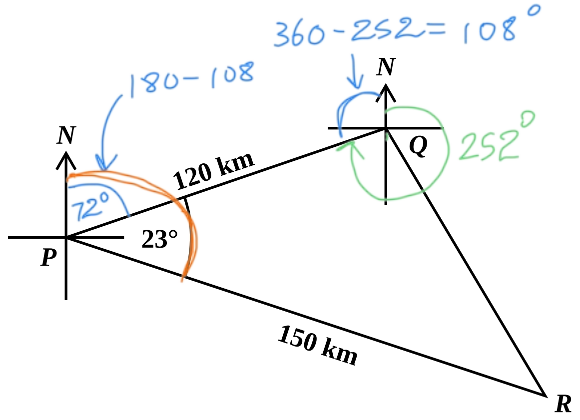
(b) The diagram below, **not drawn to scale**, shows the positions of three points, P, Q and R on a horizontal plane.

$PQ = 120$ km $\quad PR = 150$ km $\quad \angle QPR = 23°$



(i) Calculate, correct to one decimal place

a) the distance QR 61.3 km **(3 marks)**

b) the area of triangle PQR. 3516.6 km² **(2 marks)**

(ii) The bearing of P from Q is 252°. Calculate the bearing of R from P. **(4 marks)**

Total 15 marks

i) a) Using Cosine Rule:

$QR^2 = 120^2 + 150^2 - 2(120)(150)\cos 23°$

$QR^2 = 36900 - 36000(0.9205...)$

$QR^2 = 3761.825276$

$QR = \sqrt{3761.825276}$

$QR = 61.3$ km

b) Area of $PQR = \frac{1}{2}(150)(120)\sin 23°$

$= 3516.6 \text{ km}^2$

$N\hat{Q}P = 252°$ (reflex)

$\therefore$ the obtuse angle at NQP

$= 360 - 252 = 108°$

$N\hat{P}Q + N\hat{Q}P = 180°$

$N\hat{P}Q + 108° = 180°$

$N\hat{P}Q = 72°$

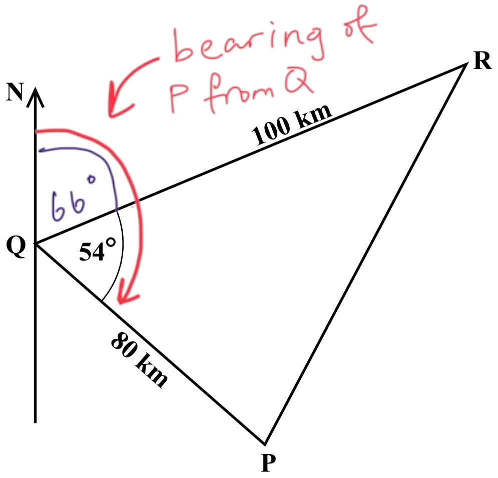
The bearing of R from P

$= NPQ + 23°$

$= 72° + 23°$

$= 95°$ (shown in orange)

(b) The diagram below, **not drawn to scale**, shows the positions of three ports, *P*, *Q* and *R*.



Q is 80 km from *P*.

R is 100 km from *Q* on a bearing of 066°.

<*PQR* = 54°.

Calculate

(i) the bearing of *P* from *Q* $66° + 54° = 120°$ **(2 marks)**

(ii) the distance *PR* correct to 2 decimal places 83.64 km **(3 marks)**

(iii) the measure of <*QPR* to the **nearest** degree. 75° **(3 marks)**

Total 15 marks

ii) Using Cosine Rule:

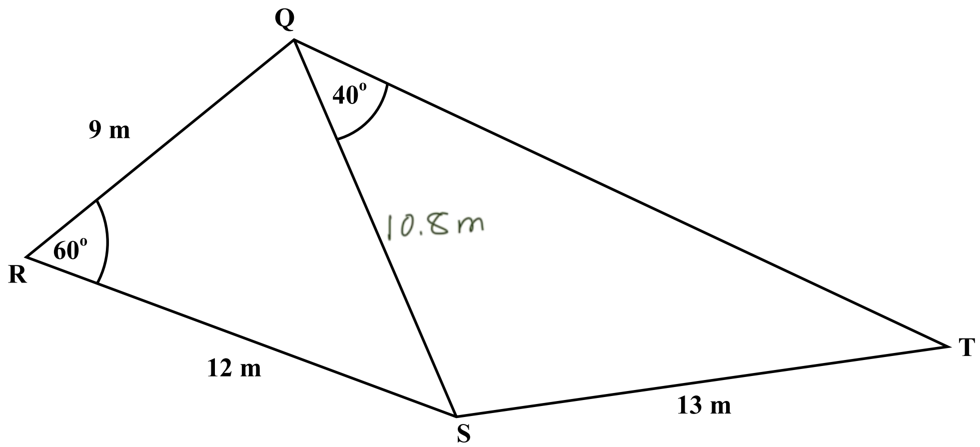
$$PR^2 = 80^2 + 100^2 - 2(80)(100)\cos 54°$$
$$= 6400 + 10000 - 16000(0.587785252)$$
$$= 16400 - 9404.564037$$
$$= 6995.435963$$
$$PR = \sqrt{6995.435963}$$
$$PR = 83.64 \text{ km}$$

iii) Using Sine Rule: $\dfrac{100}{\sin QPR} = \dfrac{83.64}{\sin 54}$

$$83.64 \sin QPR = 100 \sin 54$$
$$\sin QPR = \frac{100 \sin 54}{83.64}$$
$$\sin QPR = 0.96726$$
$$QPR = \sin^{-1}(0.96726)$$
$$QPR = 75°$$

MEASUREMENT, GEOMETRY AND TRIGONOMETRY

10. (a) On the diagram below, **not drawn to scale**, $RQ = 9$ m, $RS = 12$ m, $ST = 13$ m, $<QRS = 60^{o}$ and $<SQT = 40^{o}$.



Calculate, correct to 1 decimal place,

(i) the length QS

Using Cosine Rule:

$QS^2 = 9^2 + 12^2 - 2(9)(12)\cos 60^{\circ}$

$= 81 + 144 - 216(0.5)$

$= 117$

$QS = \sqrt{9.0082}$

$QS = 10.8$ m

(2 marks)

(ii) the measure of $<QTS$

Using sine rule:

$\frac{10.8}{\sin QTS} = \frac{13}{\sin 40^{\circ}}$

$13 \sin QTS = 10.8 \sin 40^{\circ}$

$\sin QTS = \frac{10.8 \sin 40^{\circ}}{13}$

$\sin QTS = 0.534008...$

$QTS = \sin^{-1}(0.534008...)$

$QTS = 32.3^{\circ}$

(2 marks)

GO ON TO THE NEXT PAGE

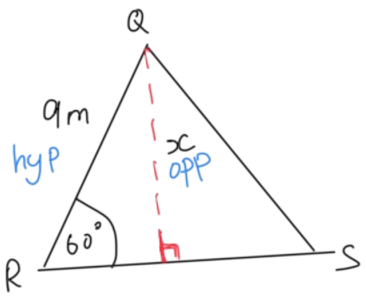
(iii) the area of triangle *QRS*

Area of QRS $= \frac{1}{2}(9)(12)\sin 60$

$= 46.8\,m^2$

(2 marks)

(iv) the perpendicular distance from *Q* to *RS*.



Using $\sin\theta = \frac{opp}{hyp}$

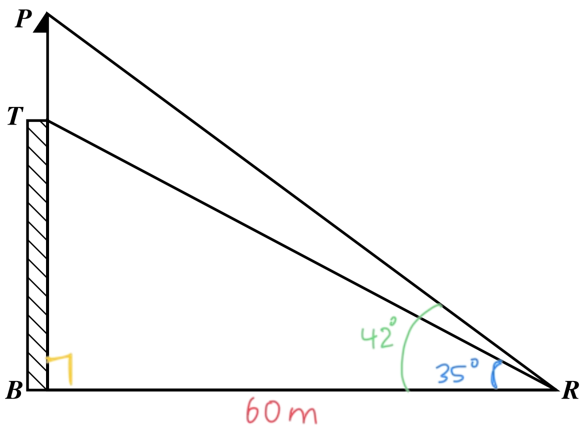
$\sin 60° = \frac{x}{9}$

$9\sin 60° = x$

Ans $= 7.8\,m$

(1 mark)

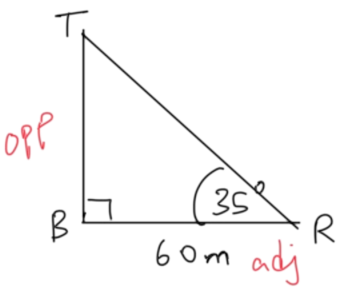
10. (a) The diagram below, **not drawn to scale**, shows a vertical tower, *BT*, with a flagpole, *TP*, mounted on it. A point *R* is on the same horizontal ground as *B*, such that *RB* = 60 m, and the angles of elevation of *T* and *P* from *R* are 35° and 42°, respectively.



