer(d) ..... cm [2]

May/June 2010 (42)

5



The diagram shows some straight line distances between Auckland ( $A$ ), Hamilton ( $H$ ), Tauranga ( $T$ ) and Rotorua ( $R$ ).

$AT = 180$  km,  $AH = 115$  km and  $HT = 90$  km.

- (a) Calculate angle  $HAT$ .  
Show that this rounds to  $25.0^\circ$ , correct to 3 significant figures.

Answer(a)

[4]

(b) The bearing of  $H$  from  $A$  is  $150^\circ$ .

Find the bearing of

(i)  $T$  from  $A$ ,

Answer(b)(i) ..... [1]

(ii)  $A$  from  $T$ .

Answer(b)(ii) ..... [1]

(c) Calculate how far  $T$  is east of  $A$ .

Answer(c) ..... km [3]

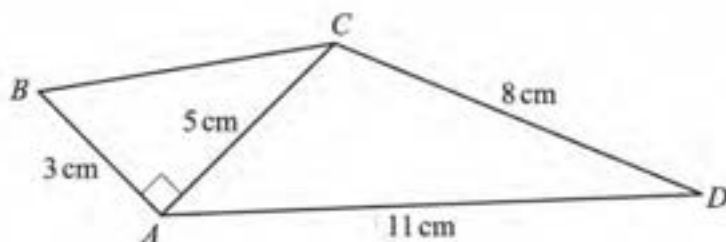
(d) Angle  $THR = 30^\circ$  and angle  $HRT = 70^\circ$ .

Calculate the distance  $TR$ .

Answer(d) ..... km [3]

May/June 2010 (43)

2


 NOT TO  
SCALE

In the quadrilateral  $ABCD$ ,  $AB = 3$  cm,  $AD = 11$  cm and  $DC = 8$  cm.  
The diagonal  $AC = 5$  cm and angle  $BAC = 90^\circ$ .

Calculate

 (a) the length of  $BC$ ,

Answer(a)  $BC =$  ..... cm [2]

 (b) angle  $ACD$ ,

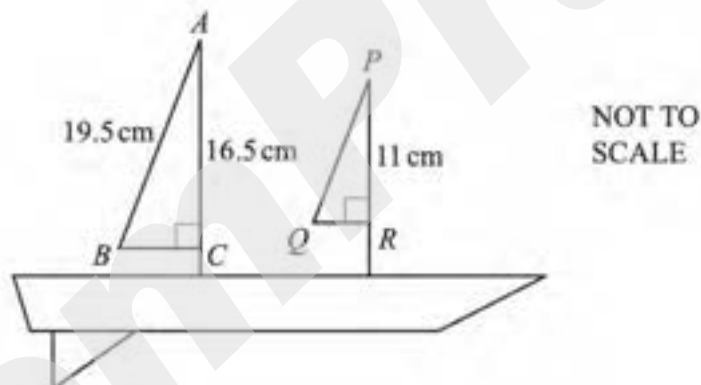
Answer(b) Angle  $ACD =$  ..... [4]

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

Answer(c) .....  $\text{cm}^2$  [3]

October/November 2010 (41)

6 (a)



The diagram shows a toy boat.  
 $AC = 16.5$  cm,  $AB = 19.5$  cm and  $PR = 11$  cm.  
 Triangles  $ABC$  and  $PQR$  are **similar**.

(i) Calculate  $PQ$ .

Answer(a)(i)  $PQ =$  ..... cm [2]

(ii) Calculate  $BC$ .

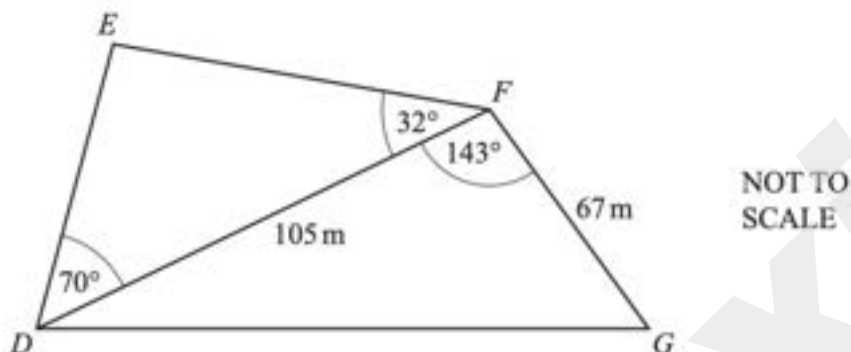
Answer(a)(ii)  $BC =$  ..... cm [3]

(iii) Calculate angle  $ABC$ .

Answer(a)(iii) Angle  $ABC =$  ..... [2]



(b)



The diagram shows a field  $DEFG$ , in the shape of a quadrilateral, with a footpath along the diagonal  $DF$ .

$DF = 105$  m and  $FG = 67$  m.

Angle  $EDF = 70^\circ$ , angle  $EFD = 32^\circ$  and angle  $DFG = 143^\circ$ .

(i) Calculate  $DG$ .

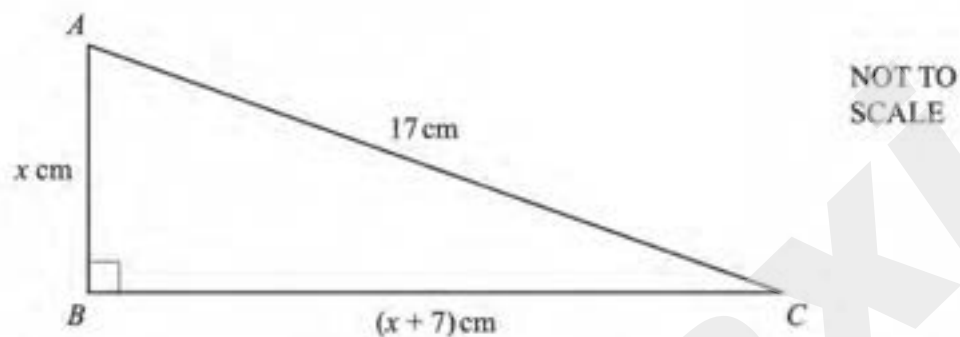
Answer(b)(i)  $DG = \dots\dots\dots$  m [4]

(ii) Calculate  $EF$ .

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

October/November 2010 (42)

5 (a)



In the right-angled triangle  $ABC$ ,  $AB = x$  cm,  $BC = (x + 7)$  cm and  $AC = 17$  cm.

(i) Show that  $x^2 + 7x - 120 = 0$ .

*Answer(a)(i)*

[3]

(ii) Factorise  $x^2 + 7x - 120$ .

*Answer(a)(ii)* ..... [2]

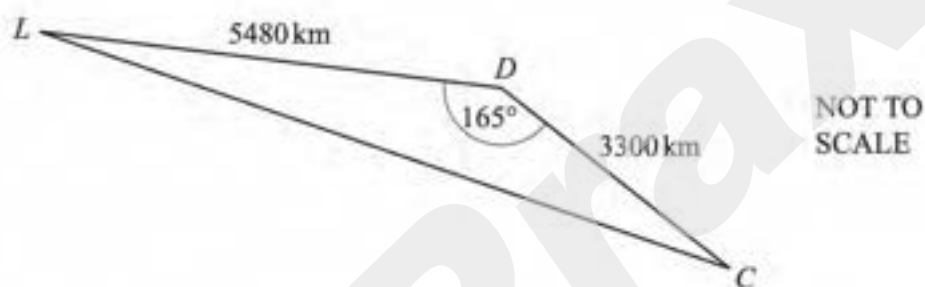
(iii) Write down the solutions of  $x^2 + 7x - 120 = 0$ .

*Answer(a)(iii)*  $x =$  ..... or  $x =$  ..... [1]

(iv) Write down the length of  $BC$ .

Answer(a)(iv)  $BC =$  ..... cm [1]

6



The diagram shows the positions of London ( $L$ ), Dubai ( $D$ ) and Colombo ( $C$ ).

(a) (i) Show that  $LC$  is 8710 km correct to the nearest kilometre.

Answer(a)(i)

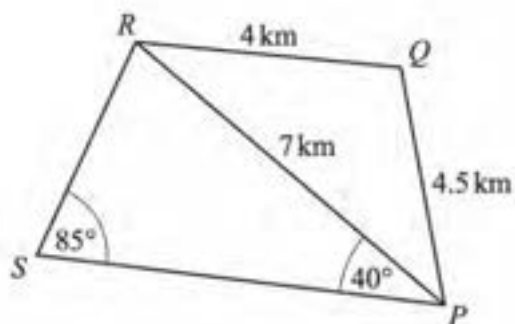
[4]

(ii) Calculate the angle  $CLD$ .

Answer(a)(ii) Angle  $CLD$  = ..... [3]

October/November 2010 (43)

2



NOT TO  
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The diagram shows five straight roads.  
 $PQ = 4.5$  km,  $QR = 4$  km and  $PR = 7$  km.  
 Angle  $RPS = 40^\circ$  and angle  $PSR = 85^\circ$ .

- (a) Calculate angle  $PQR$  and show that it rounds to  $110.7^\circ$ .

*Answer(a)*

[4]

- (b) Calculate the length of the road  $RS$  and show that it rounds to  $4.52$  km.

*Answer(b)*

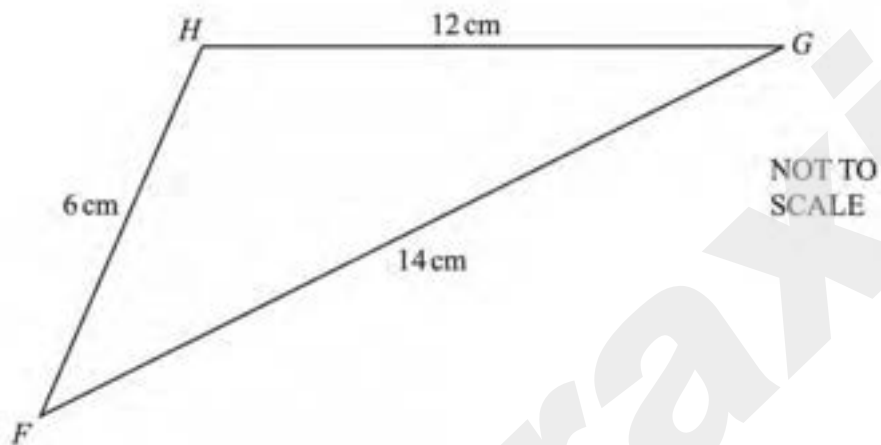
[3]

- (c) Calculate the area of the quadrilateral  $PQRS$ .  
[Use the value of  $110.7^\circ$  for angle  $PQR$  and the value of 4.52 km for  $RS$ .]

Answer(c) ..... km<sup>2</sup> [5]

May/June 2011 (41)

4 (a)



The diagram shows triangle  $FGH$ , with  $FG = 14$  cm,  $GH = 12$  cm and  $FH = 6$  cm.

(i) Calculate the size of angle  $HFG$ .

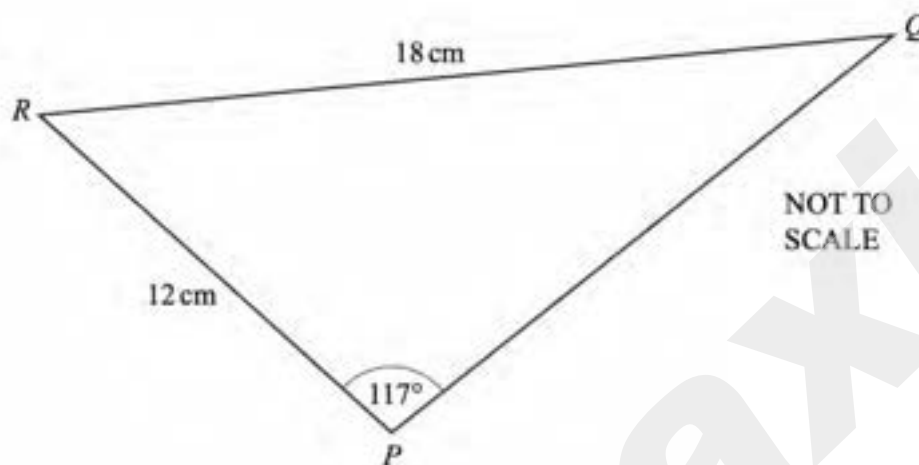
Answer(a)(i) Angle  $HFG =$  ..... [4]

(ii) Calculate the area of triangle  $FGH$ .

