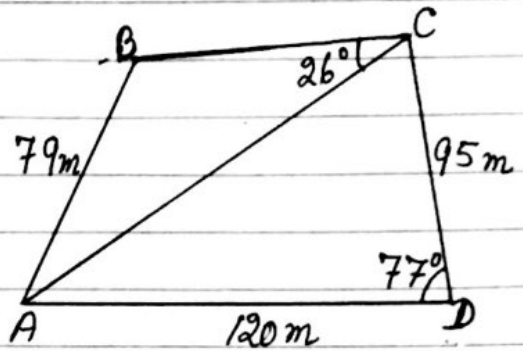


IG-Maths
0580

Trigonometry
Exercise
Paper-4

(Suresh Goel)

Q1 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 $CD = 95\text{ m}$.

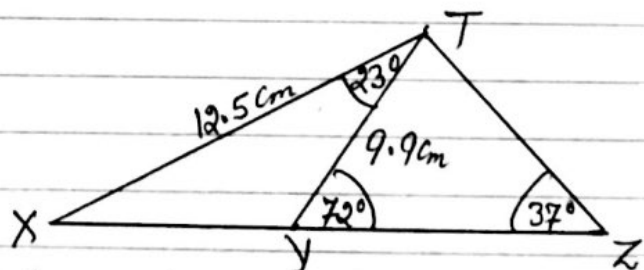
Angle $BCA = 26^\circ$ and angle $CDA = 77^\circ$.

- (a) Show that the length of the road, AC, is 135 m correct to the nearest metre. --- [4]
- (b) Calculate the size of the obtuse 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. --- [3]
- (d) Houses are to be built on the land in triangle ACD. Each house needs at least 180 m^2 of land. Calculate the maximum number of houses which can be built. Show all your working. SP-15/04/Q6 [4]

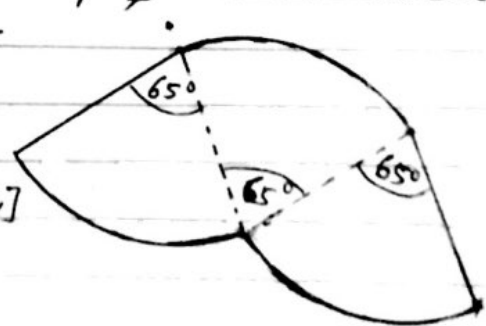
Q2 In triangle TXZ, $TX = 12.5\text{ cm}$ and angle $TZX = 37^\circ$

Y is a point on the line XZ such that $TY = 9.9\text{ cm}$, angle $XTY = 23^\circ$ and angle $TYZ = 72^\circ$.

- (i) Calculate XY --- [4]
- (ii) Calculate TZ --- [3]



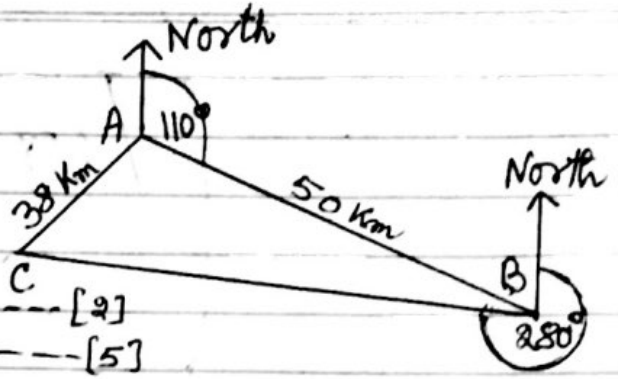
(b) The diagram shows a shape made up of three identical sectors of a circle, each with sector angle 65° , the perimeter of the shape is 20.5 cm .



Calculate the radius of the circle. --- [4]

M-17/42/Q8

Q3 (a) A, B and C are three towns.
The bearing of B from A is 110° .
The bearing of C from B is 280° .
 $AC = 38 \text{ km}$ and $AB = 50 \text{ km}$.

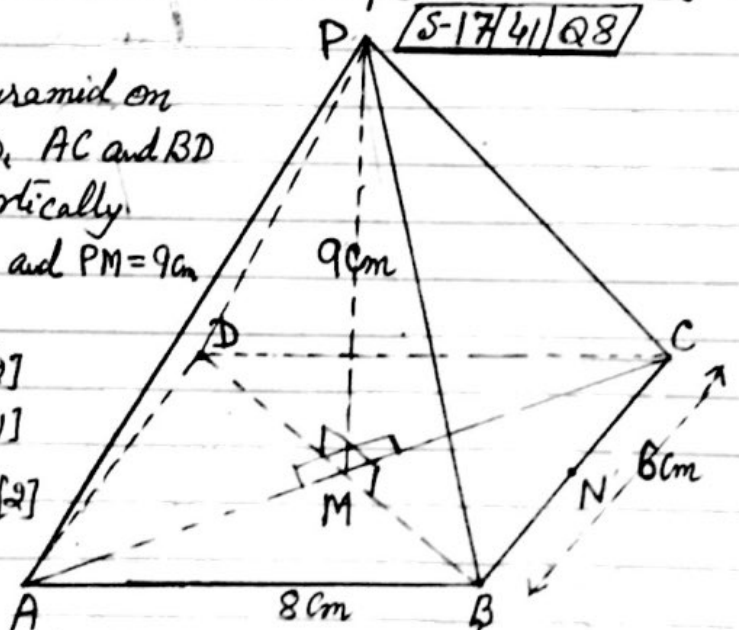


- (i) Find the bearing of A from B ----- [2]
- (ii) Calculate angle BAC. ----- [5]
- (iii) A road is built from A to join the straight road BC.
Calculate the shortest possible length of this new road --- [3]

(b) Town A has a rectangular park. The length of the park is $x \text{ cm}$. The width of the park is 25 m shorter than the length. The area of the park is 2200 m^2 .

- (i) Show that $x^2 - 25x - 2200 = 0$ ----- [1]
- (ii) Solve: $x^2 - 25x - 2200 = 0$, show all your working, and give your answers correct to 2 decimal places. ----- [4]

Q4 The diagram shows a pyramid on a rectangular base ABCD. AC and BD intersect at M and P is vertically above M. $AB = 8 \text{ cm}$, $BC = 6 \text{ cm}$ and $PM = 9 \text{ cm}$.