(i) Label the diagram to show

- the distance 60 m
- the angles of 35° and 42°
- any right angle(s). **(3 marks)**

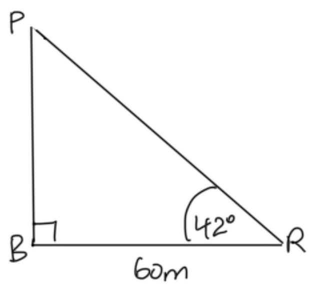
(ii) Calculate the length of the flagpole, giving your answer to the nearest metre.



$TB: \tan 35° = \frac{TB}{60}$

$TB = 60 \tan 35°$

$TB = 42m$



Similarly,

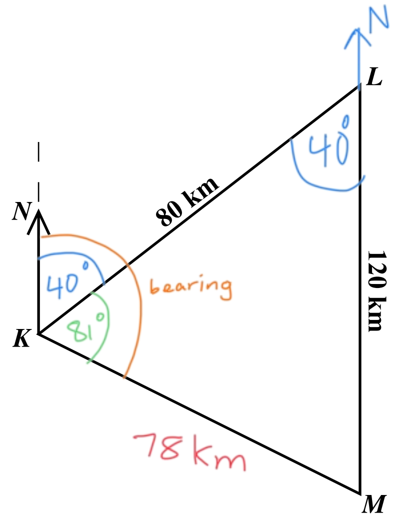
$PB = 60 \tan 42°$

$PB = 54m$

(4 marks)

Therefore PT, the length of the flagpole is $54 - 42 = 12m$.

(b) The diagram below, **not drawn to scale**, shows the relative positions of three fishing boats, K, L and M. L is on a bearing of 040° from K and M is due south of L. LM = 120 km and KL = 80 km.



(i) On the diagram show the bearing of 040°. **(1 mark)**

(ii) Calculate the measure of $\angle KLM$.

$\angle NKL = \angle KLM = 40°$ because they are alternate interior angles between the parallel North lines and the transversal KL.

(1 mark)

(iii) Calculate the length, to the nearest kilometre, of KM.

Using Cosine Rule:

$KM^2 = 80^2 + 120^2 - 2(80)(120)\cos 40°$

$= 6400 + 14400 - 19200(0.76604\ldots)$

$= 6091.946692$

$KM = \sqrt{6091.946692}$

(3 marks)

$KM = 78$ km

(iv) Calculate the measure of $\angle LKM$ to the nearest degree.

Using Sine rule: $\frac{120}{\sin LKM} = \frac{78}{\sin 40}$

$78 \sin LKM = 120 \sin 40$

$\sin LKM = \frac{120 \sin 40}{78}$

$\sin LKM = 0.988904014$

$LKM = \sin^{-1}(0.9889...)$

$\angle LKM = 81°$

(2 marks)

(v) Calculate the bearing of *M* from *K*.

Bearing of M from K $= 40 + 81$

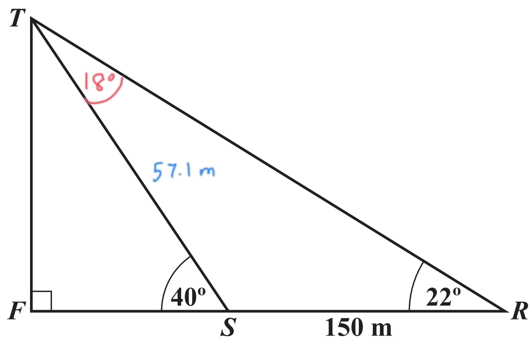
$= 121°$

(shown in orange)

(1 mark)

Total 15 marks

(b) The diagram below, **not drawn to scale**, shows two ships, *R* and S at anchor on a lake of calm water. *FT* is a vertical tower. *FSR* is a straight line and *RS* = 150 m. The angles of elevation of *T*, the top of a tower, from *R* and *S*, are 22° and 40° respectively. *F* is the foot of the tower.



Calculate, giving your answer to 1 decimal place where appropriate

(i) the measure of $\angle RTS$

RTS = RTF − STF

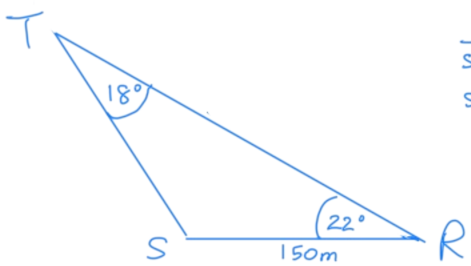
$\angle RTF = 180 - (90 + 22) = 68^\circ$

$\angle STF = 180 - (90 + 40) = 50^\circ$

$\therefore \angle RTS = 68 - 50 = 18^\circ$

(1 mark)

(ii) the length of *ST*



Using Sine Rule:

$\frac{ST}{\sin 22^\circ} = \frac{150}{\sin 18^\circ}$

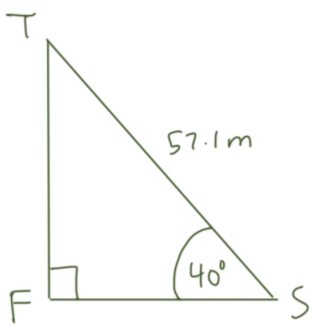
$ST \sin 80 = 150 \sin 22^\circ$

$ST = \frac{150 \sin 22^\circ}{\sin 80^\circ}$

$ST = 57.1\text{ m}$

(3 marks)

(iii) the height of the tower, *FT*.



Using $\sin \theta = \frac{opp}{hyp}$

$\sin 40^\circ = \frac{FT}{57.1}$

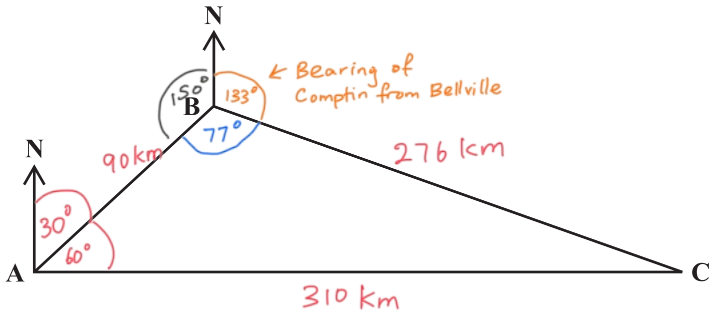
$FT = 57.1 \sin 40^\circ$

$FT = 36.7\text{m}$

(3 marks)

Total 15 marks

(b) A ship travels from Akron (A) on a bearing of 030° to Bellville (B), 90 km away. It then travels to Comptin (C) which is 310 km due east of Akron (A), as shown in the diagram below.



(i) Indicate on the diagram the bearing 030° and the distances 90 km and 310 km.
(2 marks)

(ii) Calculate, to the nearest km, the distance between Bellville (B) and Comptin (C).

Using Cosine Rule:

$$BC^2 = 90^2 + 310^2 - 2(90)(310)\cos 60^\circ$$

$$BC^2 = 8100 + 96100 - 27900$$

$$= 76300$$

$$BC = \sqrt{76300}$$

$$BC = 276 \text{ km}$$

(2 marks)

(iii) Calculate, to the nearest degree, the measure of $A\hat{B}C$.

Using Sine Rule: $\dfrac{276}{\sin 60^\circ} = \dfrac{310}{\sin ABC}$

$$276 \sin ABC = 310 \sin 60^\circ$$

$$\sin ABC = \frac{310 \sin 60^\circ}{276}$$

$$ABC = \sin^{-1}\left(\frac{310 \sin 60^\circ}{276}\right)$$

$$A\hat{B}C = 77^\circ$$

(2 marks)

(iv) Determine the bearing of Comptin (C) from Bellville (B).