Answer(a)(ii) .....  $\text{cm}^2$  [2]



(b)

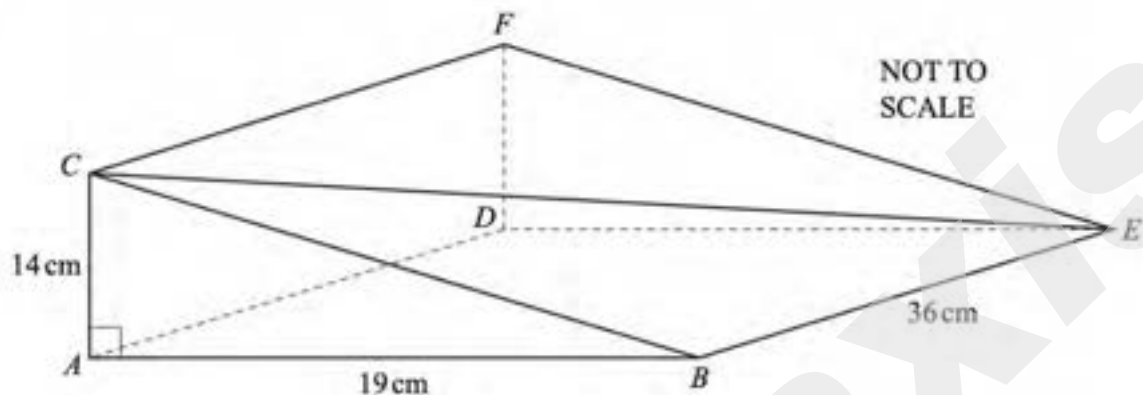


The diagram shows triangle  $PQR$ , with  $RP = 12\text{ cm}$ ,  $RQ = 18\text{ cm}$  and angle  $RPQ = 117^\circ$ .

Calculate the size of angle  $RQP$ .

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

6



In the diagram,  $ABCDEF$  is a prism of length 36 cm.  
 The cross-section  $ABC$  is a right-angled triangle.  
 $AB = 19$  cm and  $AC = 14$  cm.

Calculate

(a) the length  $BC$ ,

Answer(a)  $BC = \dots\dots\dots$  cm [2]

(b) the total surface area of the prism,

Answer(b)  $\dots\dots\dots$   $\text{cm}^2$  [4]

(c) the volume of the prism,

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

(d) the length  $CE$ ,

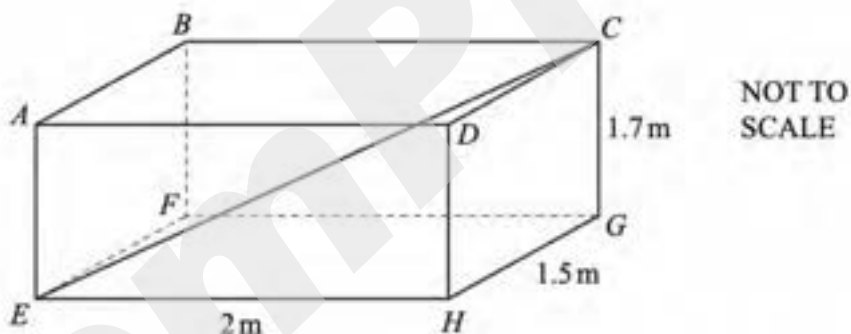
Answer(d)  $CE =$  ..... cm [2]

(e) the angle between the line  $CE$  and the base  $ABED$ .

Answer(e) ..... [3]

May/June 2011 (42)

2



The diagram shows a box  $ABCDEFGH$  in the shape of a cuboid measuring 2 m by 1.5 m by 1.7 m.

(a) Calculate the length of the diagonal  $EC$ .

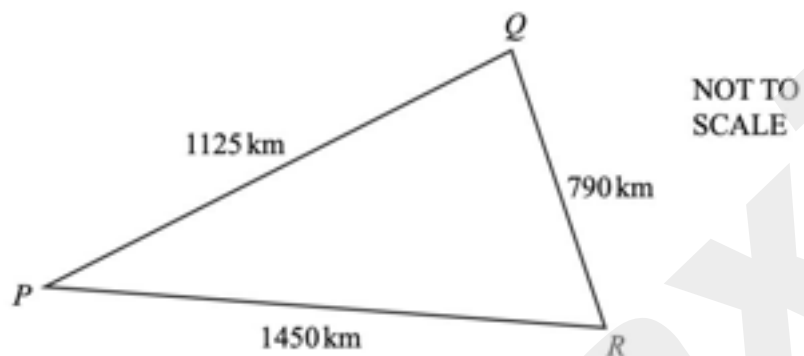
Answer(a)  $EC =$  ..... m [4]

(b) Calculate the angle between  $EC$  and the base  $EFGH$ .

Answer(b) ..... [3]

## Question 3c

(c)

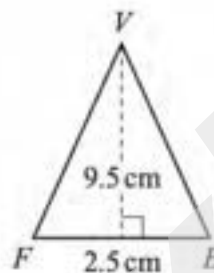
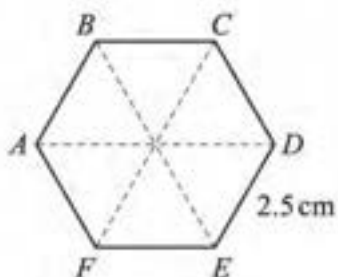
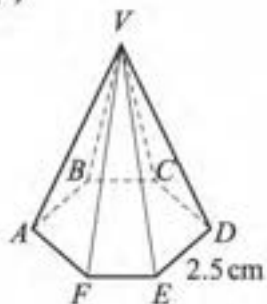


The diagram shows the distances between three towns  $P$ ,  $Q$  and  $R$ .

Calculate angle  $PQR$ .

Answer(c) Angle  $PQR = \dots\dots\dots$  [4]

7 (a)


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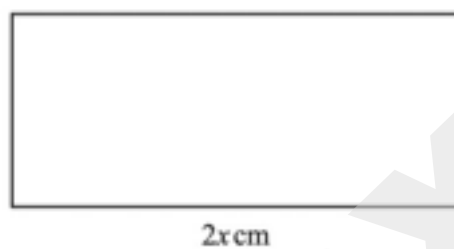
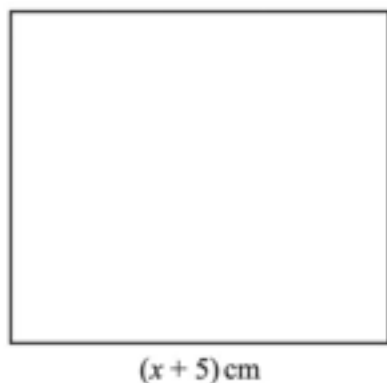
A solid pyramid has a **regular hexagon** of side 2.5 cm as its base.  
Each sloping face is an isosceles triangle with base 2.5 cm and height 9.5 cm.

Calculate the **total** surface area of the pyramid.

Answer(a) ..... cm<sup>2</sup> [4]

May/June 2011 (43)

3



NOT TO  
SCALE

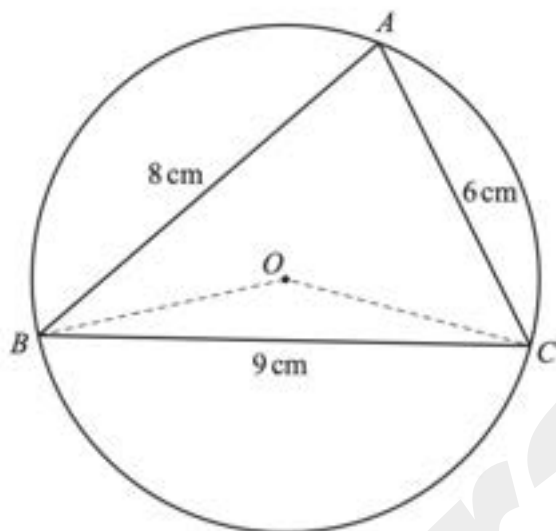
The diagram shows a square of side  $(x + 5)$  cm and a rectangle which measures  $2x$  cm by  $x$  cm.

The area of the square is  $1 \text{ cm}^2$  more than the area of the rectangle.

(c) Calculate the acute angle between the diagonals of the rectangle.

Answer(c) ..... [3]

4

NOT TO  
SCALE

The circle, centre  $O$ , passes through the points  $A$ ,  $B$  and  $C$ .

In the triangle  $ABC$ ,  $AB = 8$  cm,  $BC = 9$  cm and  $CA = 6$  cm.

(a) Calculate angle  $BAC$  and show that it rounds to  $78.6^\circ$ , correct to 1 decimal place.

*Answer(a)*

[4]



(b)  $M$  is the midpoint of  $BC$ .

(i) Find angle  $BOM$ .

Answer(b)(i) Angle  $BOM = \dots\dots\dots$  [1]

(ii) Calculate the radius of the circle and show that it rounds to 4.59 cm, correct to 3 significant figures.

Answer(b)(ii)

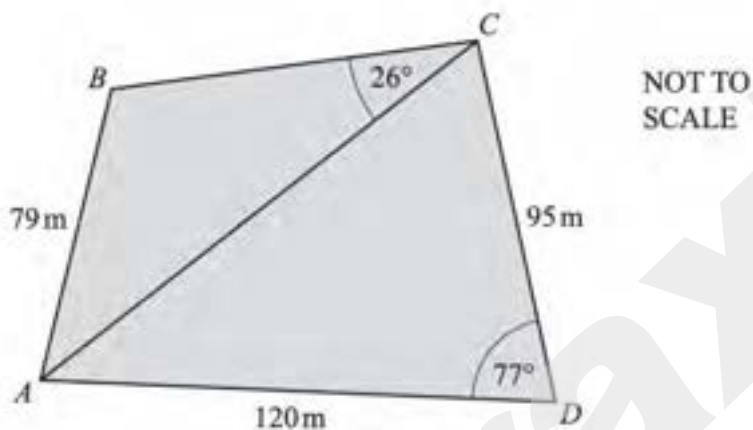
[3]

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

Answer(c) ..... % [4]

October/November 2011 (41)

6



The quadrilateral  $ABCD$  represents an area of land.

There is a straight road from  $A$  to  $C$ .

$AB = 79\text{ m}$ ,  $AD = 120\text{ m}$  and  $CD = 95\text{ m}$ .

Angle  $BCA = 26^\circ$  and angle  $CDA = 77^\circ$ .

- (a) Show that the length of the road,  $AC$ , is  $135\text{ m}$  correct to the nearest metre.

*Answer(a)*

[4]

(b) Calculate the size of the **obtuse** angle  $ABC$ .

*Answer(b)* Angle  $ABC =$  ..... [4]

(c) A straight path is to be built from  $B$  to the nearest point on the road  $AC$ .

Calculate the length of this path.

*Answer(c)* ..... m [3]

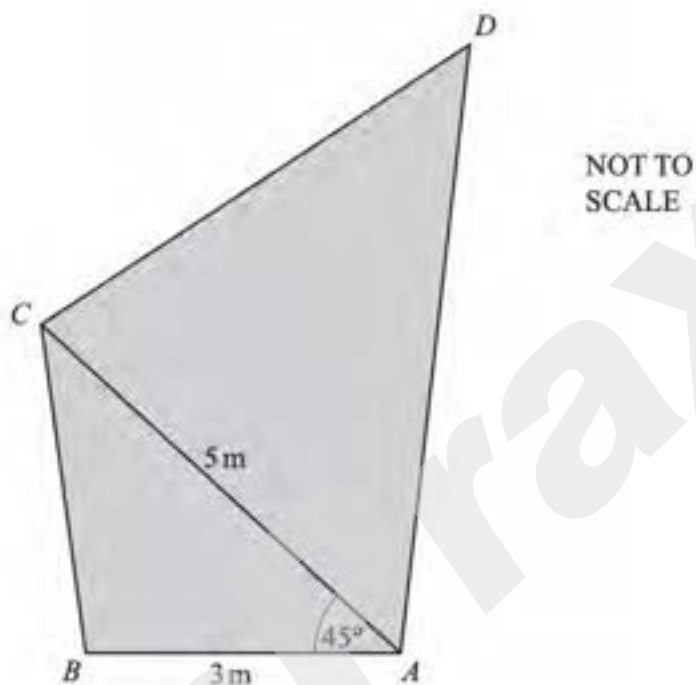
- (d) Houses are to be built on the land in triangle  $ACD$ .  
Each house needs at least  $180\text{m}^2$  of land.