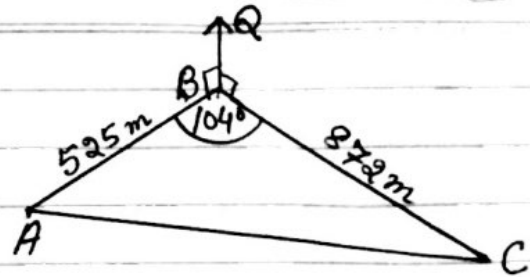


- (a) N is the mid point of BC.
Calculate angle PNM ----- [2]
- (b) Show that $BM = 5 \text{ cm}$. ----- [1]
- (c) Calculate the angle between the edge PB and the base ABCD. ----- [2]

(d) A point X is on PC, so that $PX = 7.5 \text{ cm}$.
Calculate BX. ----- [6]

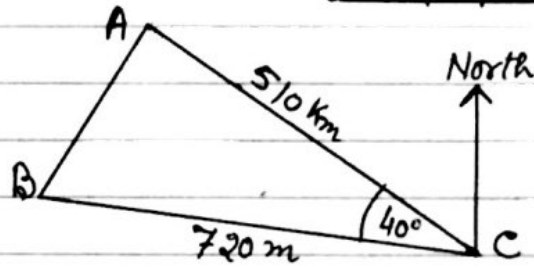
S-17/42/Q8

Q5 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°.



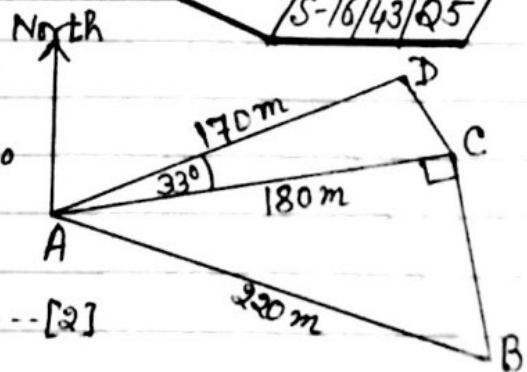
- (a) Use cosine rule to calculate the distance AC, --- [4]
 (b) The angle of elevation of Q from C is 1.0°
 Showing all your working, calculate the angle of elevation of Q from A. -- [4]
 (c) (i) Calculate the area of the field. -- [2]
 (ii) The field is drawn on a map with scale 1:20000
 Calculate the area of the field on the map in cm². [5-17/43/Q9] [2]

Q6 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°



- (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. --- [3]

Q7 The diagram shows five straight footpaths in a park. AB = 220 m, AC = 180 m and AD = 170 m, angle ACB = 90°, angle DAC = 33°



- (a) Calculate BC. --- [3]
 (b) Calculate CD. --- [4]
 (c) Calculate the shortest distance from D to AC. --- [2]
 (d) The bearing of D from A is 047°
 Calculate the bearing of B from A. --- [3]
 (e) Calculate the area of quadrilateral ABCD. --- [3]

[W-16/41/Q6]

Q8 The diagram shows a field, ABCD.
AD = 180 m and AC = 240 m

Angle ABC = 50° and angle ACB = 85°

(a) Use the sine rule to calculate AB, --- [3]

(b) The area of triangle ACD = 12000 m²

Show that angle CAD = 33.75°

Correct to 2 decimal places, --- [3]

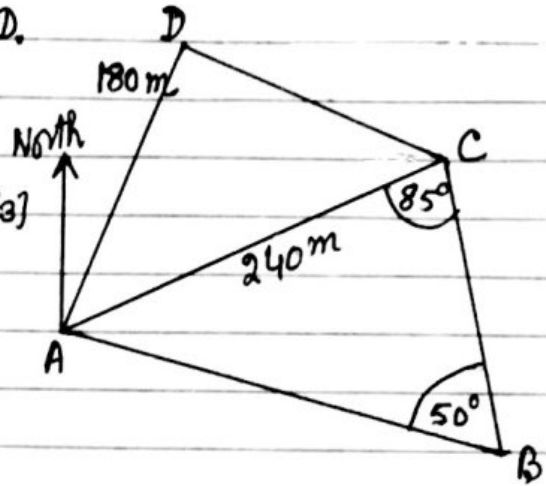
(c) Calculate BD --- [5]

(d) The bearing of D from A is 030°

Find the bearing of

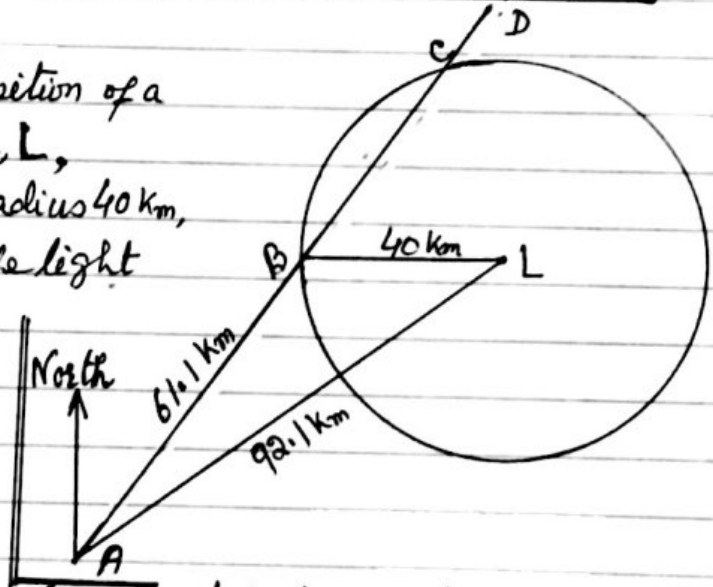
(i) B from A --- [1]

(ii) A from B --- [2]



W-16/42/Q3

Q9 The diagram shows the position of a port, A, and a light house, L. The circle, centre L and radius 40 km, shows the region where the light from the light house 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 km, AB = 61.1 km and BL = 40 km.