Bearing of C from B $= 360 - N\hat{B}A + A\hat{B}C$

$= 360^\circ - (150 + 77)^\circ$

$= 133^\circ$

$N\hat{B}A = 180 - 30$

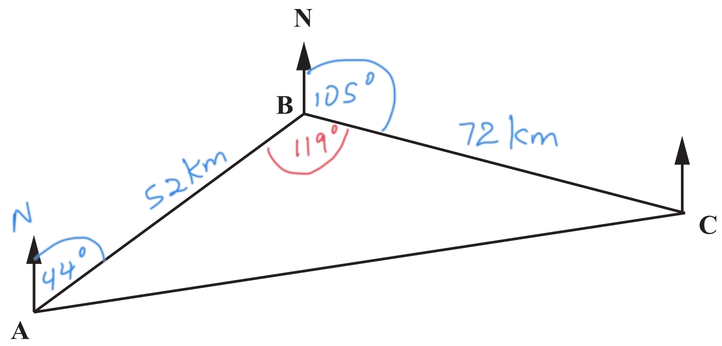
$= 150^\circ$

(3 marks)

Total 15 marks

(b) A ship leaves Port A and sails 52 km on a bearing of 044° to Port B. The ship then changes course to sail to Port C, 72 km away, on a bearing of 105°.

(i) On the diagram below, **not drawn to scale**, label the known distances travelled and the known angles.



(2 marks)

(ii) Determine the measure of $\angle ABC$.

$$A\hat{B}N = 180 - 44$$
$$= 136°$$
$$A\hat{B}C = 360 - (136 + 105)$$
$$= 119°$$

(2 marks)

(iii) Calculate, to the nearest km, the distance AC.

Using Cosine Rule:

$AC^2 = 52^2 + 72^2 - 2(52)(72)\cos 119^\circ$

$= 2704 + 5184 - (-3630.254\ldots)$

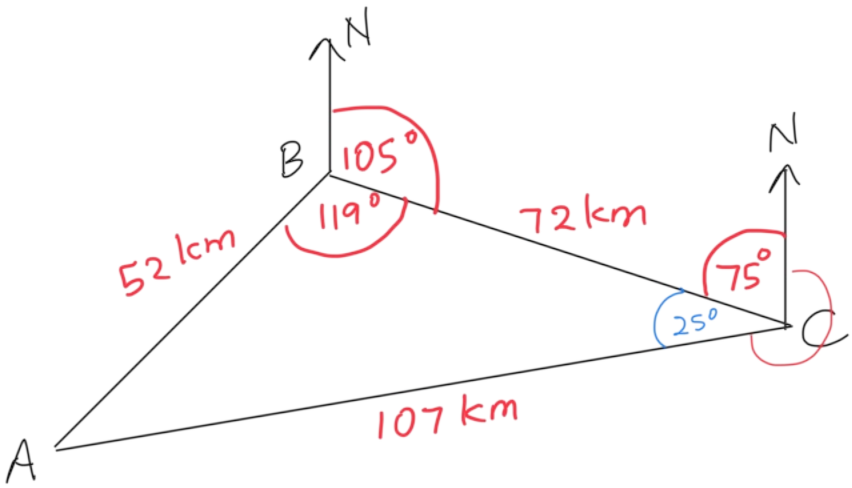
$= 11518.25444$

$AC = \sqrt{11518.25444}$

$AC = 107$ km

(3 marks)

(iv) Show that the bearing of A from C, to the nearest degree, is 260°.



Using cosine rule:

$52^2 = 107^2 + 72^2 - 2(107)(72)\cos C$

$2704 = 16633 - 15408\cos C$

$2704 - 16633 = -15408\cos C$

$-13929 = -15408\cos C$

$\cos C = \frac{-13929}{-15408}$

$C = \cos^{-1}(0.90401\ldots)$

$C = 25^\circ$

$\therefore$ Bearing of A from C

$= 360 - (75 + 25)$

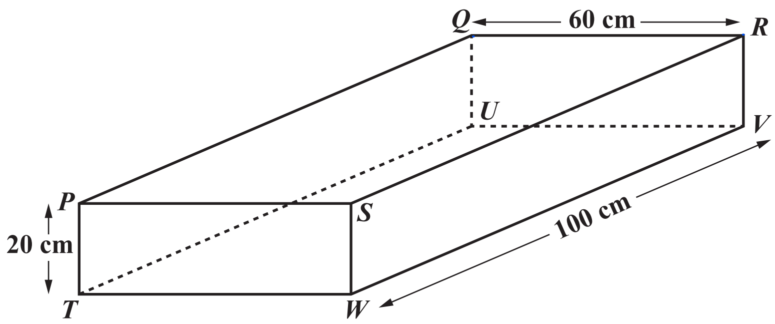
$= 260^\circ$

Q.E.D.

(3 marks)

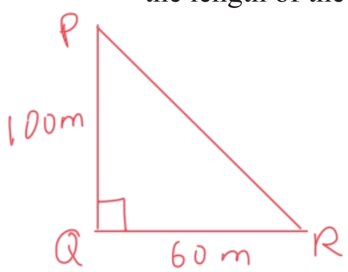
Total 15 marks

(b) The diagram below shows a cuboid.



Give your answer correct to one decimal place.

(i) A straight adjustable wire connects R to P along the top of the cuboid. Calculate the length of the wire RP.



$RP = \sqrt{100^2 + 60^2}$

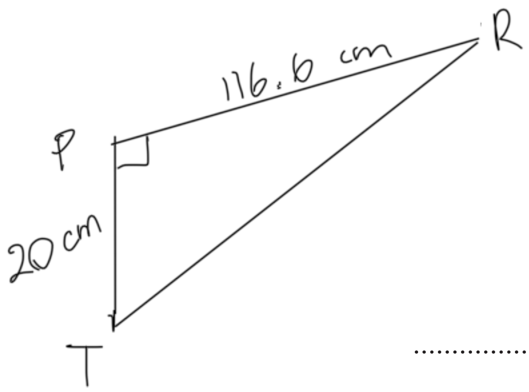
$RP = \sqrt{13600}$

116.6 cm

(1 mark)

(ii) The connection at P is now adjusted and moved to T.

Calculate the length of the wire RT.



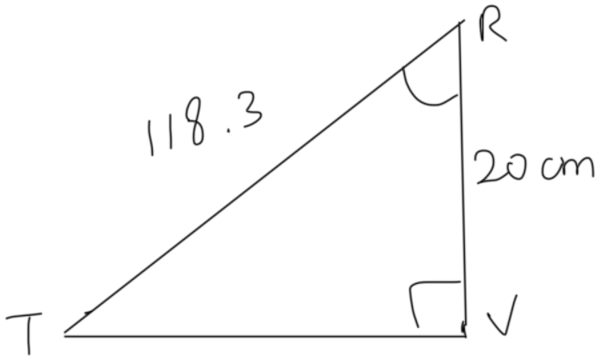
$RT = \sqrt{116.6^2 + 20^2}$

$RT = \sqrt{13995.56}$

118.3 cm

(2 marks)

(iii) Calculate the angle *TRV*.



Using $\cos\theta = \frac{adj}{hyp}$

$\cos TRV = \frac{20}{118.3}$

$TRV = \cos^{-1}(0.16906)$

80.3° ....

(2 marks)

(iv) Complete the following statements:

The size of the angle through which the wire moves from *RP* to *RT* is 9.8 °.

