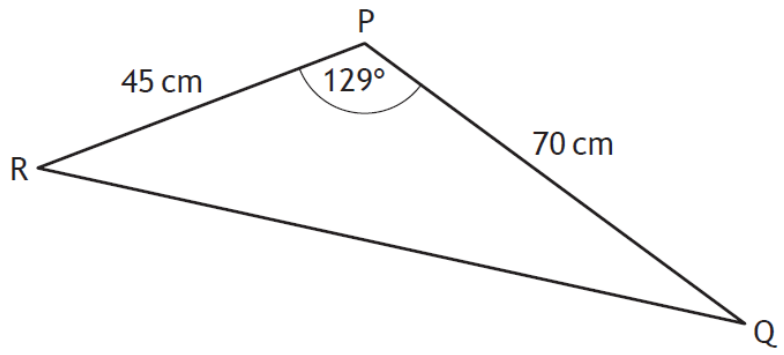
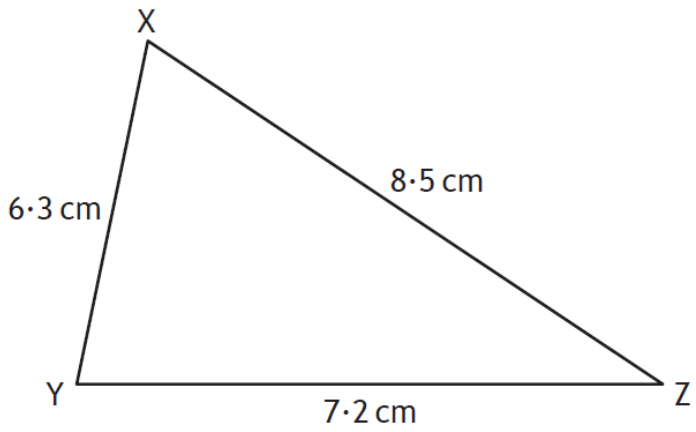
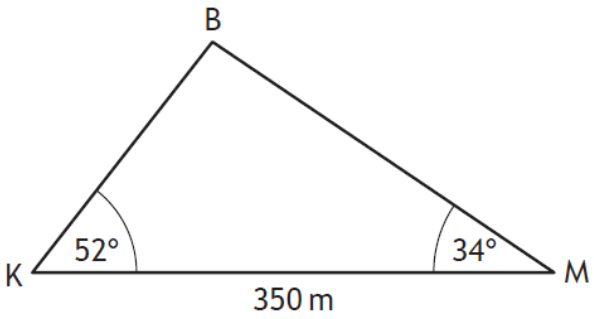
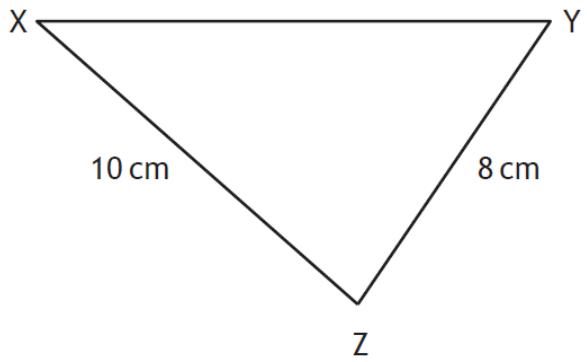
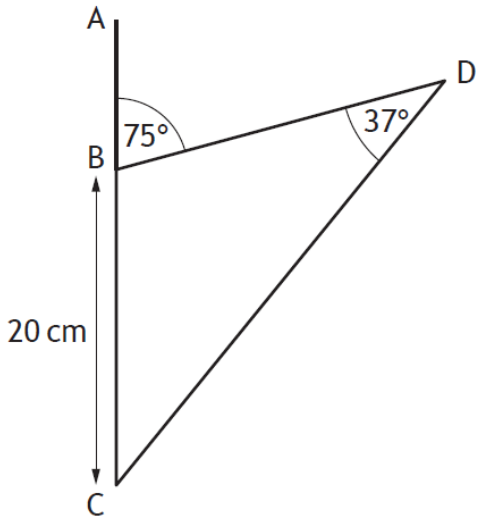
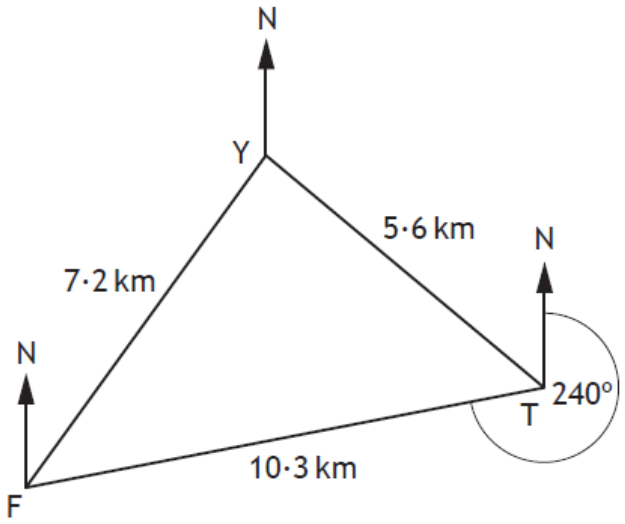