Calculate the maximum number of houses which can be built.  
Show all of your working.

Answer(d) ..... [4]

October/November 2011 (42)

8



Parvatti has a piece of canvas  $ABCD$  in the shape of an irregular quadrilateral.

$AB = 3\text{ m}$ ,  $AC = 5\text{ m}$  and angle  $BAC = 45^\circ$ .

(a) (i) Calculate the length of  $BC$  and show that it rounds to  $3.58\text{ m}$ , correct to 2 decimal places.

You must show all your working.

Answer(a)(i)

[4]

(ii) Calculate angle  $BCA$ .

Answer(a)(ii) Angle  $BCA$  = ..... [3]

(b)  $AC = CD$  and angle  $CDA = 52^\circ$ .

(i) Find angle  $DCA$ .

Answer(b)(i) Angle  $DCA$  = ..... [1]

(ii) Calculate the area of the canvas.

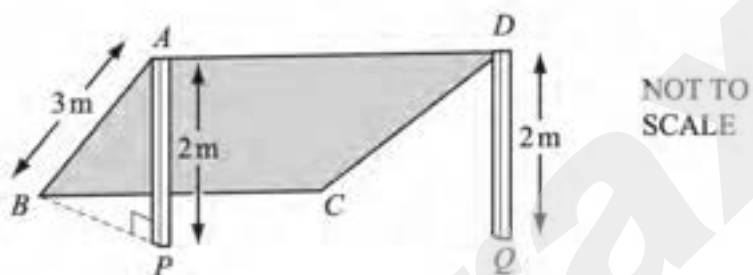
Answer(b)(ii) .....  $\text{m}^2$  [3]

(c) Parvatti uses the canvas to give some shade.

She attaches corners  $A$  and  $D$  to the top of vertical poles,  $AP$  and  $DQ$ , each of height 2 m.

Corners  $B$  and  $C$  are pegged to the horizontal ground.

$AB$  is a straight line and angle  $BPA = 90^\circ$ .



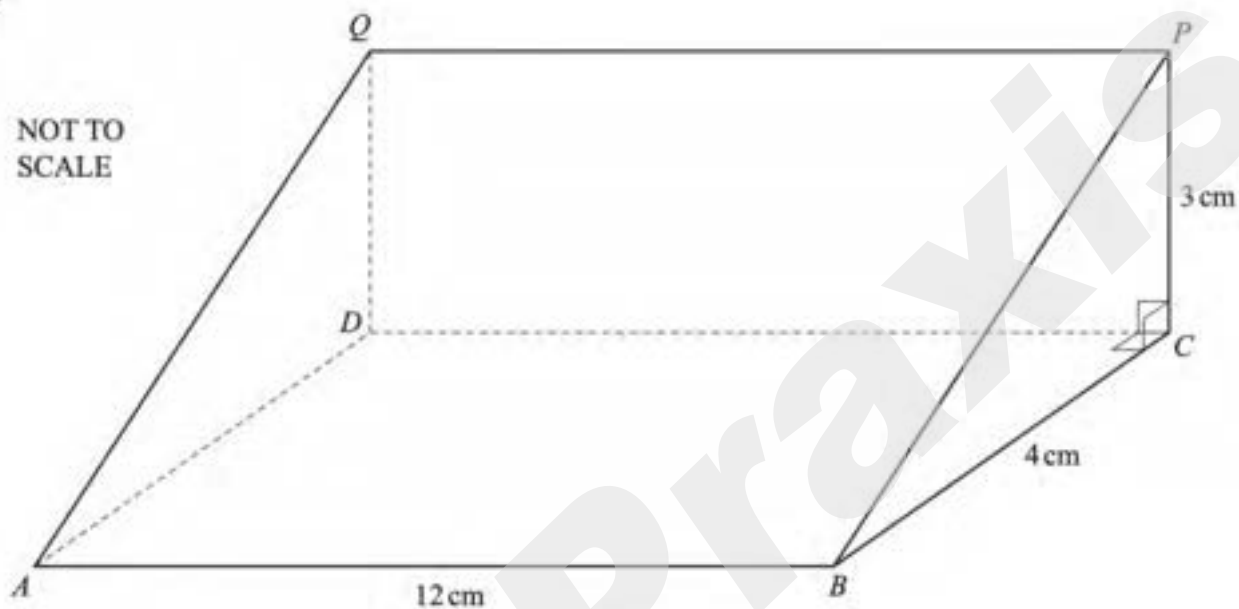
Calculate angle  $PAB$ .

Answer(c) Angle  $PAB = \dots\dots\dots$  [2]



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6



The diagram shows a triangular prism of length 12 cm.

The rectangle  $ABCD$  is horizontal and the rectangle  $DCPQ$  is vertical.

The cross-section is triangle  $PBC$  in which angle  $BCP = 90^\circ$ ,  $BC = 4$  cm and  $CP = 3$  cm.

(a) (i) Calculate the length of  $AP$ .

Answer(a)(i)  $AP =$  ..... cm [3]

(ii) Calculate the angle of elevation of  $P$  from  $A$ .

Answer(a)(ii) ..... [2]

(b) (i) Calculate angle  $PBC$ .

Answer(b)(i) Angle  $PBC$  = ..... [2]

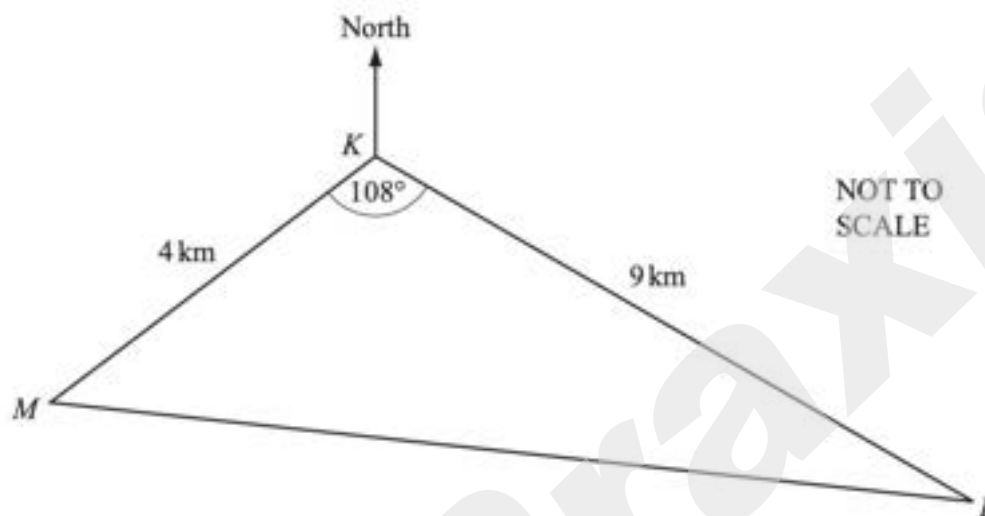
(ii)  $X$  is on  $BP$  so that angle  $BXC = 120^\circ$ .

Calculate the length of  $XC$ .

Answer(b)(ii)  $XC$  = ..... cm [3]

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2



Three buoys  $K$ ,  $L$  and  $M$  show the course of a boat race.  
 $MK = 4$  km,  $KL = 9$  km and angle  $MKL = 108^\circ$ .

(a) Calculate the distance  $ML$ .

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

(b) The bearing of  $L$  from  $K$  is  $125^\circ$ .

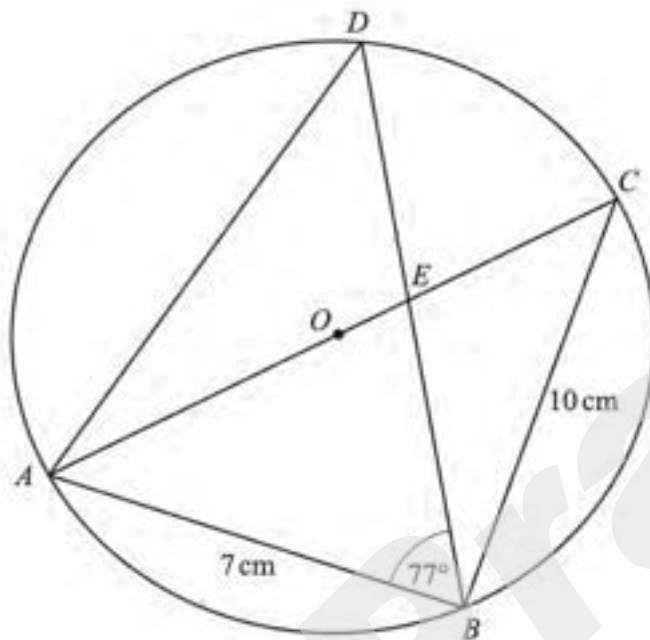
(i) Calculate how far  $L$  is south of  $K$ .

Answer(b)(i) ..... km [3]

(ii) Find the three figure bearing of  $K$  from  $M$ .

Answer(b)(ii) ..... [2]

4


 NOT TO  
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$A, B, C$  and  $D$  lie on a circle, centre  $O$ .  
 $AB = 7$  cm,  $BC = 10$  cm and angle  $ABD = 77^\circ$ .  
 $AOC$  is a diameter of the circle.

(a) Find angle  $ABC$ .

Answer(a) Angle  $ABC = \dots\dots\dots$  [1]

(b) Calculate angle  $ACB$  and show that it rounds to  $35^\circ$  correct to the nearest degree.

Answer(b)

[2]

(c) Explain why angle  $ADB =$  angle  $ACB$ .

Answer(c) ..... [1]

(d) (i) Calculate the length of  $AD$ .

Answer(d)(i)  $AD =$  ..... cm [3]

(ii) Calculate the area of triangle  $ABD$ .

Answer(d)(ii) .....  $\text{cm}^2$  [2]

(e) The area of triangle  $AED = 12.3 \text{ cm}^2$ , correct to 3 significant figures.

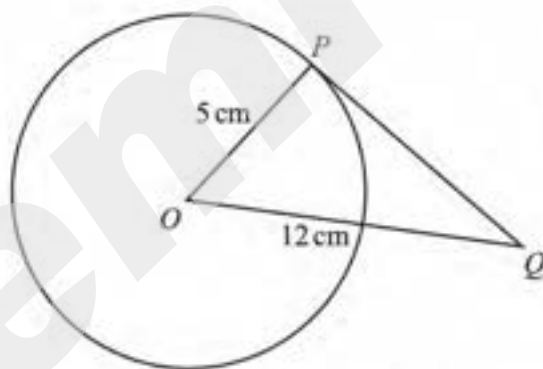
Use similar triangles to calculate the area of triangle  $BEC$ .

Answer(e) .....  $\text{cm}^2$  [3]

May/June 2012 (42)

**Question 4b**

(b)



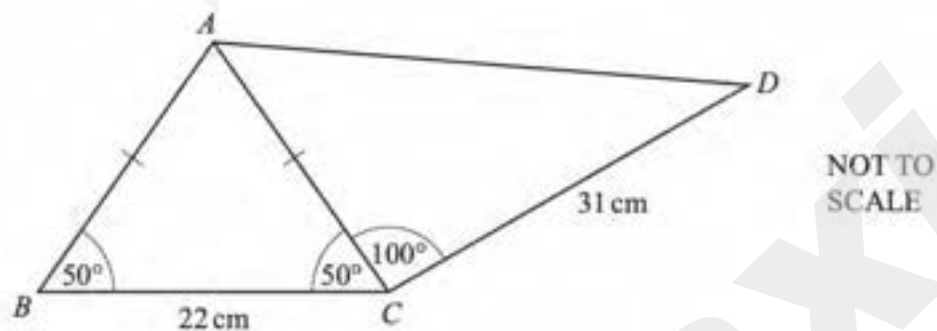
In the diagram,  $O$  is the centre of the circle and  $PQ$  is a tangent to the circle at  $P$ .  
 $OP = 5 \text{ cm}$  and  $OQ = 12 \text{ cm}$ .