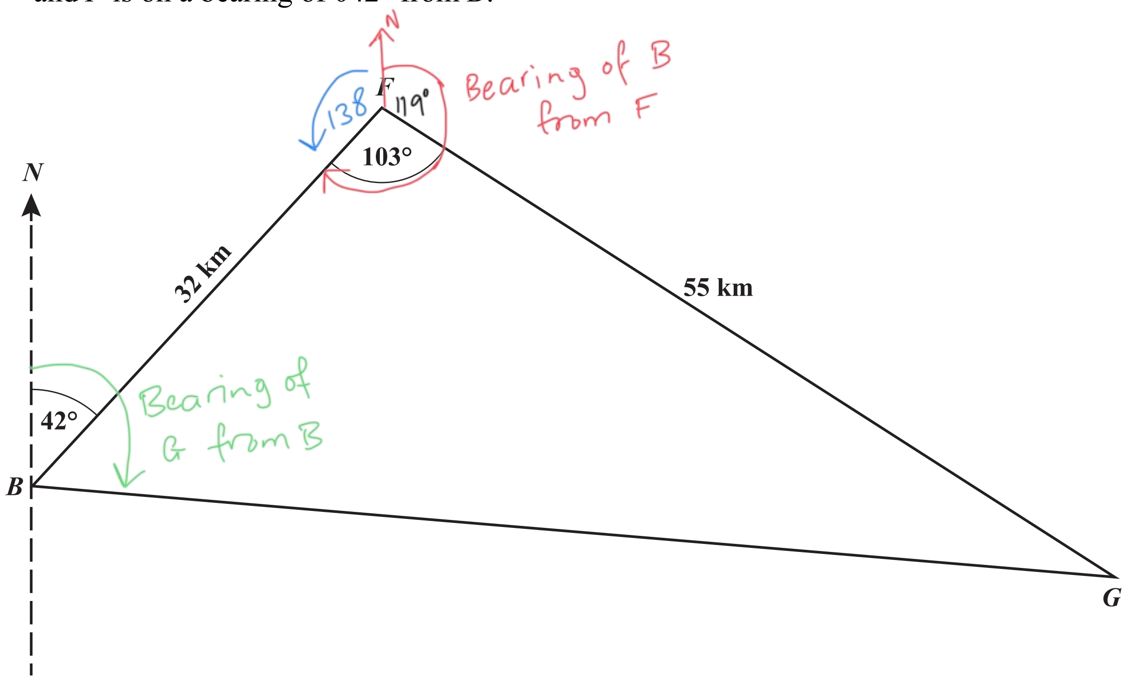
An angle which is the same in size as *RTV* is TRP

(2 marks)

Total 15 marks

GEOMETRY AND TRIGONOMETRY

9. (a) The diagram below, **not drawn to scale**, shows the relative positions of three reservoirs B, F and G, all on level ground. The distance BF = 32 km, FG = 55 km, $\angle BFG$ is 103° and F is on a bearing of 042° from B.



(i) Determine the bearing of B from F.

$119 + 103 = 222^\circ$

222° ....

(1 mark)

(ii) Calculate the distance *BG*, giving your answer to one decimal place.

Using Cosine Rule:

$BG^2 = 32^2 + 55^2 - 2(32)(55)\cos 103^\circ$

$= 4049 - (-791.8277113)$

$= 4840.827711$

$BG = \sqrt{4840.827711}$

$BG = 69.6$

69.6 km

(2 marks)

(iii) Calculate, to the nearest degree, the bearing of *G* from *B*.

Using sine rule:

$\frac{55}{\sin B} = \frac{69.6}{\sin 103}$

$69.6 \sin B = 55 \sin 103$

$\sin B = \frac{55 \sin 103}{69.6}$

$\sin B = 0.769976344$

$B = \sin^{-1}(0.7699\ldots)$

$B = 50^\circ$

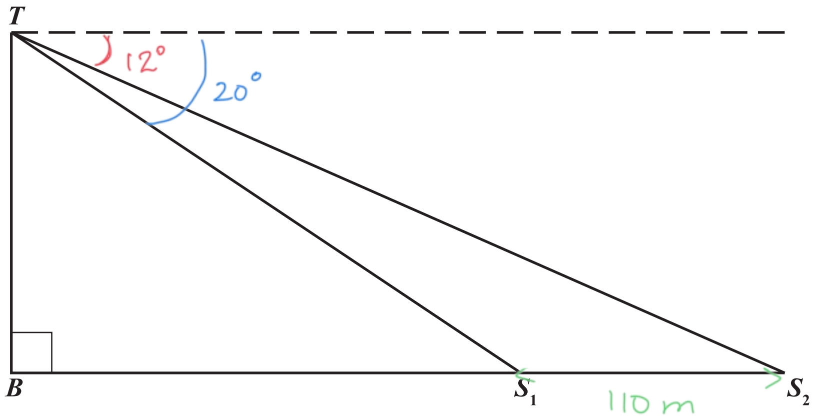
Bearing of G from B $= 42^\circ + 50^\circ$

92°

(3 marks)

(b) A person at the top of a lighthouse, *TB*, sees two ships, S_1 and S_2, approaching the coast as illustrated in the diagram below. The angles of depression are 12° and 20° respectively. The ships are 110 m apart.

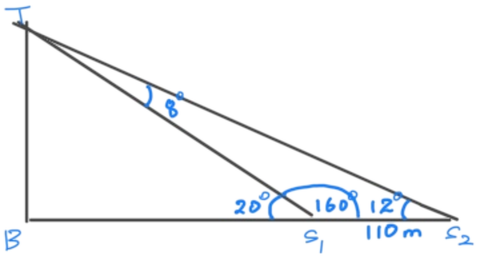
(i) Complete the diagram below by inserting the angles of depression and the distance between the ships.



(1 mark)

(ii) Determine, to the nearest metre,

a) the distance, TS_2, between the top of the lighthouse and Ship 2



Using sine rule:

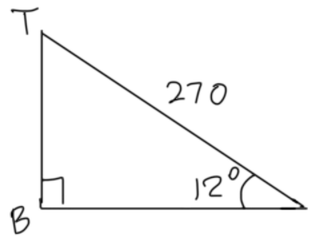
$$\frac{110}{\sin 8^\circ} = \frac{TS_2}{\sin 160^\circ}$$

$$TS_2 = \frac{110 \sin 160}{\sin 8^\circ}$$

270 m

(3 marks)

b) the height of the lighthouse, *TB*.



Using $\sin\theta = \frac{opp}{hyp}$

$$\sin 12^\circ = \frac{TB}{270}$$

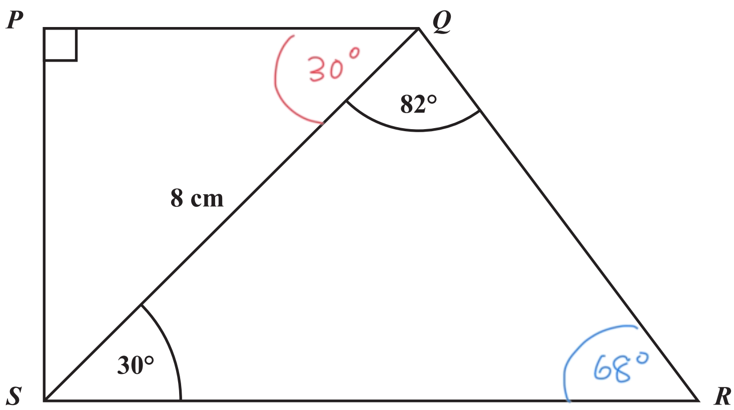
$$TB = 270 \sin 12^\circ$$

56m

(2 marks)

Total 12 marks

(b) The diagram below shows a quadrilateral *PQRS* where *PQ* and *SR* are parallel, *SQ* = 8 cm, $\angle SPQ = 90°$, $\angle SQR = 82°$ and $\angle QSR = 30°$.



Determine

(i) the length *PS*

Using $\sin\theta = \frac{opp}{hyp}$

$\sin 30° = \frac{PS}{8}$

$PS = 8 \sin 30°$

4 cm
....

(2 marks)

(ii) the length *PQ*

By Pythagoras' Theorem:

$PQ = \sqrt{8^2 - 4^2}$

$PQ = \sqrt{48}$

6.9 cm

(1 mark)

(iii) the area of *PQRS*.

Using sine rule: $\frac{8}{\sin 68} = \frac{SR}{\sin 82}$

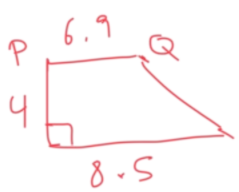
$SR \sin 68 = 8 \sin 82$

$SR = \frac{8 \sin 82}{\sin 68}$

$SR = 8.5$ cm

Area of $PQRS = \frac{1}{2}(8.5 + 6.9) \times 4$

$= 30.8 \text{ cm}^2$



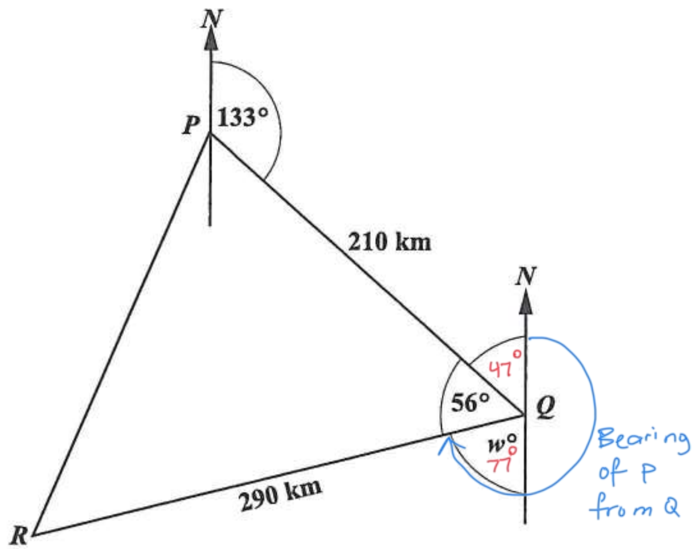
PQRS is a trapezium.