(a) Use cosine rule to show that angle ABL = 130.1°, correct to 1 decimal place. --- [4]

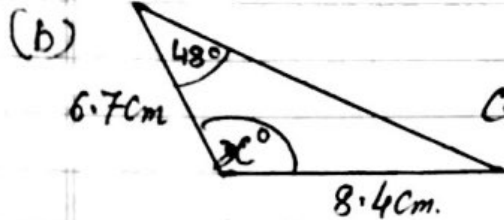
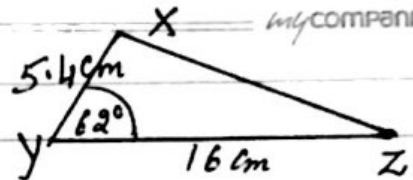
(b) Calculate the bearing of the lighthouse, L, from the port, A. --- [4]

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

Calculate the length of time for which the light from the light house can be seen from the ship. Give your answer correct to the nearest minute. --- [5]

W-16/43/Q6

Q10(a) Show that the area of triangle XYZ is 38.1 cm^2 , correct to 1 decimal place. [2]

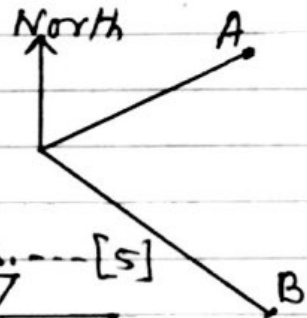


Calculate the value of x . [4]

(c) Ship A is 180 km from port P on a bearing of 063° . Ship B is 245 km from P on a bearing of 146° .

Calculate AB, the distance between the ships. [5]

M-15/42/Q5



Q11(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. [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 . [4]

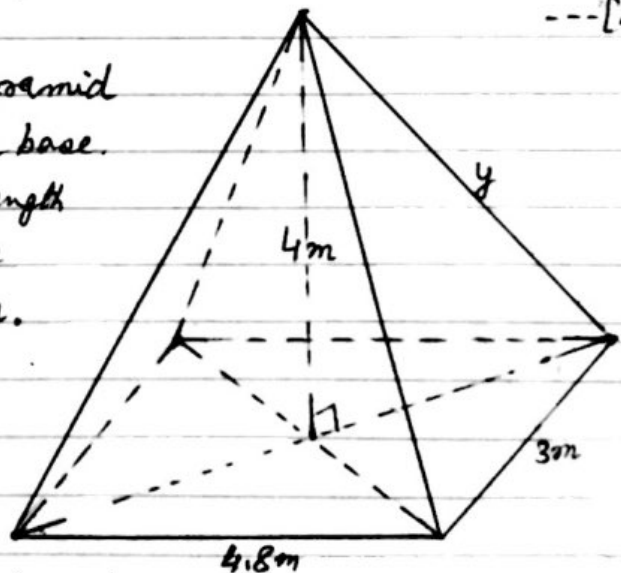
(b) The diagram shows a pyramid with a horizontal rectangular base.

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. [4]

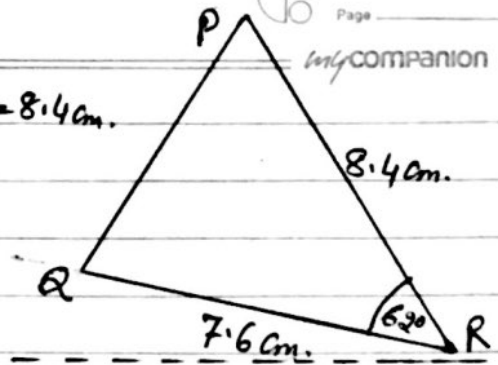
(ii) The angle between a sloping edge and the rectangular base of the pyramid. [2]



S-15/41/Q5

Q12(a) In the triangle PQR, $QR = 7.6 \text{ cm}$ and $PR = 8.4 \text{ cm}$.
Angle $QRP = 62^\circ$, Calculate,

- (i) PQ --- [4]
(ii) the area of triangle PQR --- [2]
- (b)



The diagram shows the positions of three small islands G, H and J.

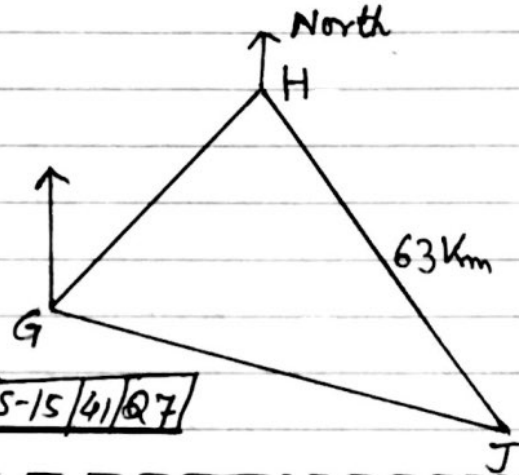
The bearing of H from G is 045°

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. --- [5]



S-15/41/Q7

Q13

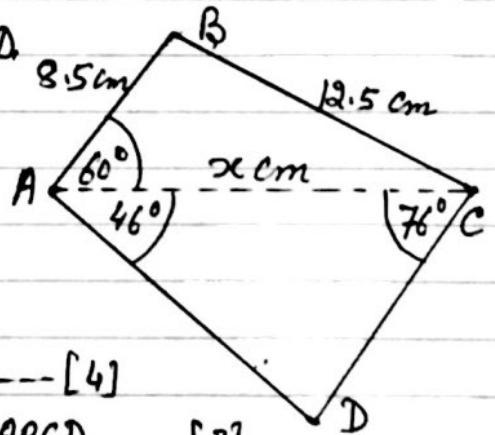
The diagram shows a quadrilateral ABCD.