Calculate  $PQ$ .

Answer(b)  $PQ =$  .....  $\text{cm}$  [3]

## Question 11c

(c)



The frame of a child's bicycle is made from metal rods.  $ABC$  is an isosceles triangle with base 22 cm and base angles  $50^\circ$ . Angle  $ACD = 100^\circ$  and  $CD = 31$  cm.

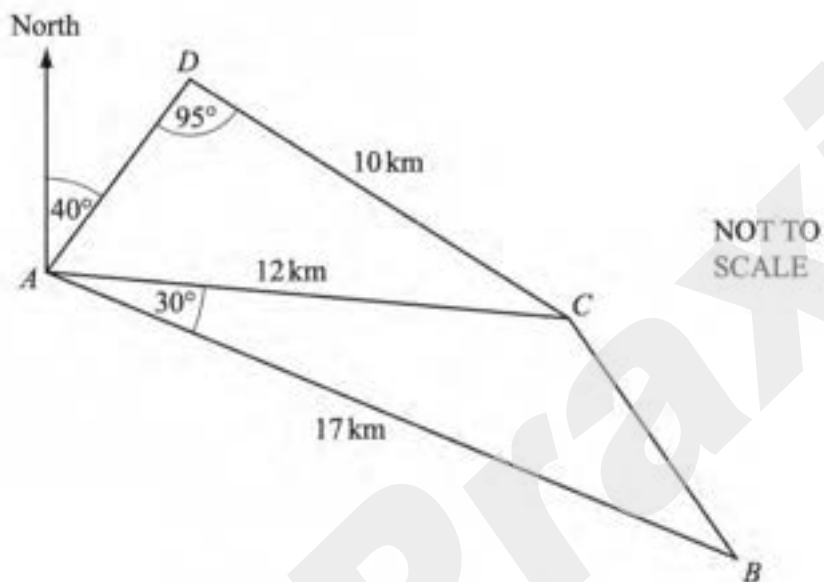
Calculate the length  $AD$ .

Answer(c)  $AD = \dots\dots\dots$  cm [6]



May/June 2012 (43)

2



The diagram shows straight roads connecting the towns  $A$ ,  $B$ ,  $C$  and  $D$ .

$AB = 17$  km,  $AC = 12$  km and  $CD = 10$  km.

Angle  $BAC = 30^\circ$  and angle  $ADC = 95^\circ$ .

(a) Calculate angle  $CAD$ .

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

(b) Calculate the distance  $BC$ .

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

(c) The bearing of  $D$  from  $A$  is  $040^\circ$ .

Find the bearing of

(i)  $B$  from  $A$ ,

*Answer(c)(i)*  $\dots\dots\dots$  [1]

(ii)  $A$  from  $B$ .

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

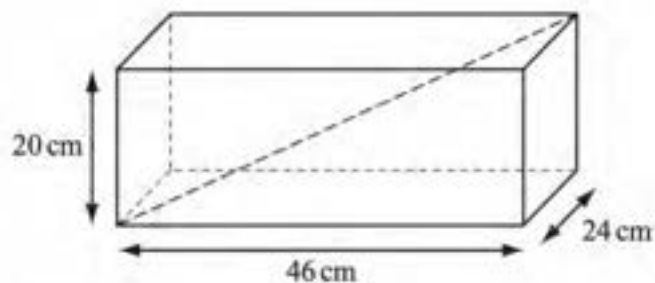
(d) Angle  $ACB$  is obtuse.

Calculate angle  $BCD$ .

*Answer(d)* Angle  $BCD =$  ..... [4]

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5 (a)



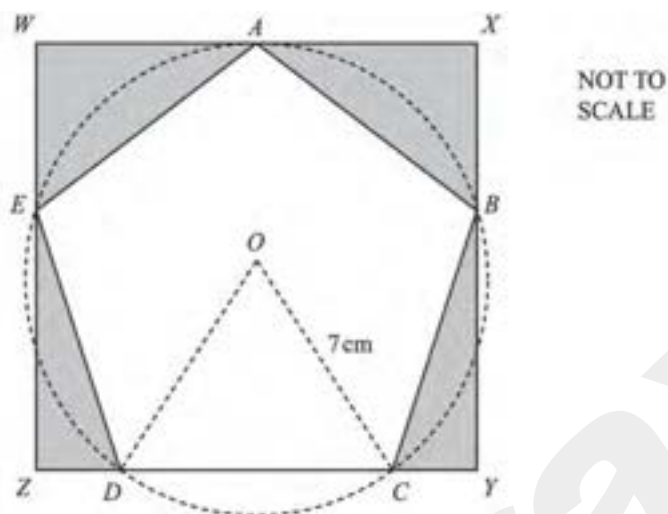
NOT TO  
SCALE

Jose has a fish tank in the shape of a cuboid measuring 46 cm by 24 cm by 20 cm.

Calculate the length of the diagonal shown in the diagram.

Answer(a) ..... cm [3]

7



The vertices  $A$ ,  $B$ ,  $C$ ,  $D$  and  $E$  of a regular pentagon lie on the circumference of a circle, centre  $O$ , radius  $7$  cm.

They also lie on the sides of a rectangle  $WXYZ$ .

(a) Show that

(i) angle  $DOC = 72^\circ$ ,

*Answer(a)(i)*

[1]

(ii) angle  $DCB = 108^\circ$ ,

*Answer(a)(ii)*

[2]

(iii) angle  $CBY = 18^\circ$ .

*Answer(a)(iii)*

[1]

- (b) Show that the length  $CD$  of one side of the pentagon is 8.23 cm correct to three significant figures.

*Answer(b)*

- (c) Calculate

[3]

- (i) the area of the triangle  $DOC$ ,

*Answer(c)(i)* .....  $\text{cm}^2$  [2]

- (ii) the area of the pentagon  $ABCDE$ ,

*Answer(c)(ii)* .....  $\text{cm}^2$  [1]

- (iii) the area of the sector  $ODC$ ,

*Answer(c)(iii)* .....  $\text{cm}^2$  [2]

- (iv) the length  $XY$ .

*Answer(c)(iv)* ..... cm [2]

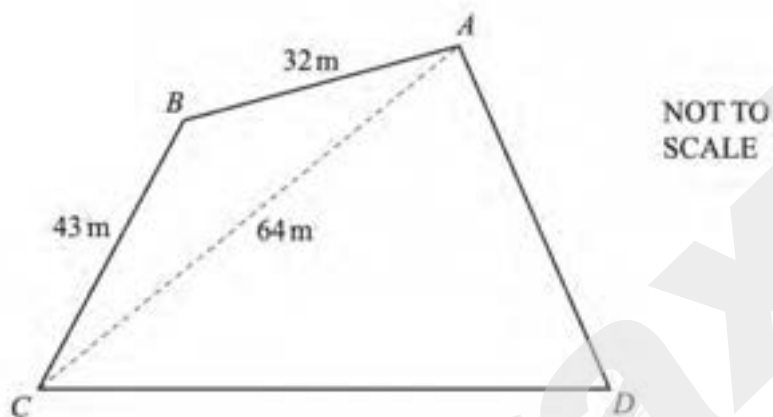
- (d) Calculate the ratio  
area of the pentagon  $ABCDE$  : area of the rectangle  $WXYZ$ .

Give your answer in the form  $1 : n$ .

*Answer(d)* 1 : ..... [5]

October/November 2012 (42)

2



The diagram represents a field in the shape of a quadrilateral  $ABCD$ .  
 $AB = 32$  m,  $BC = 43$  m and  $AC = 64$  m.

- (a) (i) Show clearly that angle  $CAB = 37.0^\circ$  correct to one decimal place.

*Answer(a)(i)*

[4]

- (ii) Calculate the area of the triangle  $ABC$ .

*Answer(a)(ii)* ..... m<sup>2</sup> [2]



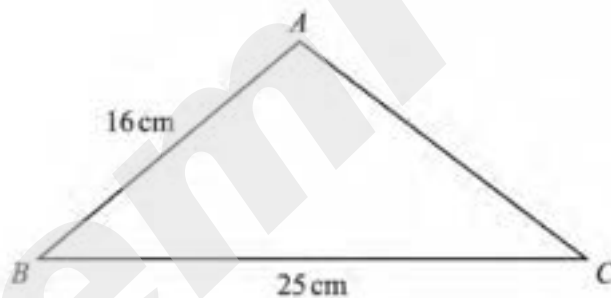
(b)  $CD = 70\text{ m}$  and angle  $DAC = 55^\circ$ .

Calculate the perimeter of the whole field  $ABCD$ .

Answer(b) ..... m [6]

October/November 2012 (43)

6



NOT TO SCALE

The area of triangle  $ABC$  is  $130\text{ cm}^2$ .  
 $AB = 16\text{ cm}$  and  $BC = 25\text{ cm}$ .

(a) Show clearly that angle  $ABC = 40.5^\circ$ , correct to one decimal place.

Answer (a)

[3]

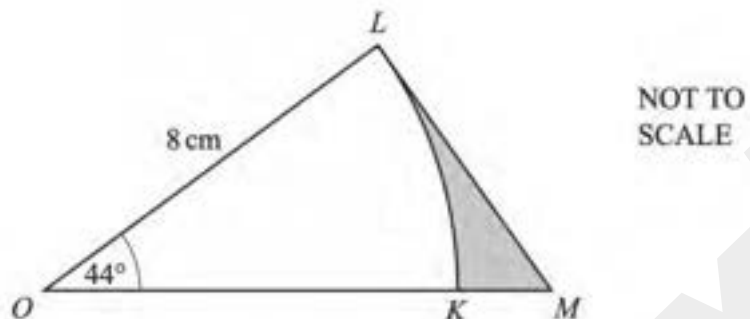
(b) Calculate the length of  $AC$ .

*Answer(b)*  $AC =$  ..... cm [4]

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

*Answer(c)* ..... cm [2]

(c)



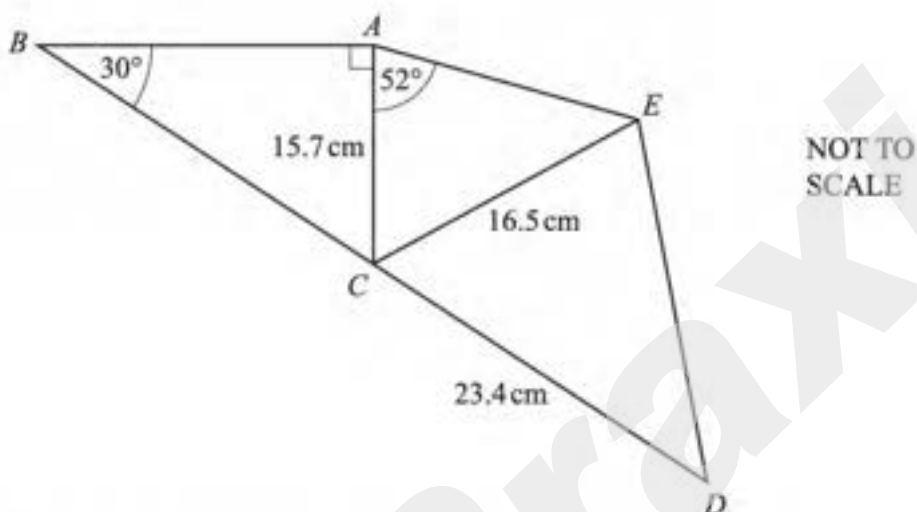
In the diagram  $OKL$  is a sector of a circle, centre  $O$  and radius 8 cm.  
 $OKM$  is a straight line and  $ML$  is a tangent to the circle at  $L$ .  
 Angle  $LOK = 44^\circ$ .