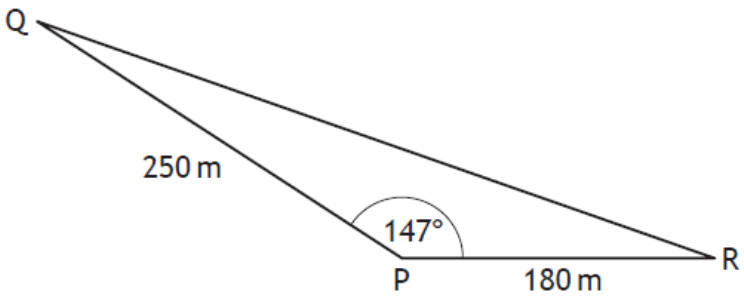
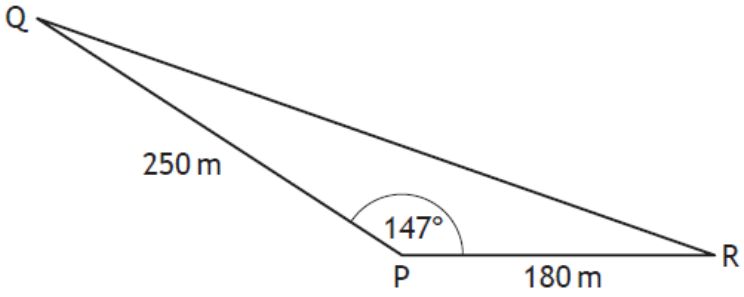
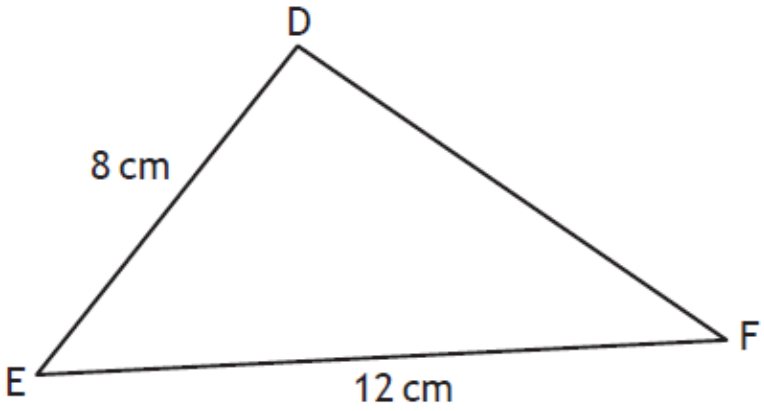
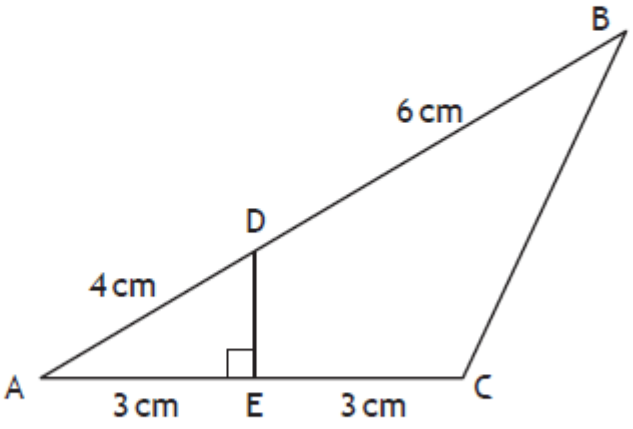
Nat 5/Credit/Int 2: Triangle Trigonometry