30.8 cm^2

(3 marks)

Total 12 marks

(b) The diagram below, **not drawn to scale**, shows the route of a ship cruising from Palmcity (P) to Quayton (Q) and then to Rivertown (R). The bearing of Q from P is 133° and the angle PQR is 56°.



(i) Calculate the value of angle w.

$PQN = 180 - 133 = 47°$

$w = 180 - (47 + 56)$

77°

(2 marks)

(ii) Determine the bearing of P from Q.

$180 + 77 = 257^{\circ}$

257°

(1 mark)

(iii) Calculate the distance RP.

Using cosine rule:

$RP^2 = 210^2 + 290^2 - 2(210)(290)\cos 56^{\circ}$

$RP^2 = 44100 + 84100 - 68109.69564$

$Rp^2 = 60090.30436$

$RP = \sqrt{60090.30436}$

245.13 km

(3 marks)

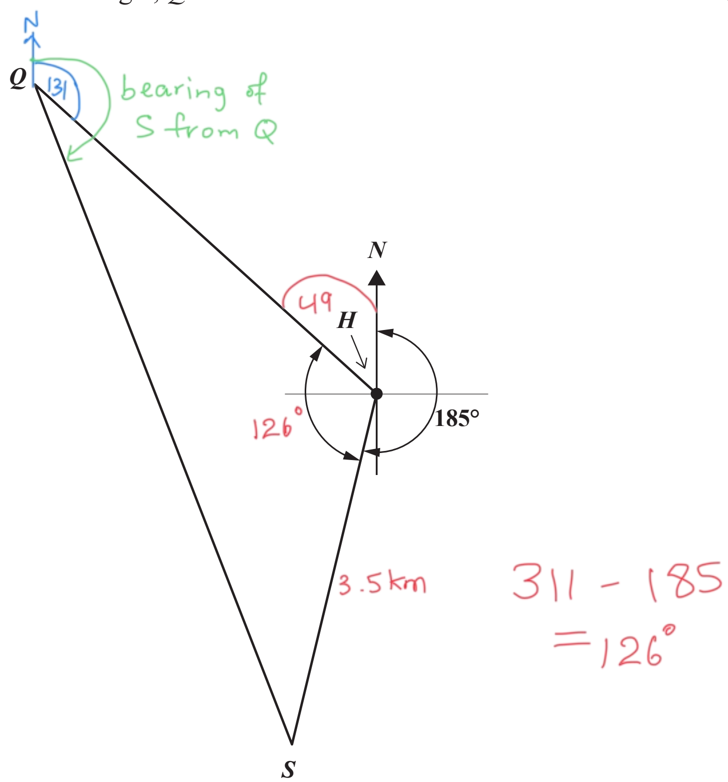
Total 12 marks

(iii) Calculate the value of angle r.

(1 mark)

(b) From a harbour, H, the bearing of two buoys, S and Q, are 185° and 311° respectively. Q is 5.4 km from H while S is 3.5 km from H.

(i) On the diagram below, which shows the sketch of this information, insert the value of the marked angle, QHS. **(1 mark)**



(ii) Calculate QS, the distance between the two buoys.

Using cosine rule:

$QS^2 = 3.5^2 + 5.4^2 - 2(3.5)(5.4)\cos 126°$

$= 12.25 + 29.14 - (-22.2182\ldots)$

$= 63.62828254$

$QS = \sqrt{63.628\ldots}$

8.0 km (1 d.p.) ....

(2 marks)

(iii) Calculate the bearing of S from Q.

Using sine rule:

$\frac{3.5}{\sin Q} = \frac{8}{\sin 126}$

$8 \sin Q = 3.5 \sin 126$

$Q = \sin^{-1}\left(\frac{3.5 \sin 126}{8}\right)$

$Q = 21°$ (2 s.f.)

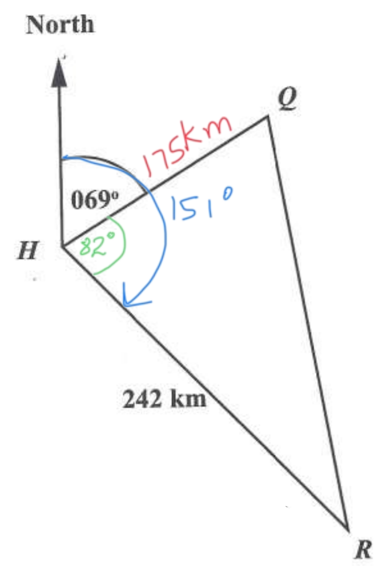
$21 + 131 = 152$

152° ....

(3 marks)

Total 12 marks

(b) From a harbour, H, the bearing of two ships, Q and R, are 069° and 151° respectively. Q is 175 km from H while R is 242 km from H.



(i) Complete the diagram above to show the information given. **(1 mark)**

(ii) Calculate QR, the distance between the two ships, to the nearest km.

Using Cosine Rule :

$QR^2 = 175^2 + 242^2 - 2(175)(242)\cos 82°$

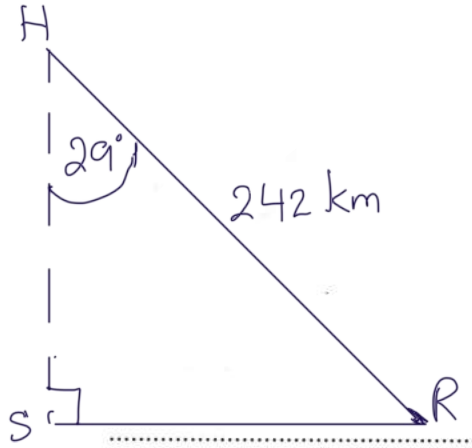
$QR^2 = 77401.03835$

$QR = \sqrt{77401.03835}$

278 km

(3 marks)

(iii) Calculate how far due south is Ship R of the harbour, H.



$180 - (69 + 82) = 29^\circ$

Using $\cos\theta = \frac{adj}{hyp}$

$\cos 29 = \frac{HS}{242}$

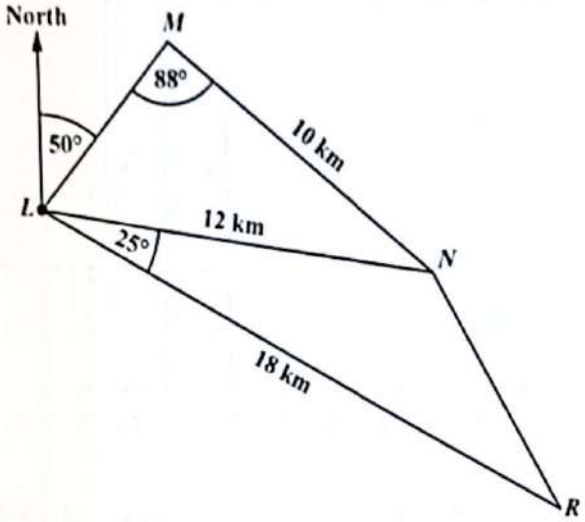
$HS = 242 \cos 29$

211.7 km ....

(2 marks)

Total 12 marks

(b) The diagram below shows straight roads connecting the towns L, M, N and R. $LR = 18$ km, $LN = 12$ km and $MN = 10$ km. Angle $RLN = 25°$ and angle $LMN = 88°$.



(i) Calculate angle MLN.

Using sine rule:

$$\frac{10}{\sin MLN} = \frac{12}{\sin 88}$$

$$12 \sin MLN = 10 \sin 88$$

$$MLN = \sin^{-1}\left(\frac{10 \sin 88}{12}\right)$$

56.4^{o}

(3 marks)

(ii) Calculate the distance NR.

Using cosine rule:

$$NR^2 = 12^2 + 18^2 - 2(12)(18)\cos 25^{o}$$

$$= 76.475036$$

$$NR = \sqrt{76.475036}$$

8.7 km

(2 marks)

(iii) Determine the bearing of Town *R* from Town *L*.