- (a) The length of AC is $x \text{ cm}$,
Use the cosine rule in triangle ABC,
to show that $2x^2 - 17x - 168 = 0$ --- [4]

- (b) Solve the equation $2x^2 - 17x - 168 = 0$
Show all your working and give your
answers correct to 2 decimal places. --- [4]

- (c) Calculate the area of the quadrilateral ABCD. --- [3]

- (d) Use the sine rule to calculate the length CD --- [3]

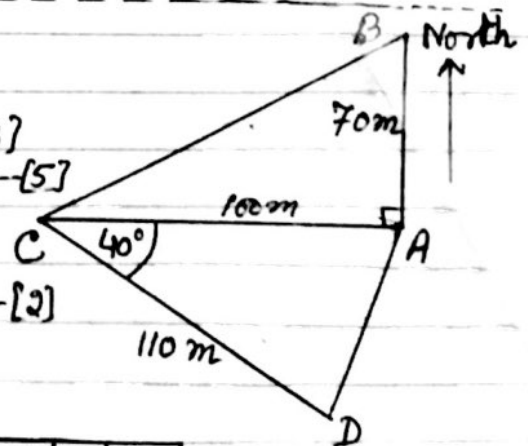


W-17/41/Q10

Q14 The diagram shows a field ABCD.

- (a) Calculate the area of field ABCD. --- [3]
(b) Calculate the perimeter of the field ABCD. --- [5]
(c) Calculate the shortest distance from A to CD --- [2]

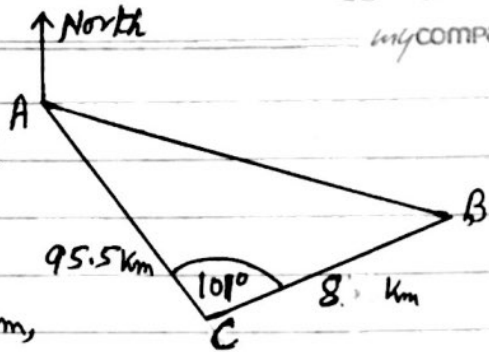
- (d) B is due North of A.
Find the bearing of C from B,



W-17/42/Q3

Q15

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



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

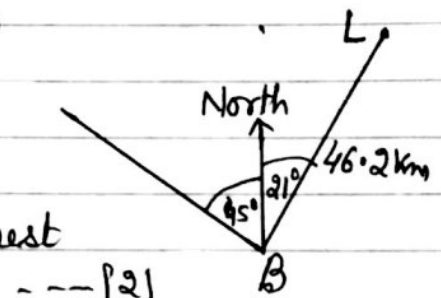
--- [4]

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

--- [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.



--- [2]

S-15/42/Q6

Q16 (a) A, B and C are points on horizontal ground.

BT is 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.

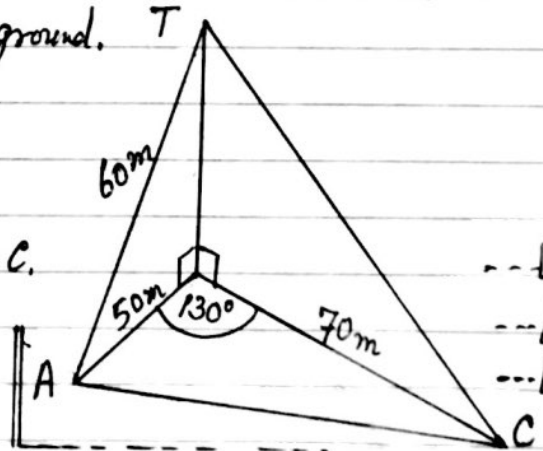
--- [5]

(ii) Calculate the length AC.

--- [4]

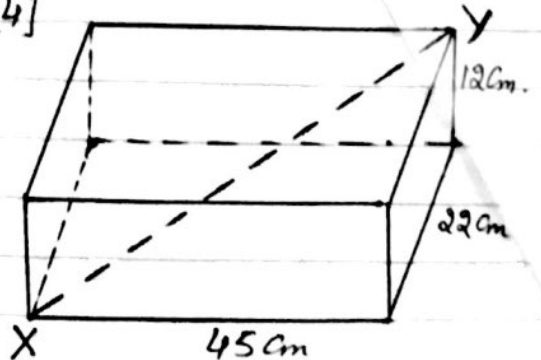
(iii) Calculate the area of triangle ABC.

--- [2]



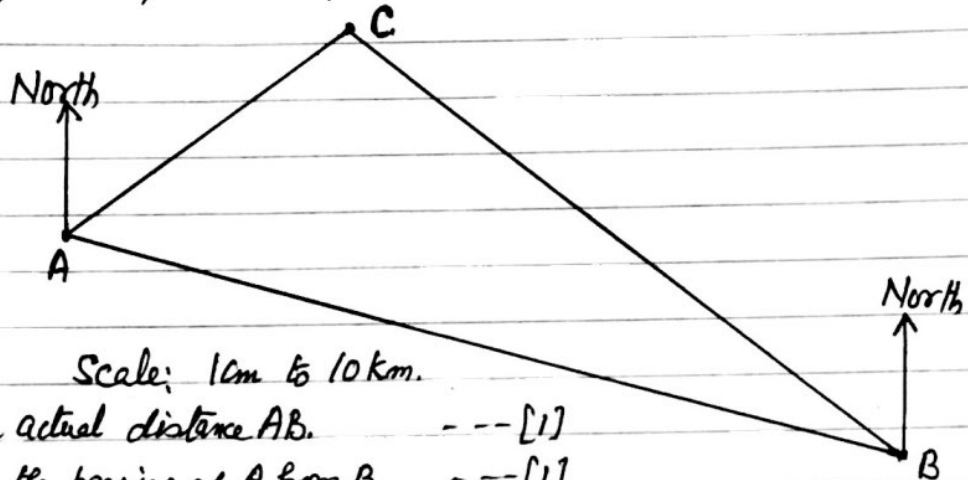
(b) A cuboid has length 45 cm, width 22 cm and height 12 cm.

Calculate the length of line XY. --- [4]



W-15/41/Q3

Q17 The scale drawing shows the positions of three towns A, B and C on a map. The scale of the map is 1cm represents 10 km.



Scale: 1cm to 10km.

- (a) Find the actual distance AB. --- [1]
- (b) Measure the bearing of A from B. --- [1]
- (c) Write the scale 1cm to 10km in the form 1:n --- [1]
- (d) A national park lies inside the triangle ABC. The four boundaries of the national park are
- equidistant from C and B,
 - equidistant from AC and CB
 - 15 km from CB
 - along AB.