Calculate the area shaded in the diagram.

Answer(c) ..... cm<sup>2</sup> [5]

May/June 2013 (41)

6



In the diagram,  $BCD$  is a straight line and  $ABDE$  is a quadrilateral.  
 Angle  $BAC = 90^\circ$ , angle  $ABC = 30^\circ$  and angle  $CAE = 52^\circ$ .  
 $AC = 15.7$  cm,  $CE = 16.5$  cm and  $CD = 23.4$  cm.

(a) Calculate  $BC$ .

Answer(a)  $BC = \dots\dots\dots$  cm [3]

- (b) Use the sine rule to calculate angle  $AEC$ .  
Show that it rounds to  $48.57^\circ$ , correct to 2 decimal places.

*Answer(b)*

[3]

- (c) (i) Show that angle  $ECD = 40.6^\circ$ , correct to 1 decimal place.

*Answer(c)(i)*

[2]

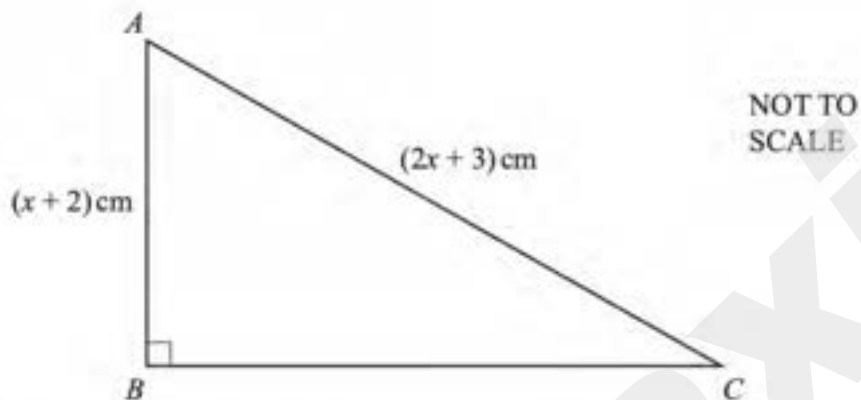
(ii) Calculate  $DE$ .

*Answer(c)(ii)*  $DE = \dots\dots\dots$  cm [4]

(d) Calculate the area of the quadrilateral  $ABDE$ .

*Answer(d)*  $\dots\dots\dots$  cm<sup>2</sup> [4]

7 (a)



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

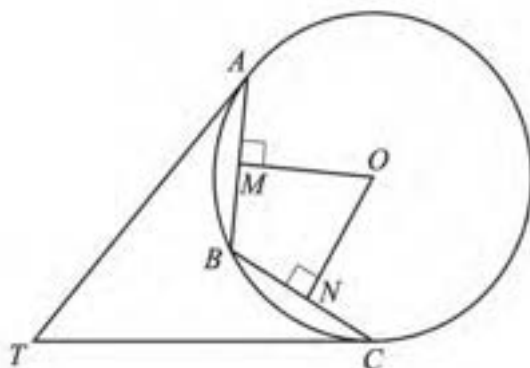
$$\sin ACB = \frac{9}{16}$$

Find the length of  $BC$ .

Answer(a)  $BC = \dots\dots\dots$  cm [6]

May/June 2013 (42)

4


 NOT TO  
SCALE

*A, B and C lie on the circle centre  $O$ , radius 8.5 cm.*

*$AB = BC = 10.7$  cm.*

*$OM$  is perpendicular to  $AB$  and  $ON$  is perpendicular to  $BC$ .*

(b) Write down the length of  $MB$ .

Answer(b) ..... cm [1]

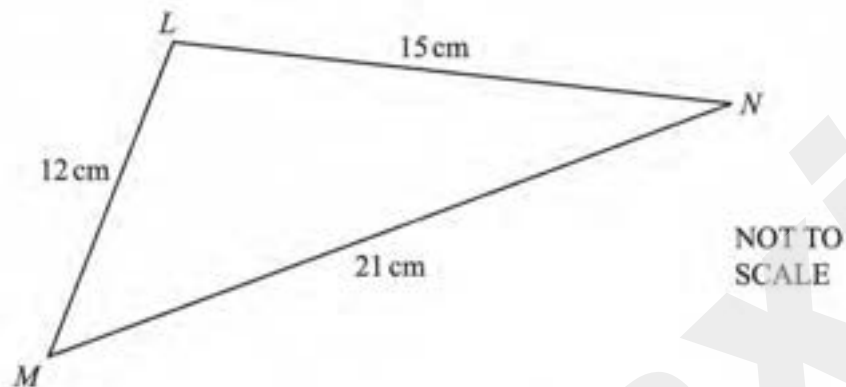
(c) Calculate angle  $MOB$  and show that it rounds to  $39^\circ$  correct to the nearest degree.

Answer(c)

[2]



6 (a)



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

- (i) Calculate angle  $LMN$ .  
Show that this rounds to  $44.4^\circ$ , correct to 1 decimal place.

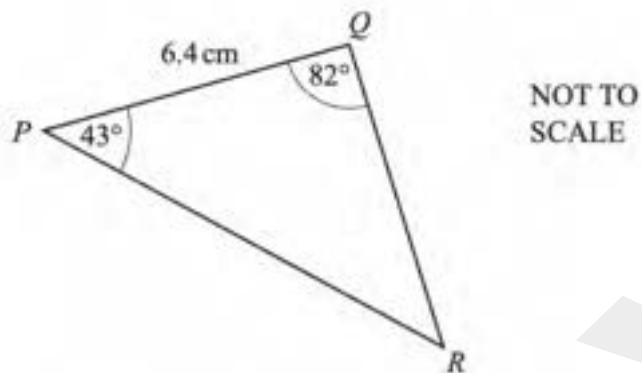
Answer(a)(i)

[4]

- (ii) Calculate the area of triangle  $LMN$ .

Answer(a)(ii) .....  $\text{cm}^2$  [2]

(b)

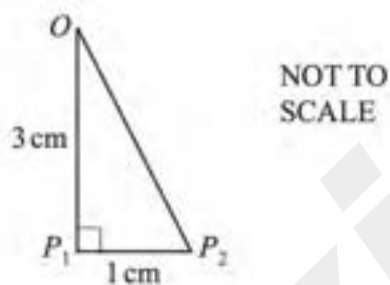


The diagram shows triangle  $PQR$  with  $PQ = 6.4$  cm, angle  $PQR = 82^\circ$  and angle  $QPR = 43^\circ$ .

Calculate the length of  $PR$ .

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

- 11 Sidney draws the triangle  $OP_1P_2$ .  
 $OP_1 = 3$  cm and  $P_1P_2 = 1$  cm.  
Angle  $OP_1P_2 = 90^\circ$ .



- (a) Show that  $OP_2 = \sqrt{10}$  cm.

*Answer(a)*

[1]

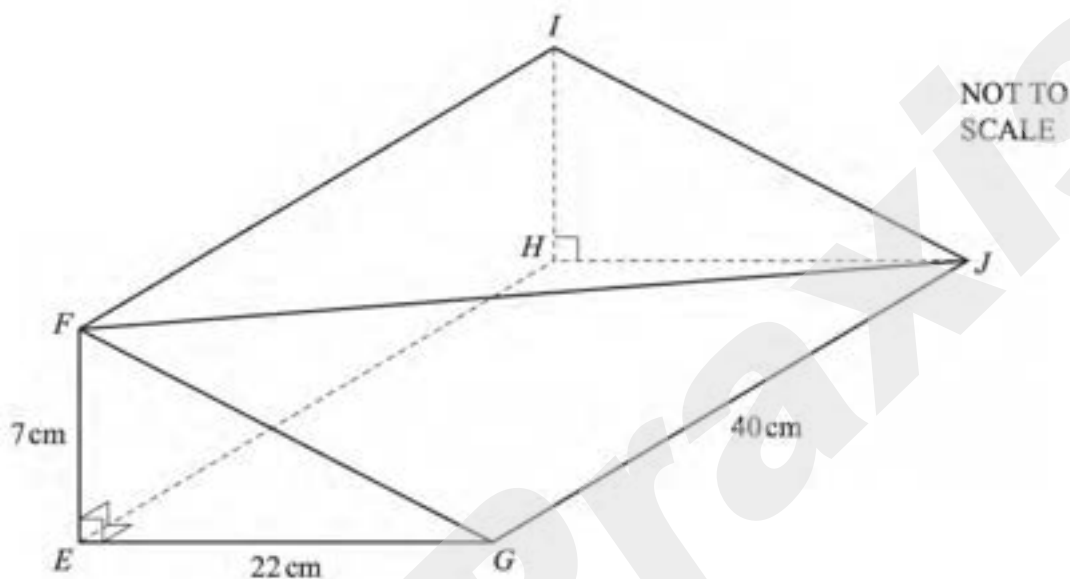
- (d) (i) Show that angle  $P_1OP_2 = 18.4^\circ$ , correct to 1 decimal place.

*Answer(d)(i)*

[2]

May/June 2013 (43)

4



*EFGHIJ* is a solid metal prism of length 40 cm.  
 The cross section *EFG* is a right-angled triangle.  
*EF* = 7 cm and *EG* = 22 cm.

(b) Calculate the length *FJ*.

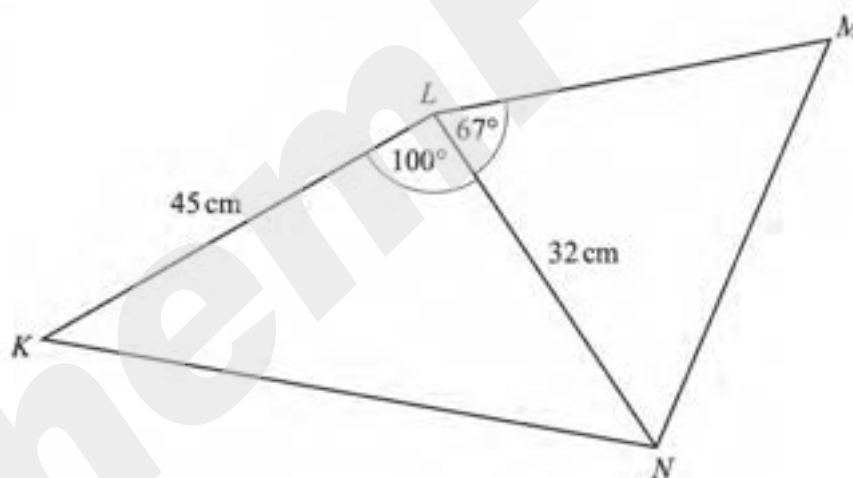
Answer(b) *FJ* = ..... cm [4]

(c) Calculate the angle between  $FJ$  and the base  $EGJH$  of the prism.

Answer(c) ..... [3]

**Question 8b**

(b)



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

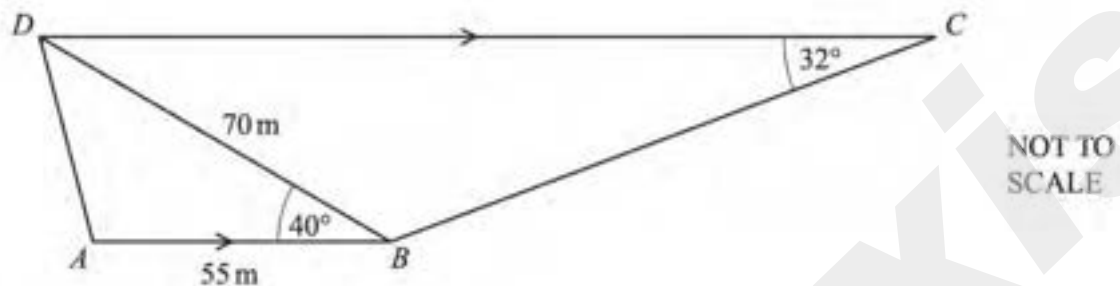
(ii) The area of triangle  $LMN$  is  $324 \text{ cm}^2$ .

Calculate the length  $LM$ .