Nat 5 2019 P2 Q3	**3.** The diagram shows triangle PQR.  • PR = 45 centimetres • PQ = 70 centimetres • Angle QPR = 129° Calculate the area of triangle PQR.	**2**	2
Ans	1224.004 cm^2		
Nat 5 2019 P2 Q7	**7.** Triangle XYZ is shown below.  Calculate the size of the smallest angle in triangle XYZ.	**3**	3
Ans	46.406		

Nat 5 2019 P2 Q19	**19.** Katy and Mona are looking up at a hot-air balloon. In the diagram below, K, M and B represent the positions of Katy, Mona and the balloon respectively.  • The angle of elevation of the balloon from Katy is 52° • The angle of elevation of the balloon from Mona is 34° • Katy and Mona are 350 metres apart on level ground Calculate the height of the hot-air balloon above the ground. **5**	5
Ans	154.6 m	
Nat 5 2018 P1 Q10	**10.** In triangle XYZ: • $XZ = 10$ centimetres • $YZ = 8$ centimetres • $\cos Z = \frac{1}{8}$.  Calculate the length of XY. **3**	3
Ans	12 cm	

Nat 5 2018 P2 Q9	**9.** In this diagram: • angle ABD = 75° • angle BDC = 37° • BC = 20 centimetres.  Calculate the length of DC. **3**	3
Ans	32.1 cm	
Nat 5 2018 P2 Q13	**13.** A ferry and a trawler receive a request for help from a stranded yacht. On the diagram the points F, T and Y show the positions of the ferry, the trawler and the yacht respectively.  • FY is 7·2 kilometres. • TY is 5·6 kilometres. • FT is 10·3 kilometres. • F is on a bearing of 240° from T. Calculate the bearing of the yacht from the trawler. **4**	4
Ans	282.088	

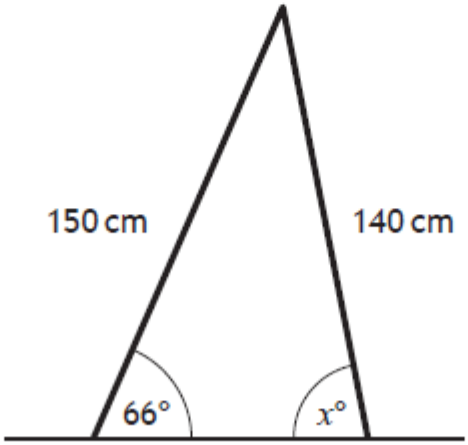
Nat 5 2017 P2 Q10	A piece of land is in the shape of a triangle as shown.  • PQ = 250 metres • PR = 180 metres • angle QPR = 147° The owner wishes to build a fence along the side QR. Calculate the length of the fence.	4
Ans	9·9 km	
Nat 5 2017 P2 Q3	A piece of land is in the shape of a triangle as shown.  • PQ = 250 metres • PR = 180 metres • angle QPR = 147° The owner wishes to build a fence along the side QR. Calculate the length of the fence.	3
Ans	413 m	

Nat 5 2017 P1 Q7	In triangle DEF: • DE = 8 centimetres • EF = 12 centimetres • $\sin E = \frac{2}{3}$  Calculate the area of triangle DEF.	2
Ans	32 cm^2	
Nat 5 2016 P2 Q16	In the diagram below: • DE is perpendicular to AC. • AD = 4 centimetres. • DB = 6 centimetres. • AE = EC = 3 centimetres.  Calculate the length of BC. Give your answer correct to one decimal place.	4
Ans	78°	

Nat 5 2016 P2 Q8

A set of stepladders has legs 150 centimetres and 140 centimetres long.

When the stepladder is fully open, the angle between the longer leg and the ground is 66°.