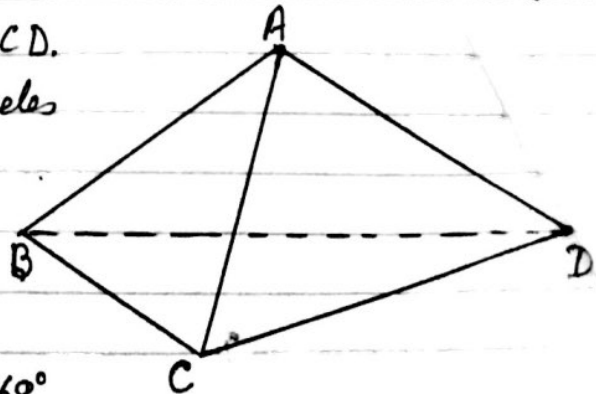
On the scale drawing, shade the region which represents the national park. Leave in your construction arcs. --- [7]

- (e) On the scale drawing, a lake inside the national park has area 0.4 m^2 . Calculate the actual area of the lake. --- [2]

W-15/41/Q7

Q18 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) $BC = 1.2 \text{ m}$ and angle $ABC = 68^\circ$. Find AC. --- [3]
- (b) $CD = 2.3 \text{ m}$ and $AD = 1.9 \text{ m}$, Find angle ADC. --- [4]
- (Continued →)

(continued →)

Q18(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. --- [4]

(d) When the tent is horizontal ground, A is a vertical distance 1.25 m above the ground. Calculate the angle between AD and the ground. --- [3]

W-15/42/Q4

Q19

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

(a) Angle $CKD = 65^\circ$, Use cosine rule to calculate the distance CD. --- [4]

(b) Angle $MKC = 40^\circ$, Use sine rule to calculate the acute angle KMC . --- [3]

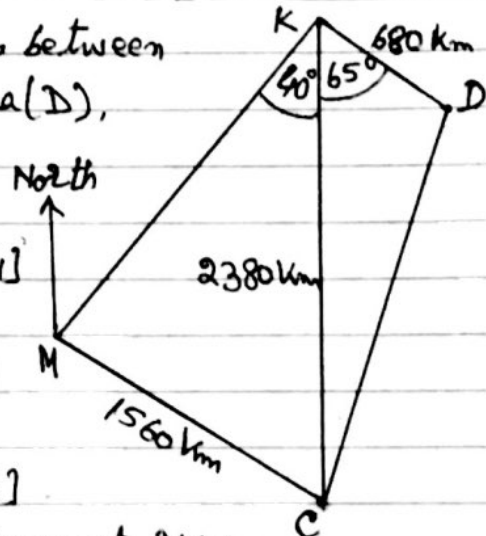
(c) The bearing of K from M is 050° . Find the bearing of M from C. --- [2]

(d) A plane from Colombo to Mumbai leaves at 2115 and the journey takes 2 hours 24 minutes.

(i) Find the time plane arrives at Mumbai. --- [1]

(ii) Calculate the average speed of the plane. --- [2]

W-15/43/Q5



Q20 In a scale drawing, P is port, L is a lighthouse and S is a ship. The scale 2 centimetres represents 3 kilometres.

(a) Measure the bearing of S from P. --- [1]

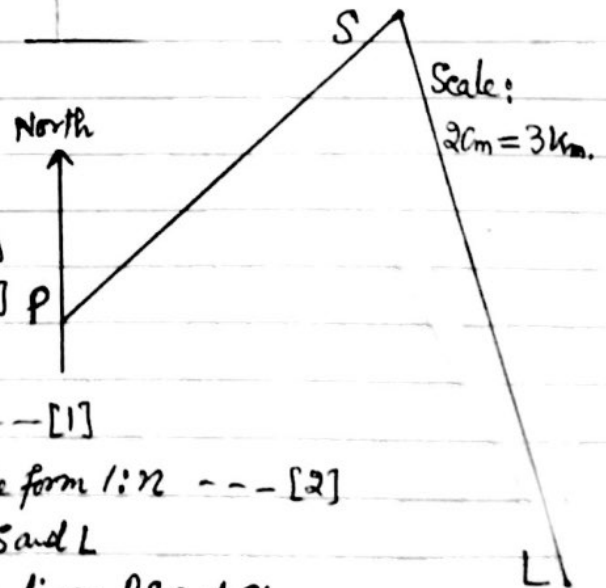
(b) Find the actual distance of S from L. --- [2]

(c) The bearing of L from S is 160° . Calculate the bearing of S from L. --- [1]

(d) Work out the scale of the map in the form $1:n$. --- [2]

(e) A boat B is
 • equidistant from S and L
 • equidistant from the lines PS and SL.

on the diagram, using a straight edge and compasses only, construct the position of B. (continued →) --- [5]



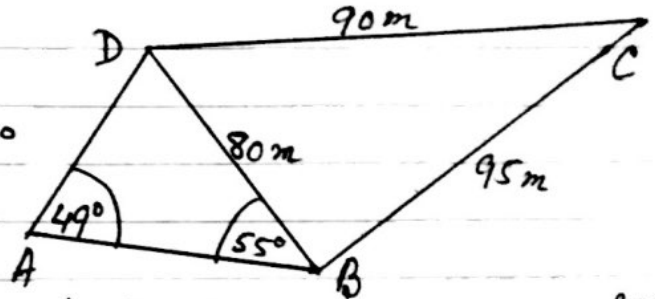
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myCOMPANION

Q20 (f) The lighthouse stands on an island of area 1.5cm^2 on the scale drawing. Work out the actual area of the island. --- [2]

S-14/41/Q5

Q21 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. --- [3]

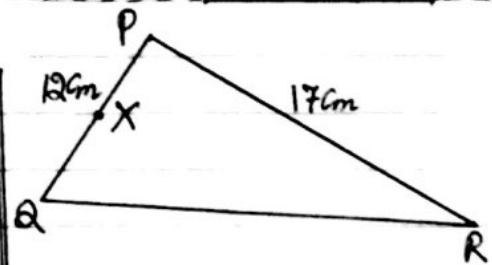
(b) Use the cosine rule to calculate angle BCD. --- [4]

(c) Calculate the area of the quadrilateral ABCD. --- [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 = 10000m^2 --- [3]

S-14/42/Q3

Q22 (a) The diagram shows triangle PQR with $PQ = 12\text{cm}$ and $PR = 17\text{cm}$. The area of triangle PQR is 97cm^2 and angle QPR is acute.