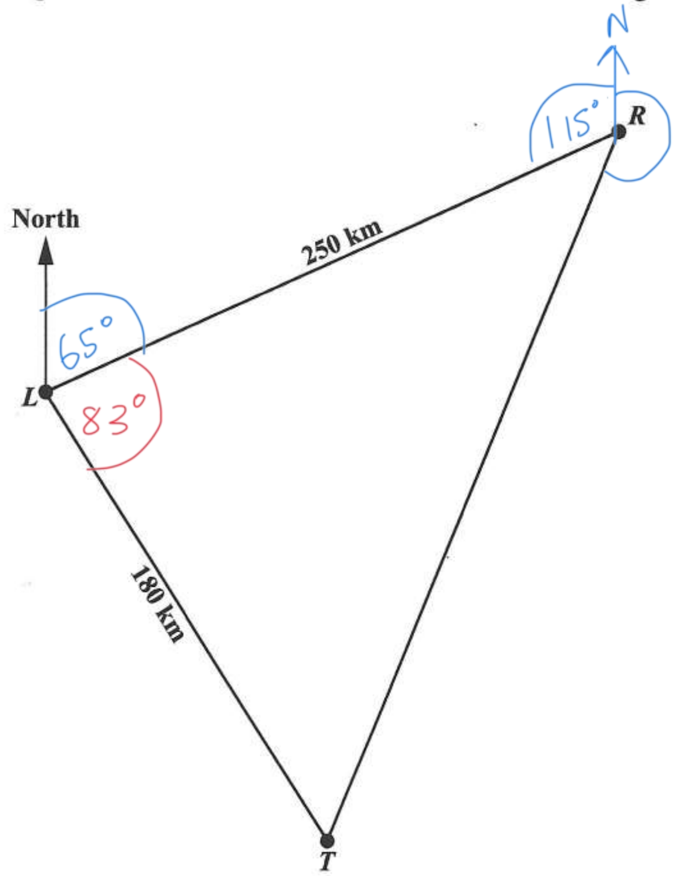
$50 + 56 + 25 = 131$

131

(1 mark)

Total 12 marks

(b) From a port, L, ship R is 250 kilometres on a bearing of 065°. Ship T is 180 kilometres from L on a bearing of 148°. This information is illustrated in the diagram below.



(i) Complete the diagram above by inserting the value of angle RLT. **(1 mark)**

(ii) Calculate RT, the distance between the two ships.

Using Cosine rule:

$RT^2 = 180^2 + 250^2 - 2(180)(250)\cos 83^\circ$

$RT^2 = 83931.75909$

$RT = \sqrt{83931.75909}$

289.7 km

(2 marks)

(iii) Determine the bearing of T from R.

Using sine rule:

$$\frac{289.7}{\sin 83} = \frac{180}{\sin R}$$

$$289.7 \sin R = 180 \sin 83$$

$$R = \sin^{-1}\left(\frac{180 \sin 83}{289.7}\right)$$

$$R = 38^{\circ}$$

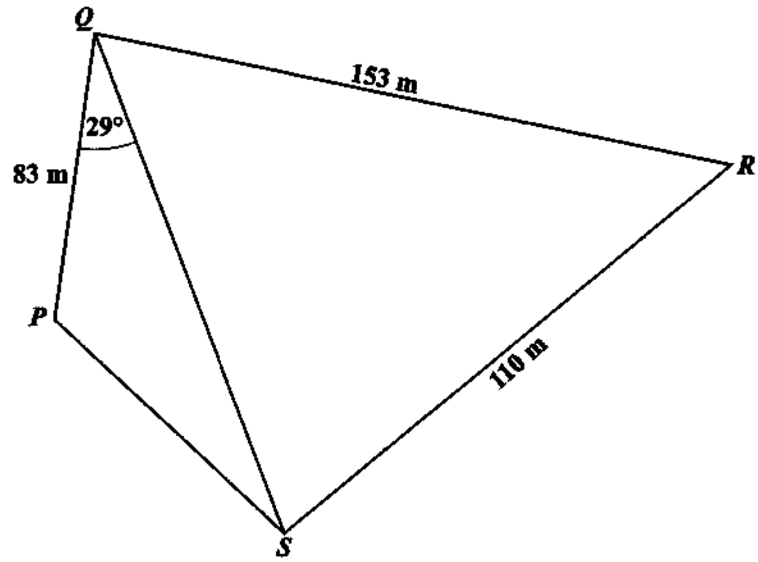
$$360 - (115 + 38) = 207$$

207°

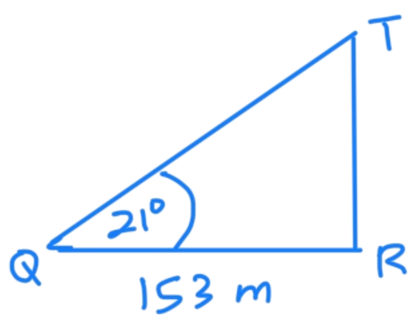
(3 marks)

Total 12 marks

(c) The diagram below shows 4 points, P, Q, R and S on level ground, where pillars will be placed to mark the outline for a foundation.



(i) There is a vertical post, RT, at R. From Q, the angle of elevation of the top of the post, T, is 21°. Find the height of the post.



Using $\tan\theta = \frac{opp}{adj}$

$\tan 21° = \frac{RT}{153}$

$RT = 153 \tan 21$

58.7 m (1 d.p.)

(2 marks)

(ii) Given that the length QS is 135 m, calculate the perimeter of the foundation $PQRS$.

Using cos rule:

$PS^2 = 83^2 + 135^2 - 2(83)(135)\cos 29$

$PS^2 = 5513.772363$

$PS = \sqrt{5513.772363}$

$PS = 74.3$ km

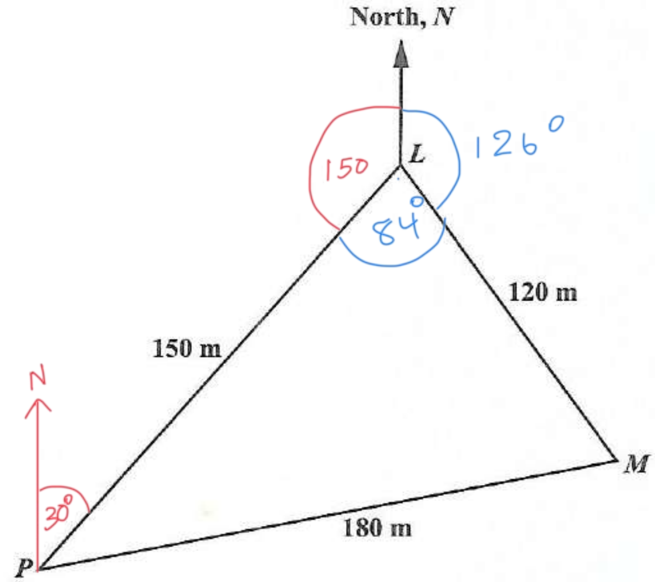
Perimeter $= 74.3 + 110 + 153 + 83$

420.3

(4 marks)

Total 12 marks

(b) The diagram below shows a triangular field, *LMP*, on horizontal ground.



(i) Calculate the value of Angle *MLP*.

Using Cosine Rule:

$180^2 = 150^2 + 120^2 - 2(180)(120)\cos MLP$

$32400 = 36900 - 43200\cos MLP$

$32400 - 36900 = -43200\cos MLP$

$-4500 = -43200\cos MLP$

$\cos MLP = \dfrac{4500}{43200}$

$MLP = \cos^{-1}(0.104166\ldots)$

84°

(3 marks)

(ii) The bearing of P from L is 210°.

a) Find the bearing of M from L.

$210 - 84$

$126°$

(1 mark)

b) Calculate the value of Angle NLP and hence, find the bearing of L from P.