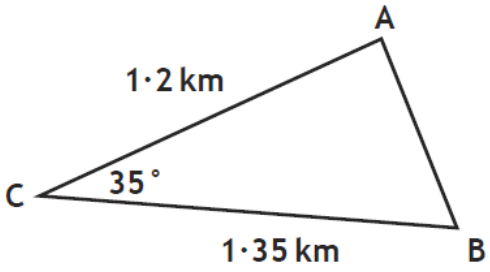


Calculate x°, the size of the angle between the shorter leg and the ground. 3

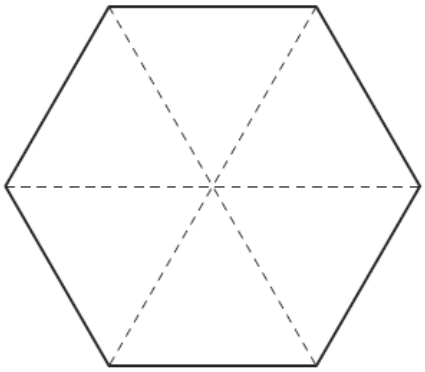
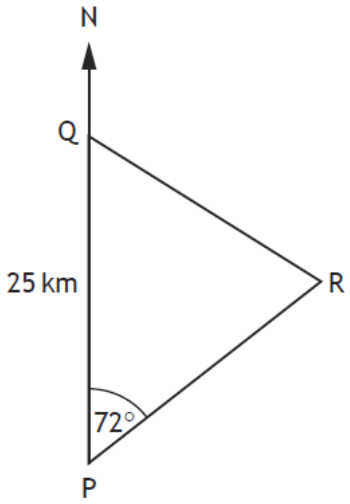
Ans 78°

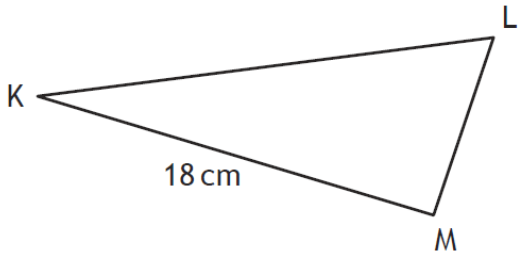
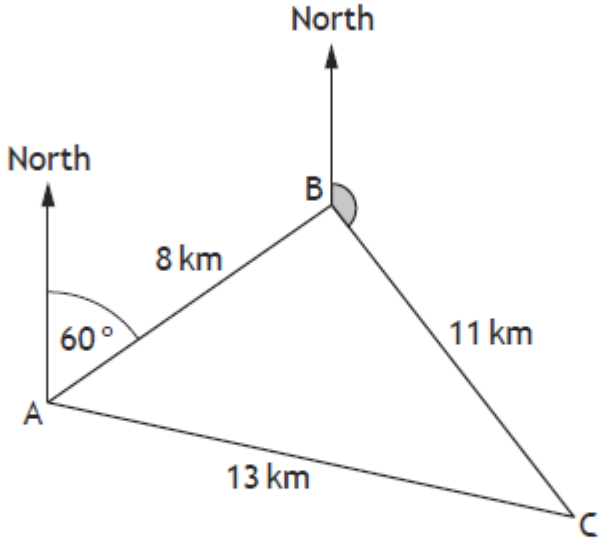
Nat 5 2015 P2 Q3

Triangle ABC is shown below.



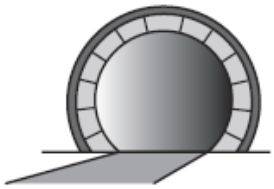
Calculate the length of AB. 3

Ans	0·78 km	
Nat 5 2015 P2 Q11	The top of a table is in the shape of a regular hexagon. The three diagonals of the hexagon which are shown as dotted lines in the diagram below each have length 40 centimetres.   Calculate the area of the top of the table.	4
Ans	1039·2 cm^2	
Nat 5 2015 P2 Q13	In the diagram below P, Q and R represent the positions of Portlee, Queenstown and Rushton respectively.  Portlee is 25 kilometres due South of Queenstown. From Portlee, the bearing of Rushton is 072°. From Queenstown, the bearing of Rushton is 128°. Calculate the distance between Portlee and Rushton. **Do not use a scale drawing.**	4
Ans	23·8 km	

Nat 5 2014 P1 Q5	In triangle KLM • KM = 18 centimetres • sin K = 0·4 • sin L = 0·9 Calculate the length of LM. 	3
Ans	8 cm	
Nat 5 2014 P2 Q10	In a race, boats sail round three buoys represented by A, B, and C in the diagram below.  B is 8 kilometres from A on a bearing of 060°. C is 11 kilometres from B. A is 13 kilometres from C. (a) Calculate the size of angle ABC. (b) Hence find the size of the shaded angle.	5
Ans	(a) 84·8° (b) 155·2°	