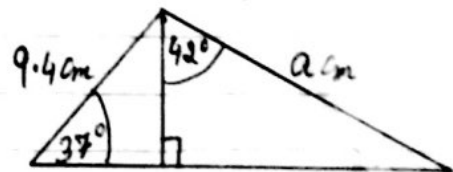
(i) Calculate angle QPR. --- [3]

(ii) The midpoint of PQ is X. Use cosine rule to calculate the length XR. --- [4]

(b) Calculate the value of α .

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

Find two values of x . --- [2]



S-14/43/Q3

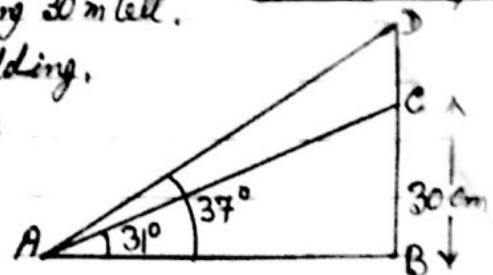
Q23 In the diagram, BC represents a building 30m tall.

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

From a point, A, the angle of elevation of the top of the building is 31° .

The angle of elevation of the top of the flagpole is 37° .

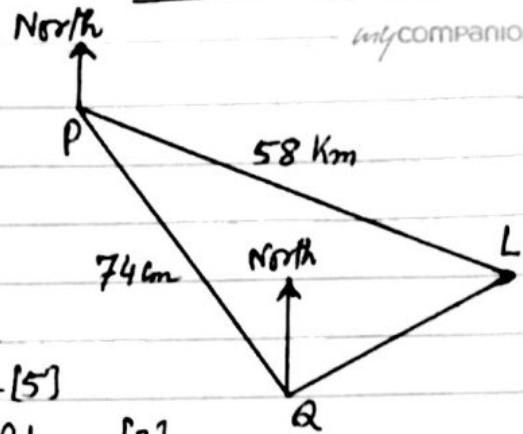
Calculate the height, DC, of the flagpole.



W-14/41/Q7(b)

--- [5]

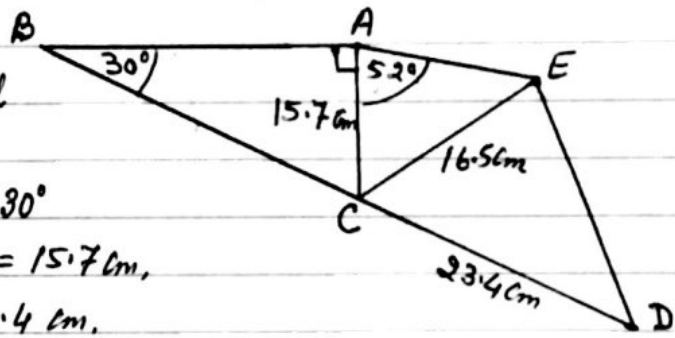
Q24 A ship sails from port P to port Q.
Q is 74 km from P on a bearing of 142° .
A lighthouse, L, is 58 km from P on
a bearing of 110° .



- (a) Show that the distance LQ is 39.5 km
Correct to 1 decimal place. --- [5]
- (b) Use the sine rule to calculate angle PQL --- [3]
- (c) Find the bearing of (i) P from Q --- [2]
(ii) L from Q --- [1]
- (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] --- [3]
- (e) Calculate the shortest distance from the lighthouse to the path of the ship.
--- [3]

W-14/42/Q8

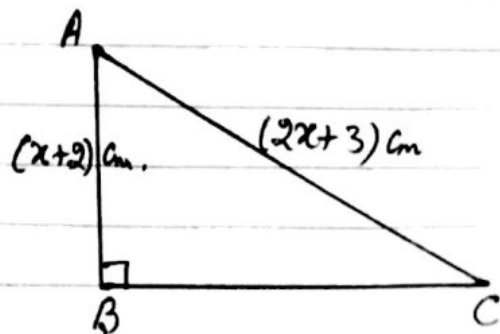
Q25 In the diagram,
BCD is a straight line and
ABDE is a quadrilateral.
Angle BAC = 90° , angle ABC = 30°
and angle CAE = 52° , AC = 15.7 cm,
CE = 16.5 cm and CD = 23.4 cm.



- (a) Calculate BC. --- [3]
- (b) Use the sine rule to calculate angle AEC.
Show that it rounds to 48.57° , correct to 2 decimal places. --- [3]
- (c) (i) Show that angle ECD = 40.6° , correct to 1 decimal place. --- [2]
(ii) Calculate DE --- [4]
- (d) Calculate the area of the quadrilateral ABDE. --- [4]

S-13/41/Q6

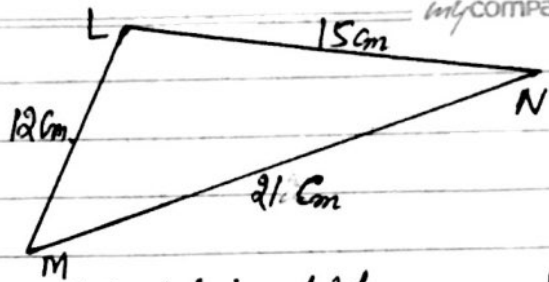
Q26 In triangle ABC, $AB = (x+2)$ cm.
and $AC = (2x+3)$ cm.
 $\sin ACB = \frac{9}{16}$
Find the length of BC.



S-13/41/Q7(a)

Q27(a) The diagram shows triangle

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



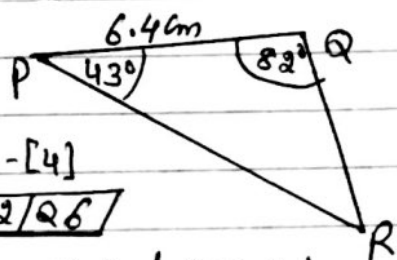
(i) Calculate angle LMN .