$NLP = 360 - 210$

$= 150°$

L from $P = 180 - 150$

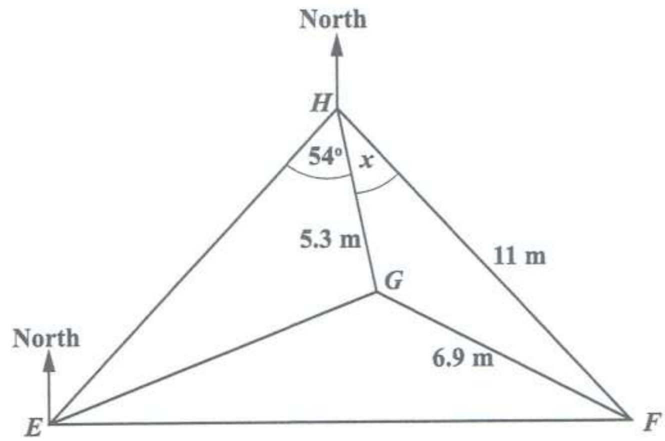
$= 30°$

$030°$

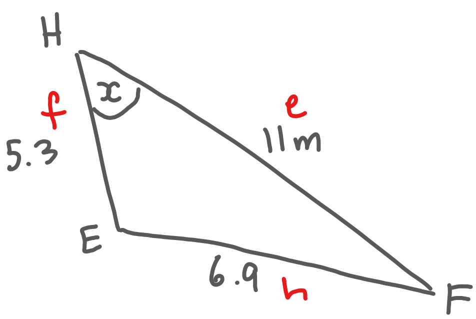
(2 marks)

Total 12 marks

(b) E, F, G and H are 4 points on level ground. The diagram below gives information on the distances and angles between the points.



(i) Show that the value of x is 29.5°, correct to 1 decimal place.



Using Cos Rule:

$$6.9^2 = 5.3^2 + 11^2 - 2(5.3)(11)\cos x$$

$$47.61 = 28.09 + 121 - 116.6\cos x$$

$$47.61 = 149.09 - \boxed{116.6\cos x}$$

$$47.61 - 149.09 = -116.6\cos x$$

$$-101.48 = -116.6\cos x$$

$$\frac{101.48}{116.6} = \cos x$$

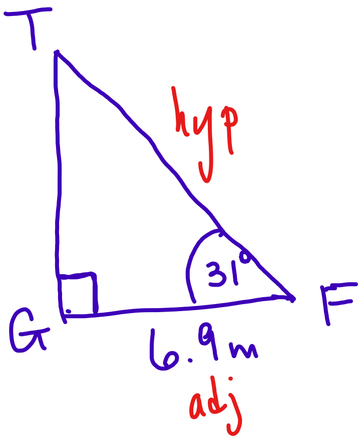
$$x = \cos^{-1}\left(\frac{101.48}{116.6}\right)$$

$$x = 29.5° \ (1\text{ dp})$$

Q.E.D.

(2 marks)

(ii) A vertical tower, GT, is constructed at the point G and is pivoted to the ground at the points E, F and H using pieces of wire. The angle of elevation of the top of the tower, T, from the point F is 31°.



What length of wire was used to secure Point T to Point F?

Using $\cos\theta = \frac{adj}{hyp}$

$$\frac{\cos 31^\circ}{1} = \frac{6.9}{TF}$$

$$TF \cos 31^\circ = 6.9$$

$$TF = \frac{6.9}{\cos 31^\circ}$$

8.0 m

(2 marks)

(iii) The bearing of E from H is 228°. Find the bearing of

a) H from E

$360 - 228 = 132^\circ$
$180 - 132 = 48^\circ$

48°

(1 mark)

b) G from H.

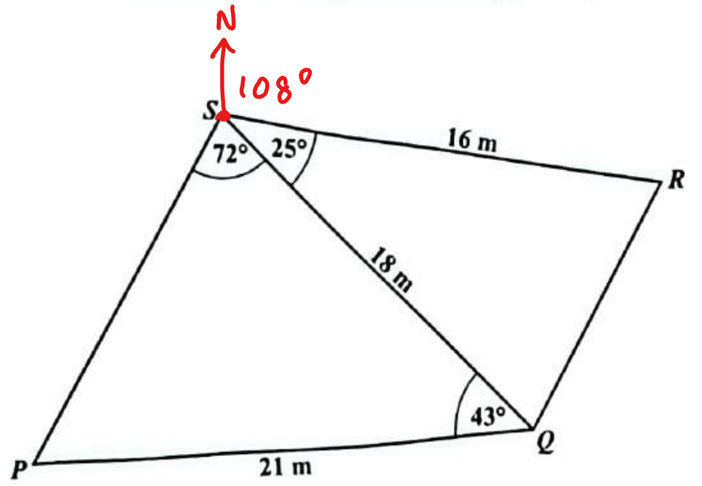
$228 - (54 + 29.5) = 144.5$
$144.5 + 29.5 = 174$

174°

(1 mark)

Total 12 marks

(b) The diagram below shows a quadrilateral *PQRS* formed by joining two triangles, *PQS* and *QRS*.



(i) Calculate the length of *QR*.

Using Cos Rule:

$QR^2 = 18^2 + 16^2 - 2(18)(16)\cos 25°$

$= 580 - 522.0332...$

$QR^2 = 57.9668$

$QR = \sqrt{57.9668}$

7.6m (1d.p.)

(3 marks)

(ii) The bearing of P from S is 205°. Determine the bearing of

a) R from S

$205 - (25 + 72)$

108°

(1 mark)

b) S from P.

$360 - 205 = 155$

$180 - 155 = 25$

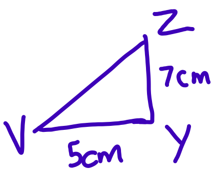
25°

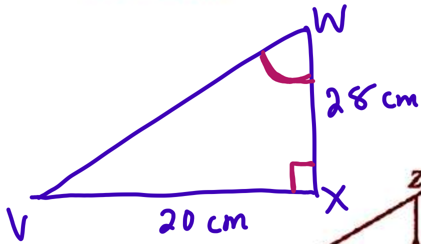
(2 marks)

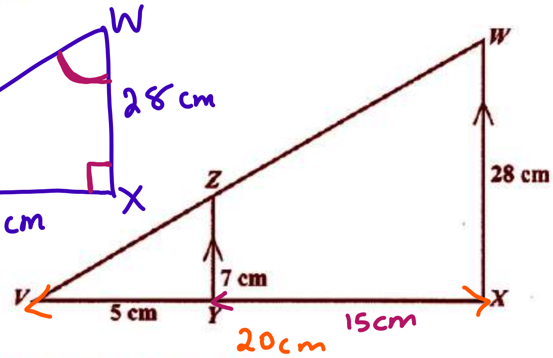
Total 12 marks

Jan 2026

(b) The diagram below shows two similar, right-angled triangles drawn from a common vertex, V. The lines ZY and WX are parallel. Also, the lines $VY = 5$ cm, $ZY = 7$ cm and $WX = 28$ cm.







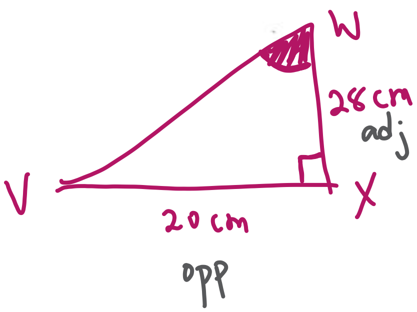
VZY : VWX

$\frac{5^{\times 4}}{7_{\times 4}} : \frac{20}{28}$

(i) Calculate the length of YX. 15 cm **(3 marks)**

(ii) Determine the magnitude of Angle VWX. **(2 marks)**

Total 9 marks



Using $\tan \theta = \frac{opp}{adj}$

$\tan VWX = \frac{20}{28}$

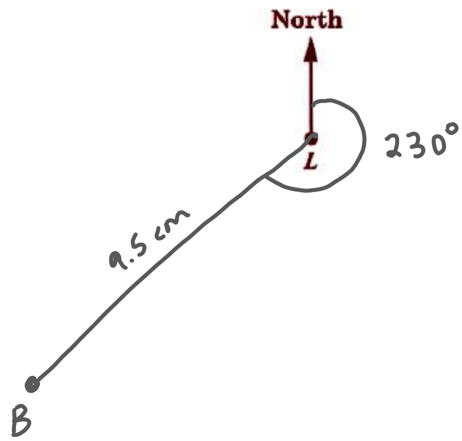
$VWX = \tan^{-1}\left(\frac{5}{7}\right)$

$V\hat{W}X = 35.5^{\circ}$ (1 d.p.)

(b) A buoy (B) and a lighthouse (L) are 95 km apart. The bearing of B from L is 230°.

Using a scale of 1 cm : 10 km and the space provided below, complete the diagram to show the buoy (B) relative to the lighthouse (L). Indicate the given bearing on your drawing.