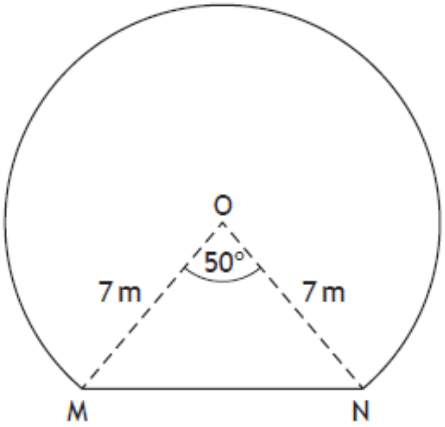
Nat 5 2014 P2 Q13

The picture shows the entrance to a tunnel which is in the shape of part of a circle.



The diagram below represents the cross-section of the tunnel.

- The centre of the circle is O.
- MN is a chord of the circle.
- Angle MON is 50°.
- The radius of the circle is 7 metres.

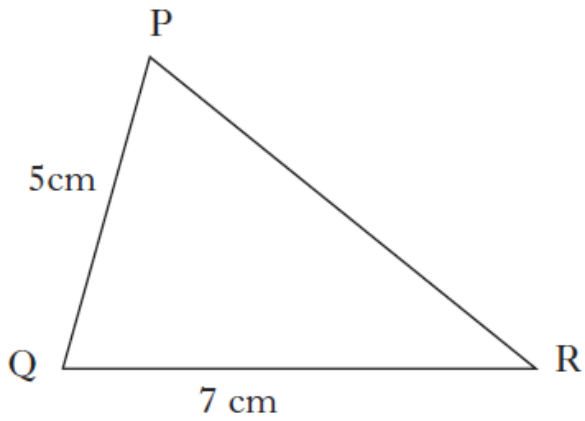


Calculate the area of the cross-section of the tunnel. 5

Ans 151·3 m^2

Int 2 2014 P1 Q3

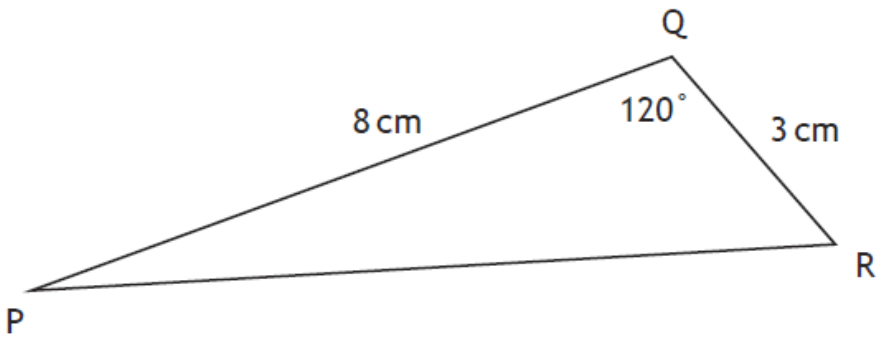
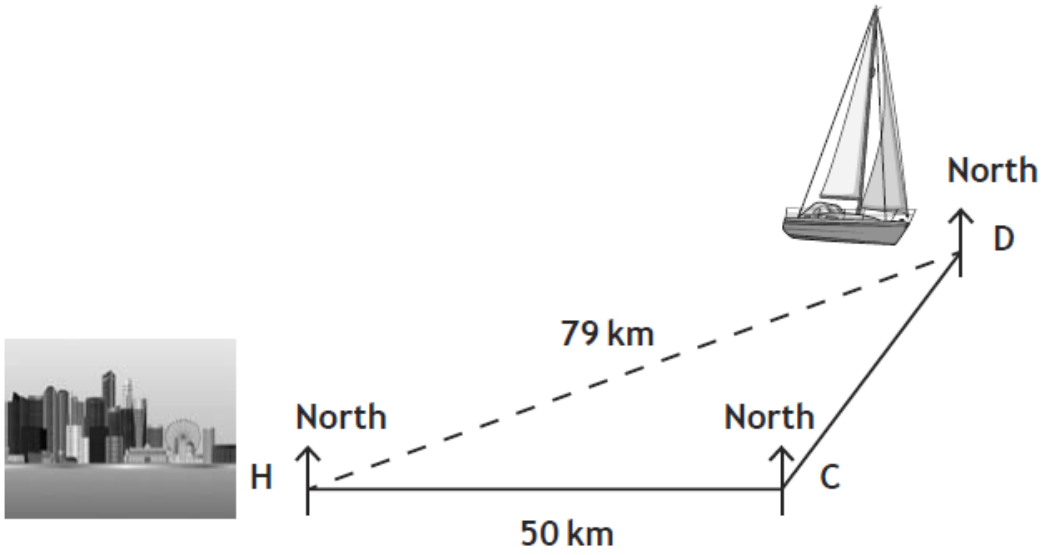
3