Show that it rounds to 44.4° , correct to 1 decimal place. ---[4]

(ii) Calculate the area of triangle LMN . ---[2]

(b) The diagram shows triangle PQR ,

with $PQ = 6.4\text{cm}$, angle $PQR = 82^\circ$ and
angle $QPR = 43^\circ$. Calculate the length PR . ---[4]

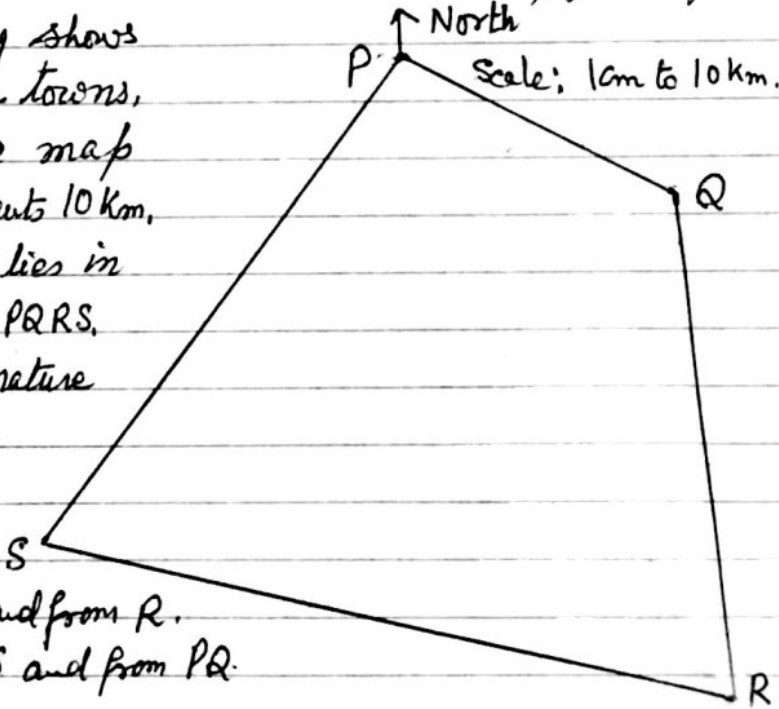


S-13/42/Q6

Q28(a) In this question show all your construction arcs and use only a ruler and compasses to draw the boundaries of your region.

This scale drawing shows the position of four towns, P , Q , R and S , on a map where 1cm represents 10km .

A nature reserve lies in the quadrilateral $PQRS$. The boundaries of nature reserve are:



- equidistant from Q and from R .
- equidistant from PS and from PQ .
- 60km from R ,
- along QR .

(i) Shade the region which represents the nature reserve. ---[7]

(ii) Measure the bearing of S from P . ---[1]

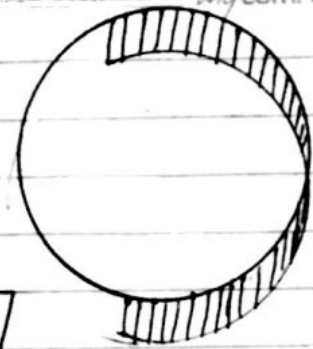
(b) A circular lake in the nature reserve has a radius of 45m .

(i) Calculate the area of the lake. ---[2]

(Continued →)

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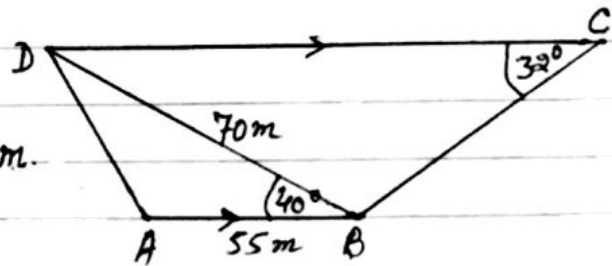
Q28(b)(ii) A fence is placed along part of the circumference of the lake. This arc subtends an angle of 210° at the centre of the circle. Calculate the length of the fence. --- [2].



S-13/43/Q28

Q29

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 $BCD = 32^\circ$

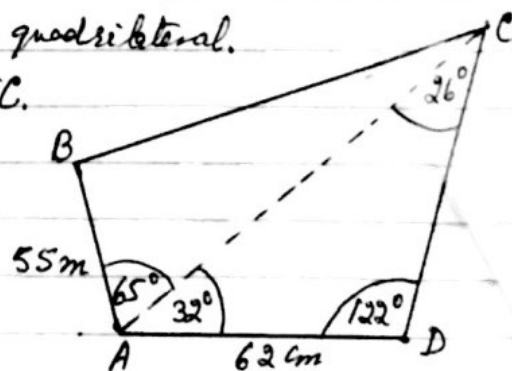


- (a) Calculate AD. --- [4]
- (b) Calculate BC. --- [4]
- (c) (i) Calculate the area of the playground ABCD. --- [3]
- (ii) An accurate plan of the school playground is to be drawn to a scale of 1:200. Calculate the area of the school playground on the plan. Give your answer in cm^2 . --- [2]
- (d) A fence, BD, divides the play ground into two areas. Calculate the shortest distance from A to BD. --- [2]

W-13/41/Q24

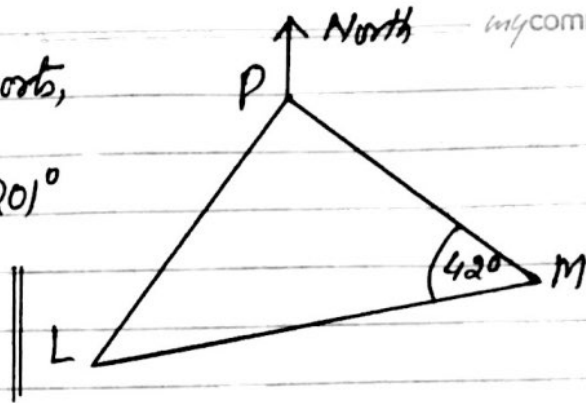
Q30 A field ABCD, is in the shape of a quadrilateral. A footpath crosses the field from A to C.

- (a) Use the sine rule to calculate the distance AC and show that it rounds to 119.9 m.
- (b) Calculate the length BC.
- (c) Calculate the area of triangle ACD.
- (d) The field is for sale at \$4.50 per square metre. Calculate the cost of the field.