Answer(b)(ii)  $LM = \dots\dots\dots$  cm [3]

October/November 2013 (41)

4



The diagram shows a school playground  $ABCD$ .

$ABCD$  is a trapezium.

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

(a) Calculate  $AD$ .

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

(b) Calculate  $BC$ .

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

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

*Answer(c)(i)* .....  $\text{m}^2$  [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  $\text{cm}^2$ .

*Answer(c)(ii)* .....  $\text{cm}^2$  [2]



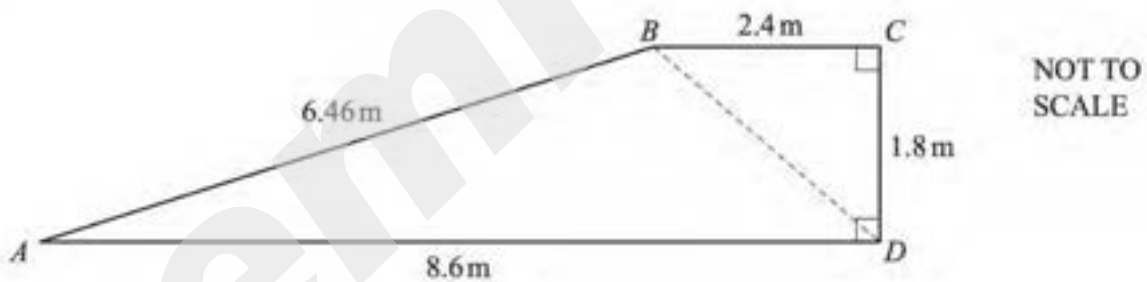
(d) A fence,  $BD$ , divides the playground into two areas.

Calculate the shortest distance from  $A$  to  $BD$ .

Answer(d) ..... m [2]

October/November 2013 (42)

2



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

(a) Calculate angle  $DBC$ .

Answer(a) Angle  $DBC$  = ..... [2]

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

*Answer(b)(i)*

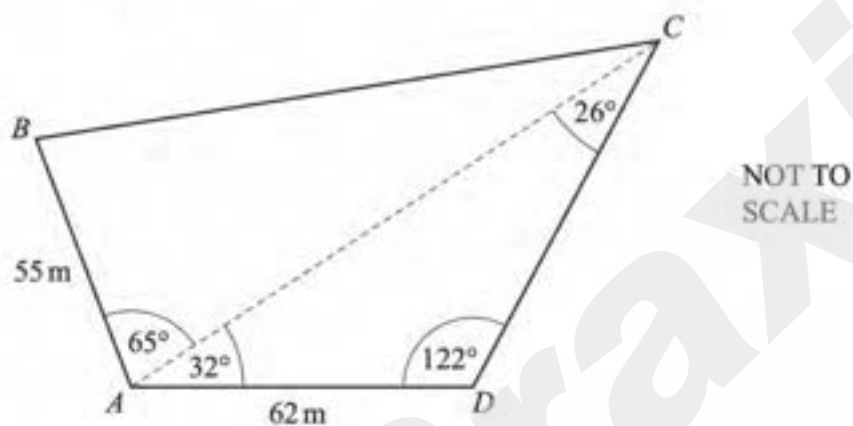
[2]

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

*Answer(b)(ii)* Angle  $ABD$  = ..... [4]

October/November 2013 (43)

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



- (a) Use the sine rule to calculate the distance  $AC$  and show that it rounds to  $119.9\text{ m}$ , 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)  $\dots\dots\dots$  m<sup>2</sup> [2]

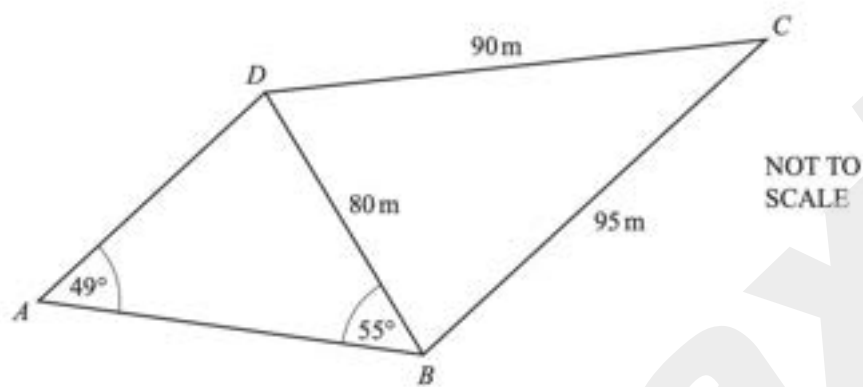
(d) The field is for sale at \$4.50 per square metre.

Calculate the cost of the field.

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

May/June 2014 (42)

3



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

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

Answer(a)  $AD = \dots\dots\dots$  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  $ABCD$ .

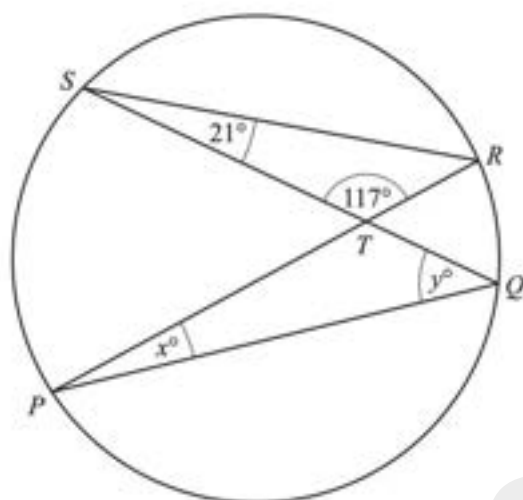
Answer(c) ..... m<sup>2</sup> [3]

(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 m<sup>2</sup>

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

6


 NOT TO  
SCALE

- (a) The chords  $PR$  and  $SQ$  of the circle intersect at  $T$ .  
Angle  $RST = 21^\circ$  and angle  $STR = 117^\circ$ .

$$x = 21 \text{ and } y = 42.$$

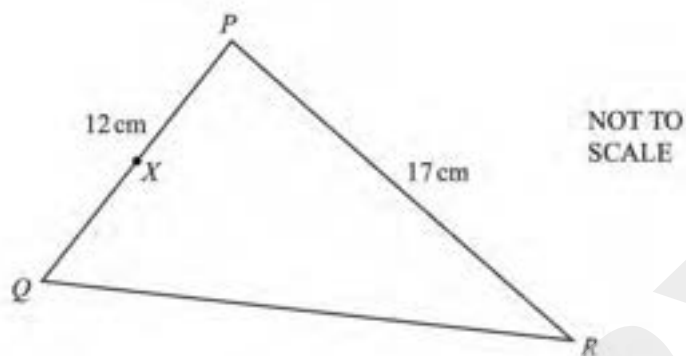
- (ii)  $SR = 8.23 \text{ cm}$ ,  $RT = 3.31 \text{ cm}$  and  $PQ = 9.43 \text{ cm}$ .

Calculate the length of  $TQ$ .

Answer(a)(ii)  $TQ = \dots\dots\dots \text{ cm [2]}$

May/June 2014 (43)

3 (a)



The diagram shows triangle  $PQR$  with  $PQ = 12$  cm and  $PR = 17$  cm. The area of triangle  $PQR$  is  $97$  cm<sup>2</sup> 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  $a$ .

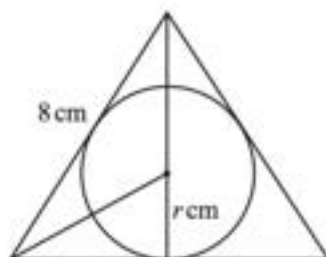
Answer(b)  $a = \dots\dots\dots$  [4]

(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]

10 (a)



NOT TO SCALE

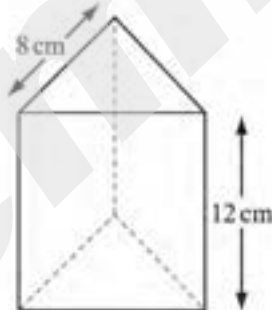
The three sides of an equilateral triangle are tangents to a circle of radius  $r$  cm. The sides of the triangle are 8 cm long.

Calculate the value of  $r$ .  
Show that it rounds to 2.3, correct to 1 decimal place.

*Answer(a)*

[3]

(b)



NOT TO SCALE

The diagram shows a box in the shape of a triangular prism of height 12 cm. The cross section is an equilateral triangle of side 8 cm.

Calculate the volume of the box.

*Answer(b)* .....  $\text{cm}^3$  [4]

- (c) The box contains biscuits.  
Each biscuit is a cylinder of radius 2.3 centimetres and height 4 millimetres.

Calculate

- (i) the largest number of biscuits that can be placed in the box,

Answer(c)(i) ..... [3]

- (ii) the volume of one biscuit in cubic centimetres,

Answer(c)(ii) .....  $\text{cm}^3$  [2]

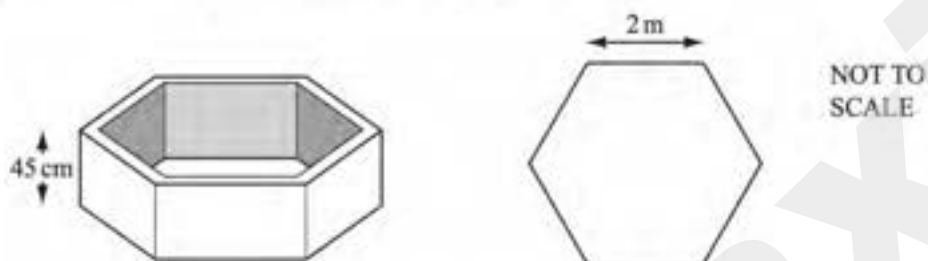
- (iii) the percentage of the volume of the box not filled with biscuits.

Answer(c)(iii) ..... % [3]

October/November 2014 (41)

Question 1b

- (b) Teresa builds a raised garden bed in the shape of a hexagonal prism.



The garden bed has a height of 45 cm.

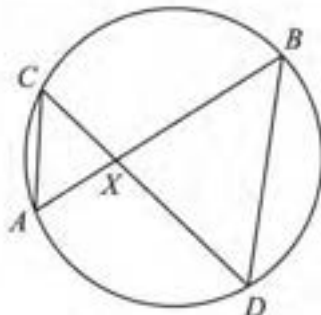
The cross section of the inside of the garden bed is a regular hexagon of side 2 m.

- (i) Show that the area of the cross section of the inside of the garden bed is  $10.4\text{m}^2$ , correct to 3 significant figures.

*Answer(b)(i)*

[3]

- 7 (a) The diagram shows a circle with two chords,  $AB$  and  $CD$ , intersecting at  $X$ .



NOT TO  
SCALE

- (ii)  $AX = 3.2$  cm,  $BX = 12.5$  cm,  $CX = 4$  cm and angle  $AXC = 110^\circ$ .

- (a) Find  $DX$ .

Answer(a)(ii)(a)  $DX = \dots\dots\dots$  cm [2]

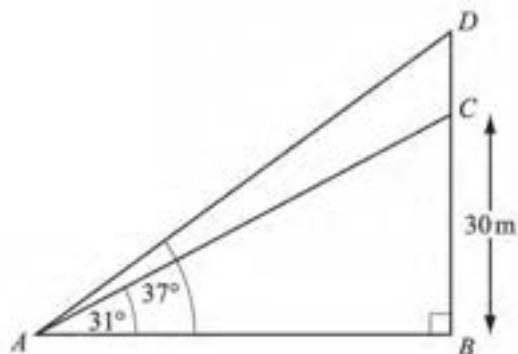
- (b) Use the cosine rule to find  $AC$ .

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

- (c) Find the area of triangle  $BXD$ .

Answer(a)(ii)(c)  $\dots\dots\dots$  cm<sup>2</sup> [2]

(b)

NOT TO  
SCALE

In the diagram,  $BC$  represents a building 30 m tall.

A flagpole,  $DC$ , stands on top of the building.

From a point,  $A$ , the angle of elevation of the top of the building is  $31^\circ$ .

The angle of elevation of the top of the flagpole is  $37^\circ$ .