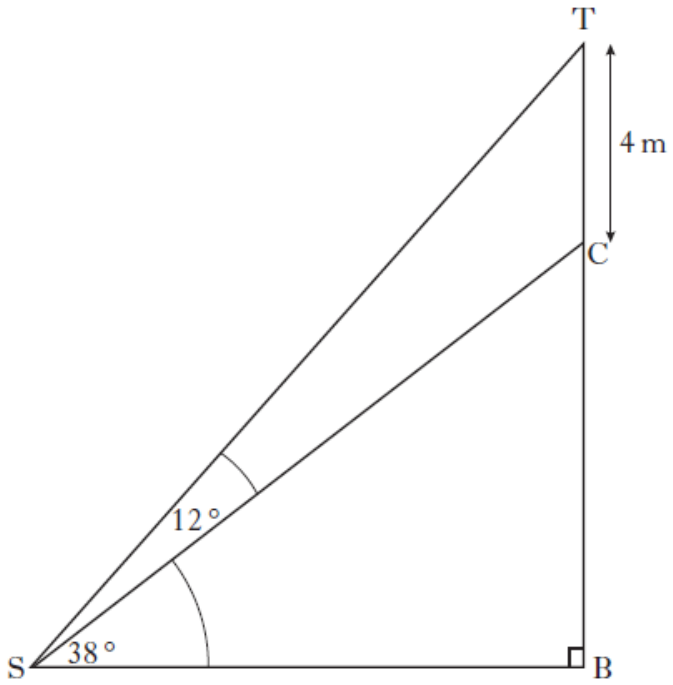


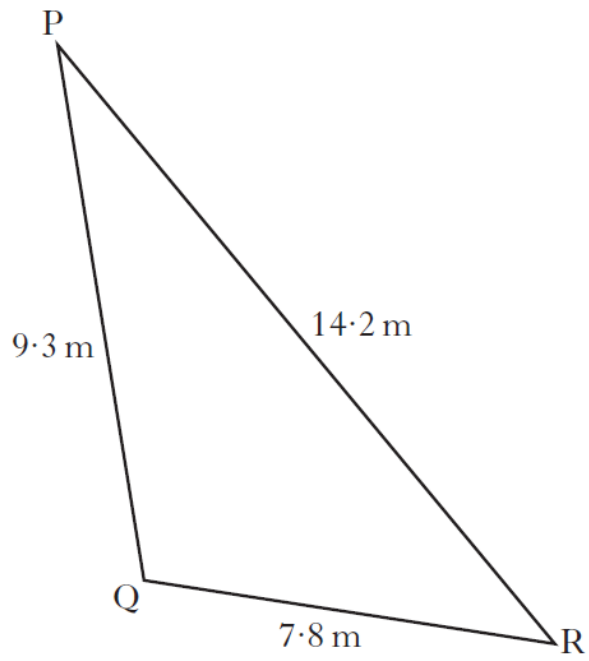
In triangle PQR, PQ = 5 centimetres, QR = 7 centimetres and $\cos Q = \frac{1}{5}$.