W-13/43/Q2

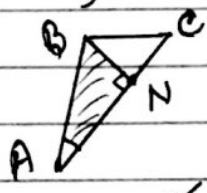
Q31 The diagram shows two ports, L and P, and a buoy, M.
 The bearing of L from P is 201°
 and $LP = 248$ km,
 The bearing of M from P is 127° .
 Angle $PML = 42^\circ$



- (a) Use the sine rule to calculate LM. --- [4]
- (b) A ship sails directly from L to P,
 (i) Calculate the shortest distance from M to LP. --- [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. M-18/42/Q8 --- [3]

Answers

Q1. (a) $AC^2 = 120^2 + 95^2 = 2 \times 120 \times 95 \times 0.77$
 (b) Using sine rule: $\angle C = 135^\circ$
 $\frac{\sin B}{135} = \frac{\sin 26}{79}$
 angle $ABC = 131.5^\circ$
 (c) angle $BAC = 180 - (26 + 131.5) = 22.5$
 Draw $BN \perp AC$
 In $\triangle ABN$
 Rep. dis. $BN = AB \sin A$
 $= 79 \times \sin 22.5 = 30.2$
 (d) Area of $\triangle ABC = \frac{1}{2} \times AC \times BN$
 or $A = \frac{1}{2} \times 120 \times 95 \times 0.77$
 No. of rows = $\frac{A}{180}$
 $= 30$



Q2 (a) (i) 5.4
 (ii) 15.6
 (b) 3.79

Q3 (a) (i) 290° (ii) 156.8°
 (iii) 8.68
 (b) (i) $2(2-25) = 2200$
 (ii) -36.04° or 61.04°

Q4 (a) 66 (b) $BM = \sqrt{3^2 + 4^2} = 5$
 (c) 60.9 (d) 5.83

Q5 (a) 1120 (Using Cosine Rule)
 (b) $\angle B = 87.2^\circ$
 Elevation of Q at A is
 $\tan \theta = \frac{QB}{AB} = \frac{872 \sin 10^\circ}{525}$
 $\theta = 1.7^\circ$

(c) (i) 222000
 (ii) 5.55

Q6 (a) (i) 275° (ii) 095
 (b) 464.66 (c) 44.9

Q7 (a) 126 (b) 99.9
 (c) 92.6 (d) 115.1 (e) 19700

Q8 (a) $AB = \frac{240 \times \sin 85^\circ}{\sin 50^\circ} = 312$
 (b) $\frac{1}{2} \times 180 \times 240 \times \sin A = 12,000$
 $\therefore A = 33.748^\circ$
 (c) 328 (d) (i) 108.75 (ii) 288.75

Q9 (a) $\cos ABL = \frac{40^2 + 61^2 - 92^2}{2 \times 40 \times 61}$
 \therefore angle $ABL = 130.11^\circ$
 (b) 059.5
 (c) 1h 50 min.

Q10 (a) $\frac{1}{2} \times 16 \times 5.4 \times \sin 62 = 38.14$
 (b) 95.6 (c) 286

Q11 (a) (i) 10.6 (ii) 175
 (b) (i) 4.9 (ii) 54.7°

Q12 (a) (i) 8.27 (ii) 28.2
 (b) 55.8

Q13 (a) $12.5^2 = x^2 + 8.5^2 - 2 \times x \times 8.5 \cos 60^\circ$
 $\therefore 2x^2 - 17x - 168 = 0$
 (b) $x = 14.35$, -5.85
 (c) 12.2 (d) 138

Q14 (a) 7040 (b) 374
 (c) 64.3 (d) 235

Q15 (a) $AB^2 = 95.5^2 + 83.1^2 - 2 \times 95.5 \times 83.1 \times \cos 101$
 $\therefore AB = 138$
 (b) 110° (c) 18.8

Q16 (a) (i) 25.4 (ii) 109 (iii) 1340
 (b) 51.5

Answers.

Q17 (a) 123 to 127 (b) 288 to 292

(c) 1 : 000000

(d) draw perp bisector of CB,
draw angular bisector of angle ACB
draw a line \parallel CB at a dist of 1.5cm
shade the correct region,

(e) 40

Q18 (a) 1.6 (b) 43.5 (c) 1.33 (d) 41.1

Q19 (a) 2180 (b) 78.7 (c) 309

(d) (i) 23 39 (ii) 650

Q20 (a) 0.44 to 0.48 (b) 12.6 to 13.2

(c) 340 (d) 1 : 15 0000

(e) draw perp bisector of SL,
draw angular bisector of angle PSL
B marked correctly.

(f) 3375

Q21 (a) 86.8 (b) 51.2 (c) 6700

(d) 2180

Q22 (a) (i) 72 (ii) 16.2

(b) 7.61 (c) 50° ; 130°

Q23 7.62 cm.

Q24 (a) angle LPQ = 32° , use cosine rule

$$LQ^2 = 58^2 + 74^2 - 2 \times 58 \times 74 \times \cos 32^\circ$$

$$\therefore LQ = 39.50$$

$$(b) \sin PAL = \frac{58 \sin 32^\circ}{39.5}$$

$$\therefore \text{angle PAL} = 51.1^\circ$$

(c) (i) 322 (ii) 0.13

(d) 1.78 (e) 30.7

Q25 (a) 31.4 (b) $\sin AEC = \frac{15.7 \times \sin 52^\circ}{16.5}$

$$\therefore \text{angle AEC} = 48.57^\circ$$

$$(c) \angle ACE = 180 - (52 + 48.57) = 79.43$$

$$\therefore \angle ECD = 40.57^\circ$$

(ii) 15.3 (d) 466

Q26 6.61

$$Q27 \text{ cos } \angle MN = \frac{12^2 + 21^2 - 15^2}{2 \times 12 \times 21}$$

$$\text{angle LMN} = 44.61^\circ$$

(ii) 88.2

(b) 7.74

Q28 (a) draw perp. bisector of QR,

draw angular bisector of angle SPL

draw a circle with centre R and radius 6cm,

(i) correct shaded region

(ii) 217 to 221

(b) (i) 6360 (ii) 165.

Q29 (a) 45 (b) 84.9

(c) (i) 4060 (ii) 1020 (d) 35.4

Q30 (a) 119.94 (b) 109

(c) 1970 (d) 22300

Q31 (a) (i) 5.14 (ii) 15.64 to 15.68

(b) 3.79