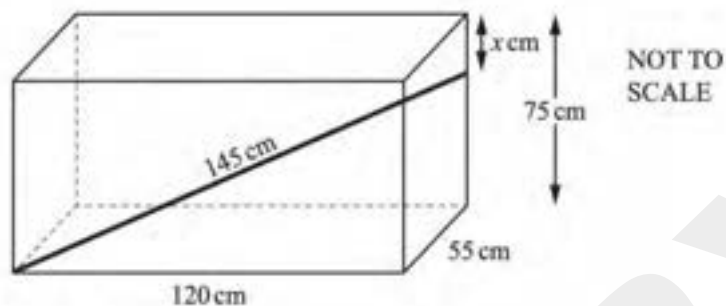
Calculate the height,  $DC$ , of the flagpole.

Answer(b) ..... m [5]

October/November 2014 (42)

**Question 7c and 7d**

(c)



A rod of length 145 cm is placed inside the water tank.  
 One end of the rod is in the bottom corner of the tank as shown.  
 The other end of the rod is  $x$  cm below the top corner of the tank as shown.

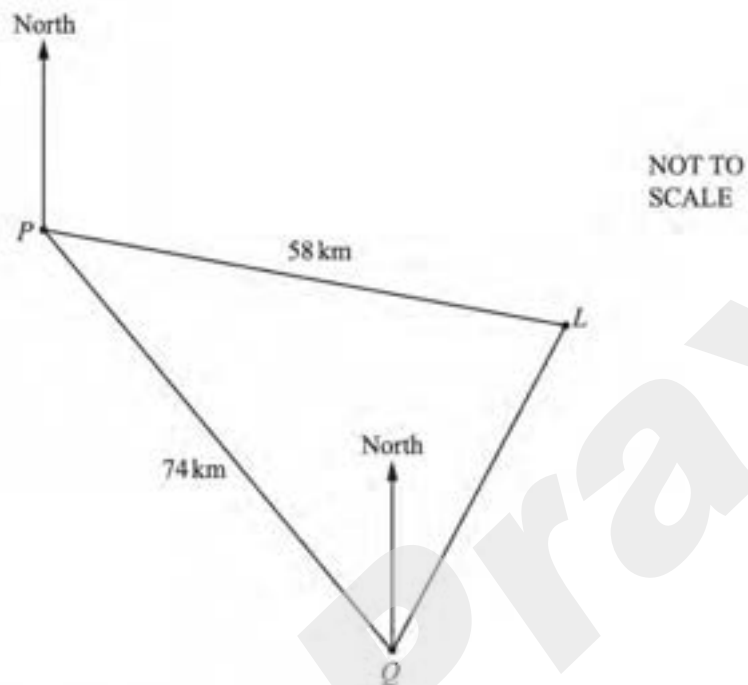
Calculate the value of  $x$ .

Answer(c)  $x = \dots\dots\dots$  [4]

(d) Calculate the angle that the rod makes with the base of the tank.

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

8



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

(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  $Q$ .

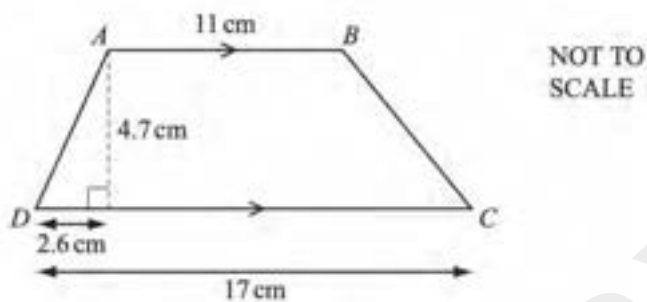
*Answer(c)(ii)*  $\dots\dots\dots$  [1]

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

*Answer(e)*  $\dots\dots\dots$  km [3]

October/November 2014 (43)

1. (a)  $ABCD$  is a trapezium.

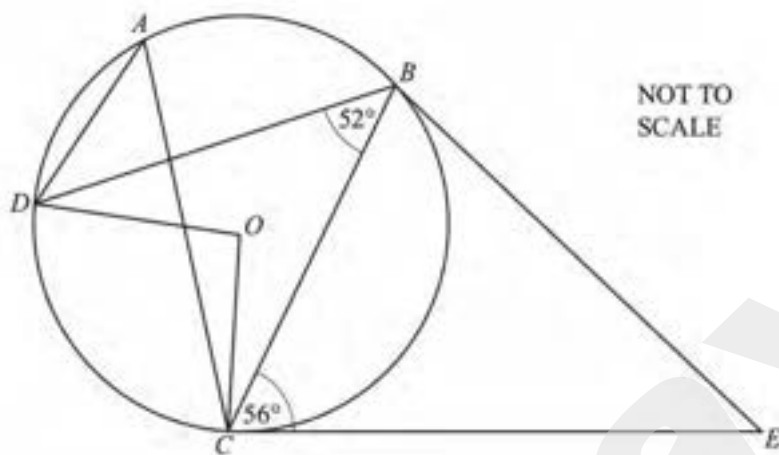


- (i) Calculate the length of  $AD$ .

Answer(a)(i)  $AD = \dots\dots\dots$  cm [2]

- (ii) Calculate the size of angle  $BCD$ .

Answer(a)(ii) Angle  $BCD = \dots\dots\dots$  [3]

**3**


*A, B, C and D are points on a circle, centre O. CE is a tangent to the circle at C.*

**(b)** *CE = 8.9cm and CB = 7 cm.*

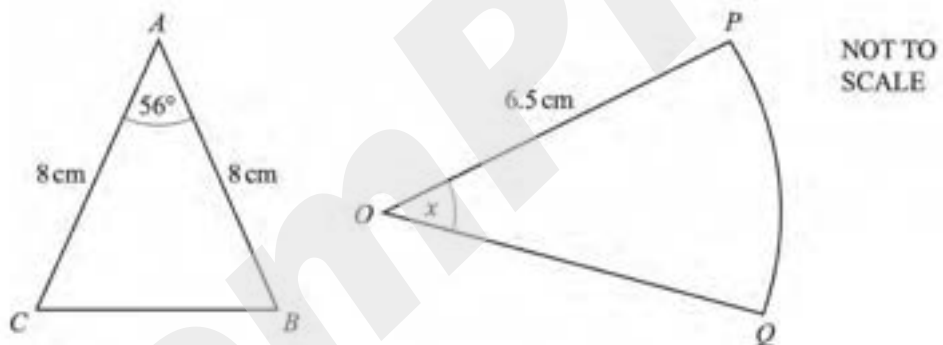
**(i)** Calculate the length of *BE*.

*Answer(b)(i) BE = ..... cm [4]*

- (ii) Calculate angle  $BEC$ .

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

7



The diagram shows a triangle and a sector of a circle.  
 In triangle  $ABC$ ,  $AB = AC = 8\text{ cm}$  and angle  $BAC = 56^\circ$ .  
 Sector  $OPQ$  has centre  $O$ , sector angle  $x$  and radius  $6.5\text{ cm}$ .

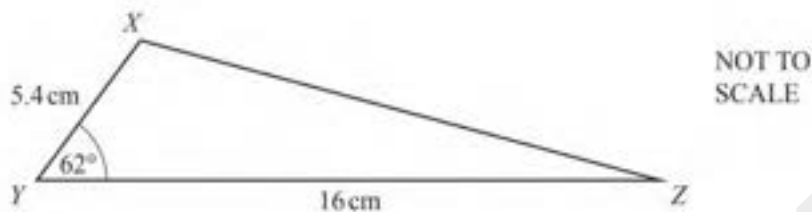
- (a) Show that the area of triangle  $ABC$  is  $26.5\text{ cm}^2$  correct to 1 decimal place.

Answer(a)

[2]

February/March 2015 (42)

5 (a)

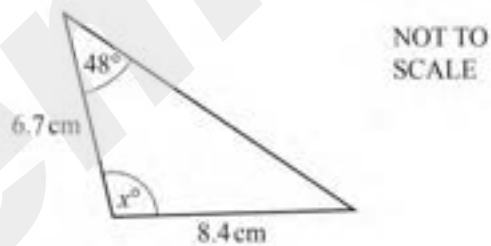


Show that the area of triangle  $XYZ$  is  $38.1 \text{ cm}^2$ , correct to 1 decimal place.

*Answer(a)*

[2]

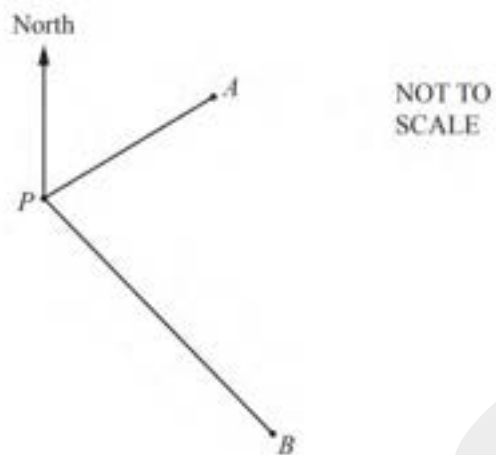
(b)



Calculate the value of  $x$ .

*Answer(b)*  $x = \dots\dots\dots$  [4]

(c)



Ship *A* is 180 kilometres from port *P* on a bearing of  $063^\circ$ .  
Ship *B* is 245 kilometres from *P* on a bearing of  $146^\circ$ .

Calculate *AB*, the distance between the two ships.

Answer(c) ..... km [5]

May/June 2015 (41)

- 5 (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.

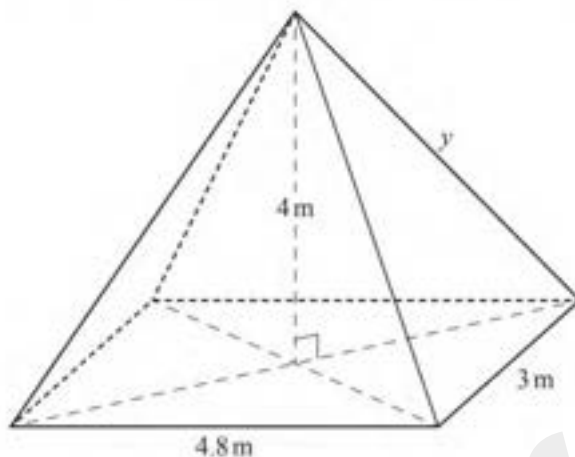
Answer(a)(i) ..... [2]

- (ii) Andrei walks a distance  $x$  metres directly towards the tower.  
The angle of elevation of the top of the tower is now  $24.8^\circ$ .

Calculate the value of  $x$ .

Answer(a)(ii)  $x =$  ..... [4]

(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,

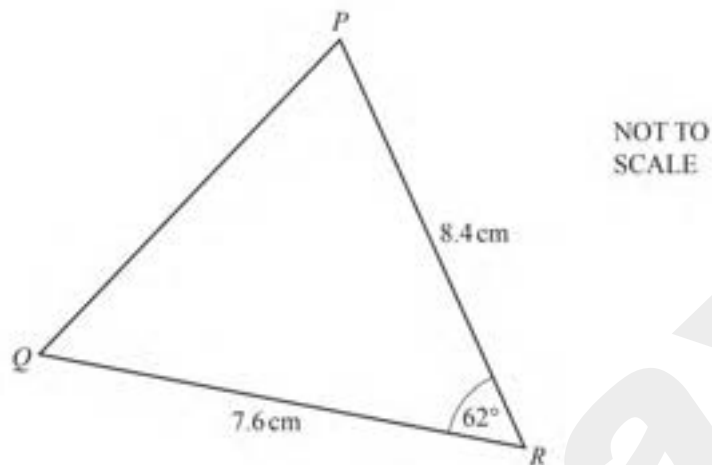
Answer(b)(i)  $y = \dots\dots\dots$  m [4]

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

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



7 (a)



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

Calculate

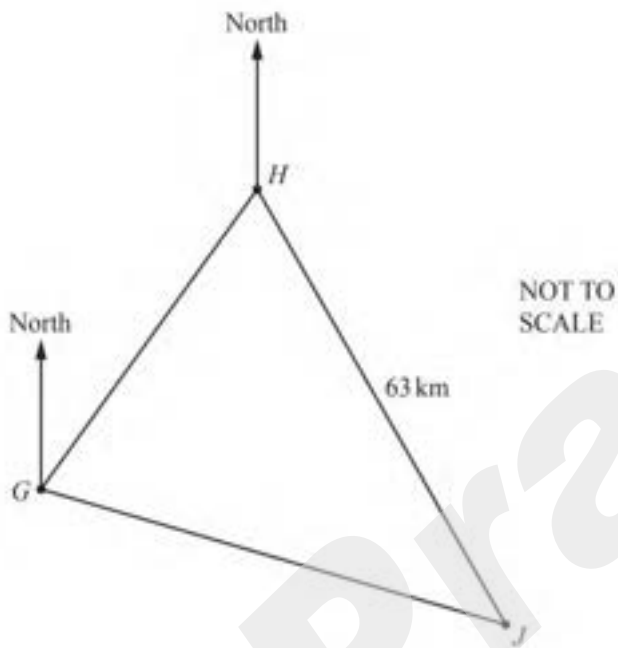
(i)  $PQ$ ,

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

(ii) the area of triangle  $PQR$ .