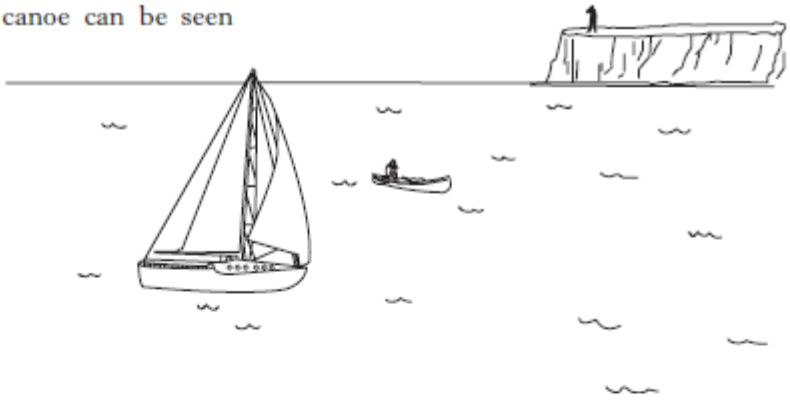
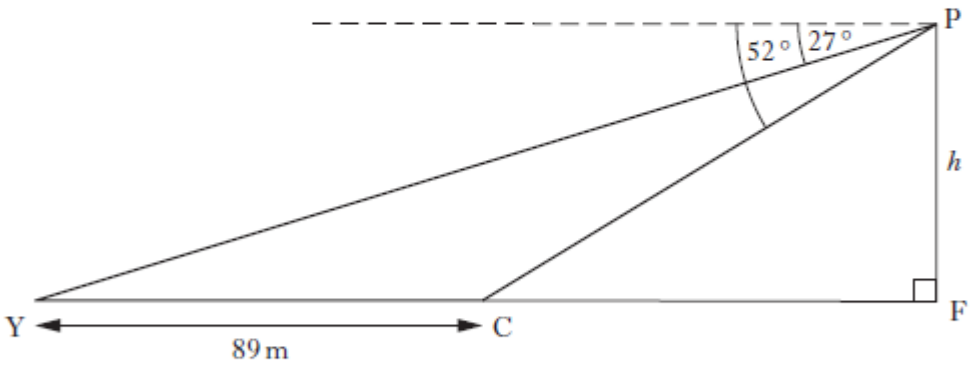
Calculate the length of side PR.

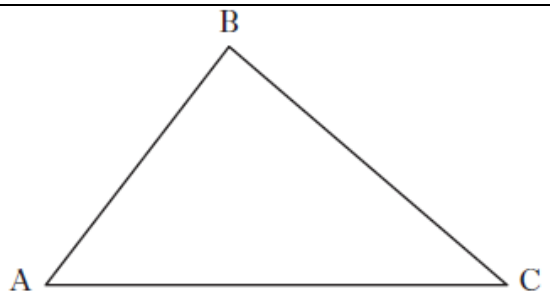
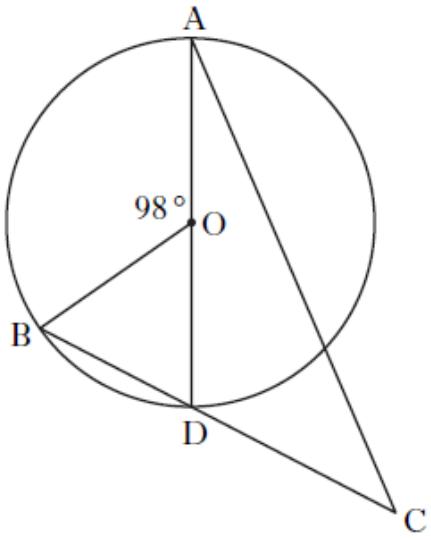
Give your answer in the form $\sqrt{a}$.