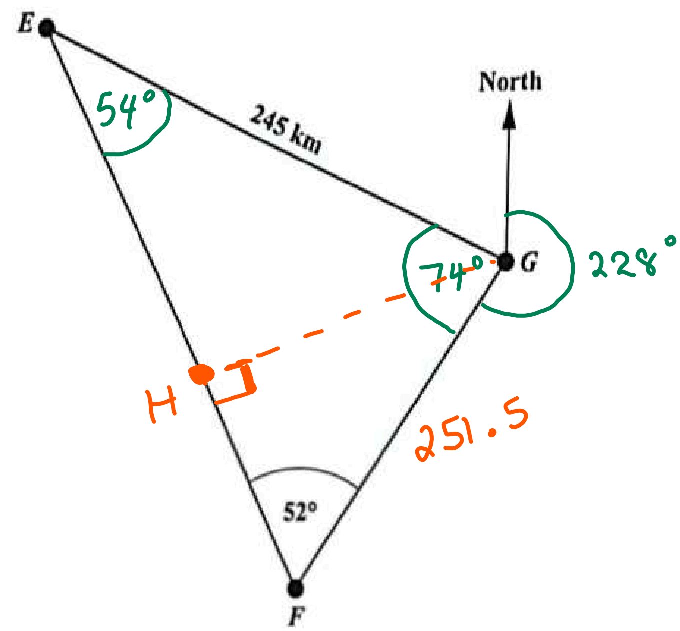
$95\text{km} = \frac{95}{10} = 9.5\text{cm}$



(3 marks)

Jan 2025

(b) Two ports, E and G, are on level ground, 245 km apart. The bearing of E from G is 302°. A ship is anchored at F, some distance away from G, on a bearing of 228°. Angle $EFG = 52°$. This information is shown on the diagram below.



(i) a) On the diagram above, insert the angle 228°, the bearing of F from G.

(1 mark)

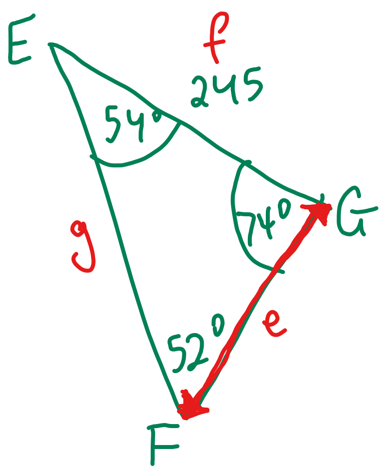
b) Determine the value of Angle FEG.

$\angle FEG = 180 - (74 + 52)$

54°

(1 mark)

(ii) Calculate GF, the distance the ship is from Port G.



Using sine rule: $\frac{e}{\sin E} = \frac{f}{\sin F}$

$\frac{GF}{\sin 54°} = \frac{245}{\sin 52°}$

$GF \sin 52° = 245 \sin 54°$

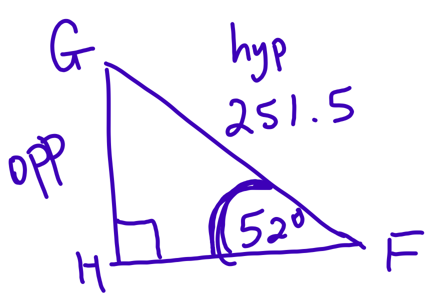
$GF = \frac{245 \sin 54°}{\sin 52°}$

251.5 km

(2 marks)

(iii) a) Indicate the point H on the line EF, such that GH is the SHORTEST distance from G to EF. (1 mark)

b) Determine the distance GH.



Using $\sin \theta = \frac{opp}{hyp}$

$\sin 52° = \frac{GH}{251.5}$

$\therefore GH = 251.5 \sin 52°$

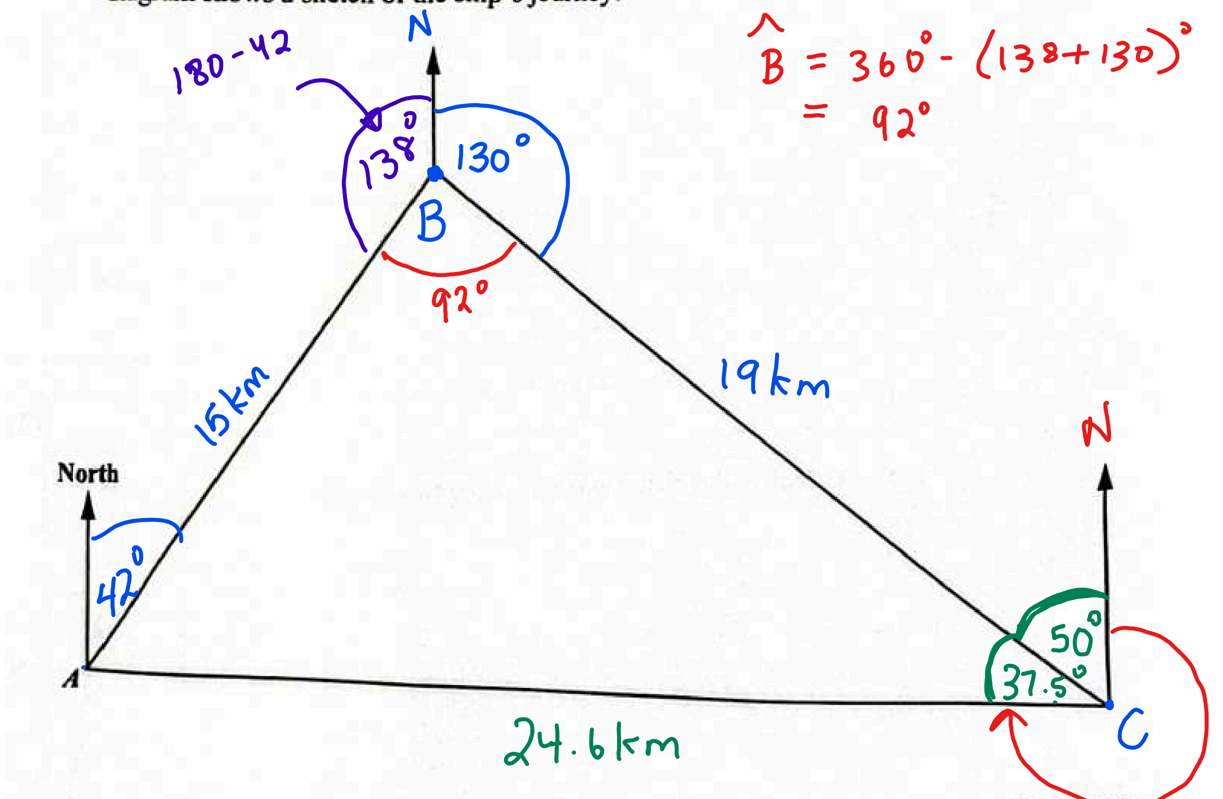
198.2 km (1 d.p.)

(2 marks)

Total 12 marks

May 2025

(a) A ship sails from Point A to Point B, which is 15 km from A on a bearing of 042°. The ship then sails to Point C, which is 19 km from B on a bearing of 130°. The following diagram shows a sketch of the ship's journey.



(1 mark)

(i) On the diagram, insert the bearings 042° and 130°.

(ii) Calculate the distance between Town A and Town C.

$$AC^2 = 15^2 + 19^2 - 2(15)(19)\cos 92°$$

$$AC^2 = 586 - (-19.8927)$$

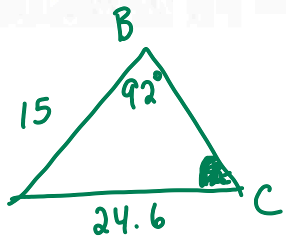
$$AC^2 = 605.8927\ldots$$

$$AC = \sqrt{605.8927}$$

24.6 km

(2 marks)

(iii) Determine the bearing of Town A from Town C.



Using Sine Rule:

$$\frac{24.6}{\sin 92^\circ} = \frac{15}{\sin C}$$

$$24.6 \sin C = 15 \sin 92$$

$$\sin C = \frac{15 \sin 92}{24.6}$$

$$C = \sin^{-1}\left(\frac{15 \sin 92}{24.6}\right)$$

$$C = 37.5^\circ \ (1 \text{ d.p.})$$

$\therefore$ Bearing of A from C

$$= 360^\circ - (30 + 37.5)^\circ$$

$$292.5^\circ$$

(3 marks)