Answer(a)(ii)  $\dots\dots\dots$  cm<sup>2</sup> [2]

(b)



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

Calculate the distance  $GJ$ .

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

May/June 2015 (42)

**Question 4a and 4b**

(ii) The sector is used to make a cone.

(a) Calculate the base radius,  $r$ .



NOT TO SCALE

Answer(a)(ii)(a)  $r = \dots\dots\dots$  cm [2]

(b) Calculate the height of the cone,  $h$ .

Answer(a)(ii)(b)  $h = \dots\dots\dots$  cm [3]

(b) The diagram shows a plant pot.

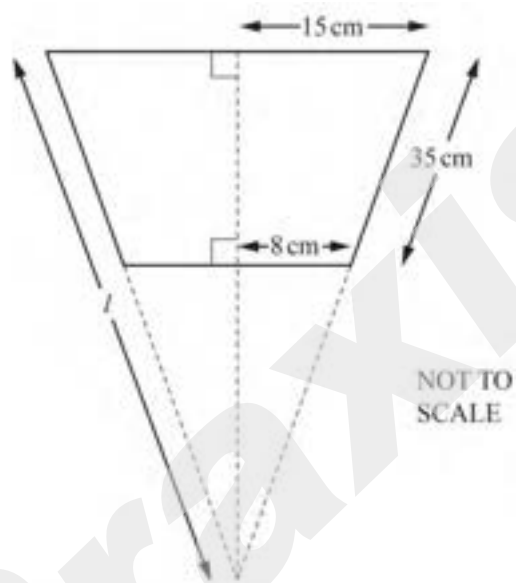
It is made by removing a small cone from a larger cone and adding a circular base.



NOT TO SCALE

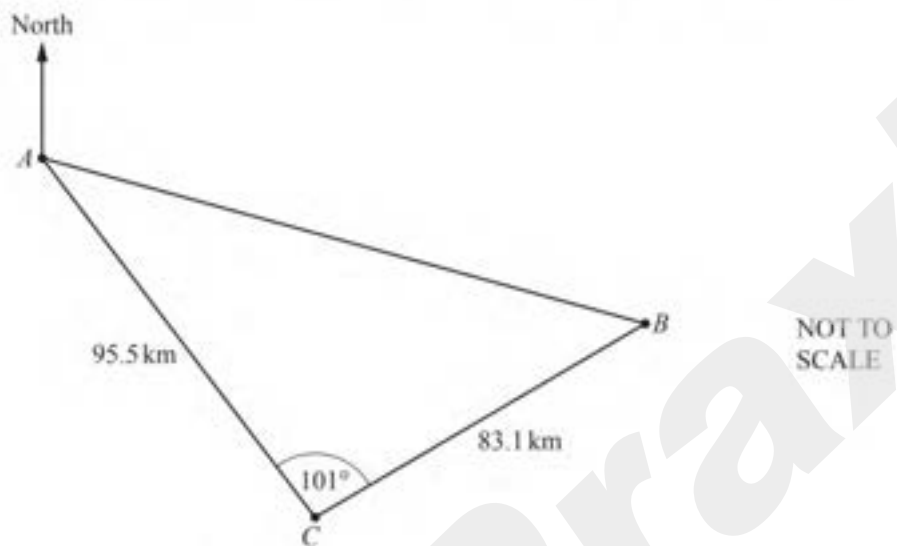
This is the cross section of the plant pot.

(i) Find  $l$ .



Answer(b)(i)  $l =$  ..... cm [3]

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



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

*Answer(a)*

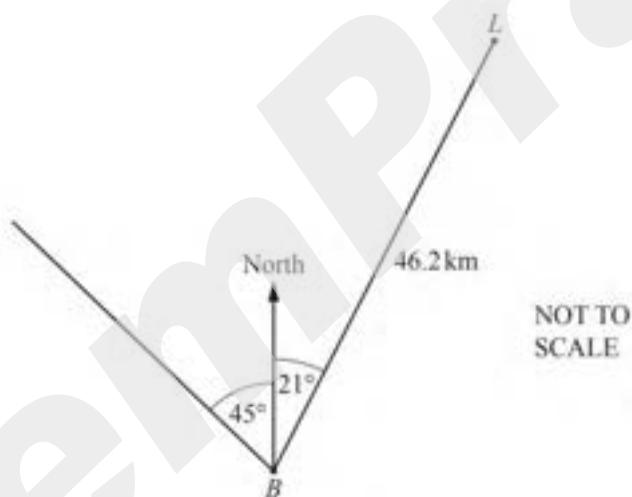
[4]

(b) The bearing of the coastguard station  $C$  from ship  $A$  is  $146^\circ$ .

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  $021^\circ$ .

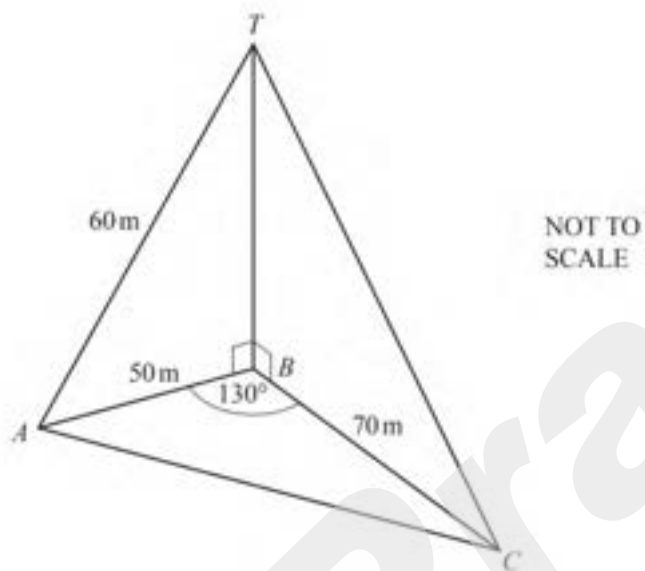
Ship  $B$  sails north west.

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]

October/November 2015 (41)

3 (a)



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

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

Answer(a)(i) ..... [5]

(ii) Calculate the length  $AC$ .

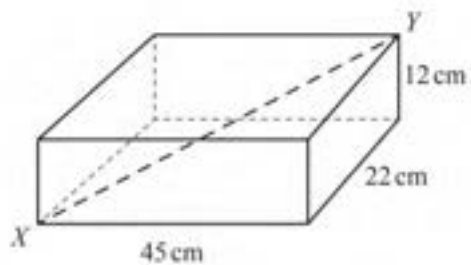
Answer(a)(ii)  $AC =$  ..... m [4]

(iii) Calculate the area of triangle  $ABC$ .

Answer(a)(iii) .....  $m^2$  [2]



(b)

NOT TO  
SCALE

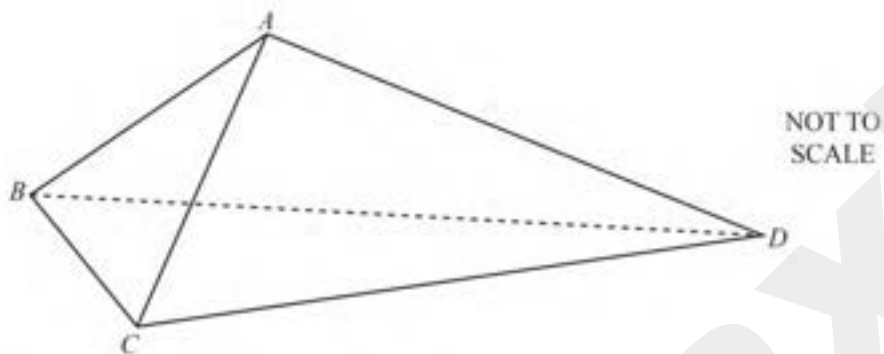
A cuboid has length 45 cm, width 22 cm and height 12 cm.

Calculate the length of the straight line  $XY$ .

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

October/November 2015 (42)

4



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)  $AC = \dots\dots\dots$  m [3]

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

Find angle  $ADC$ .

Answer(b) Angle  $ADC = \dots\dots\dots$  [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.

Answer(c) .....m<sup>2</sup> [4]

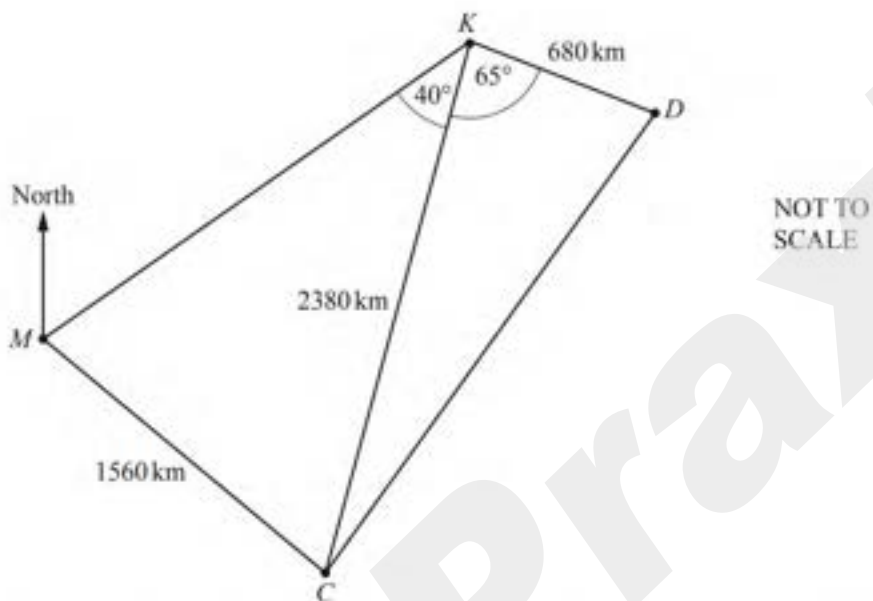
- (d) When the tent is on horizontal ground,  $A$  is a vertical distance 1.25 m above the ground.

Calculate the angle between  $AD$  and the ground.

Answer(d) ..... [3]

October/November 2015 (43)

5



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]

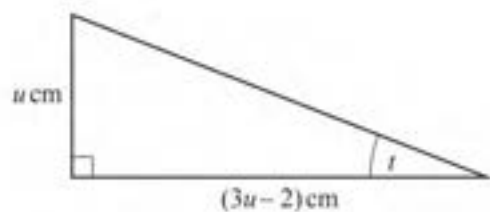
(c) The bearing of  $K$  from  $M$  is  $050^\circ$ .

Find the bearing of  $M$  from  $C$ .

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

**Question 7d**

(d)


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SCALE

 The area of the triangle is  $2.5 \text{ cm}^2$ .

 (i) Show that  $3u^2 - 2u - 5 = 0$ .

*Answer(d)(i)*

[2]

 (ii) Factorise  $3u^2 - 2u - 5$ .

*Answer(d)(ii)* ..... [2]

 (iii) Find the size of angle  $t$ .

*Answer(d)(iii)*  $t =$  ..... [3]