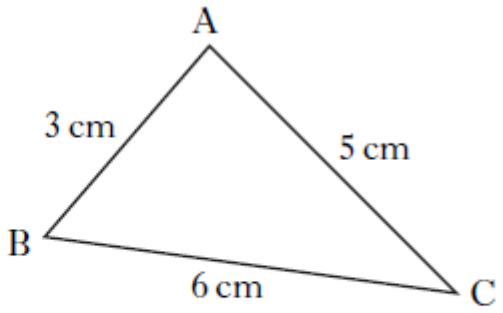
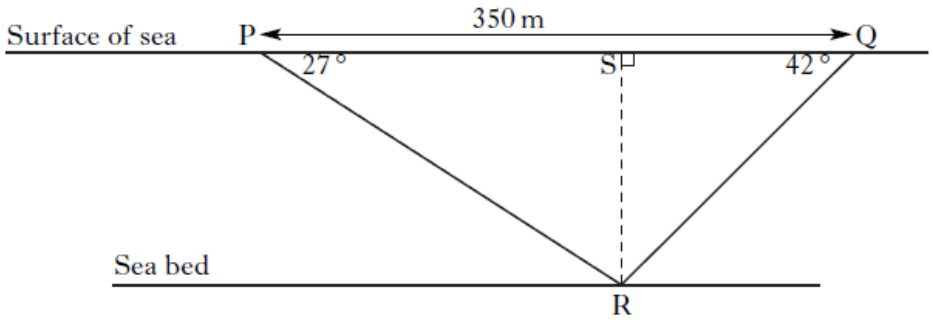
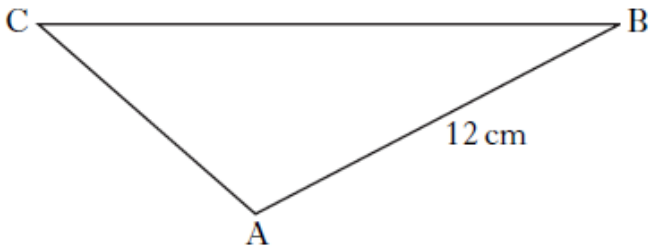
Ans	$\sqrt{60}$ cm	
Nat 5 Specimen P2 Q5	In triangle PQR, PQ = 8 centimetres, QR = 3 centimetres and angle PQR = 120°.  Calculate the length of PR.	3
Ans	9·8 cm	
Nat 5 Specimen P2 Q13	A yacht sails from a harbour H to a point C, then to a point D as shown below.  C is 50 kilometres due east of H. D is on a bearing of 040° from C and is 79 kilometres from H. (a) Calculate the size of angle CDH. (b) Hence, calculate the bearing on which the yacht must sail to return directly to the harbour.	6
Ans	(a) 29° (b) 249°	

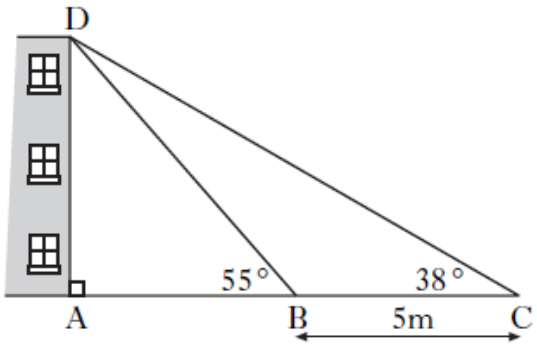
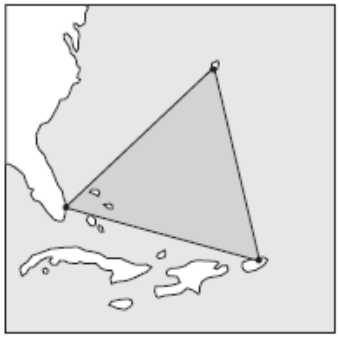
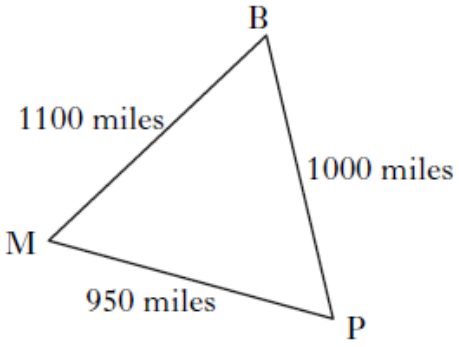
Int 2 2013 P2 Q10	A tree surgeon is asked to reduce the height of a tree. In the diagram below TB represents the original height of the tree and C is the point where the cut is to be made.  The tree surgeon will reduce the height of the tree by 4 metres. Angle TSC = 12° and angle BSC = 38°. Calculate the height of the tree after it has been cut. **Do not use a scale drawing.**	5
Ans	7.6 m	

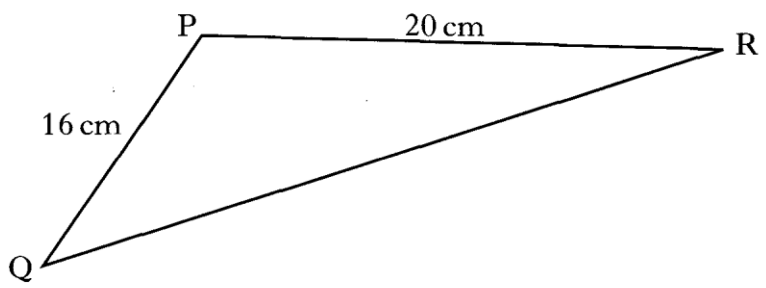
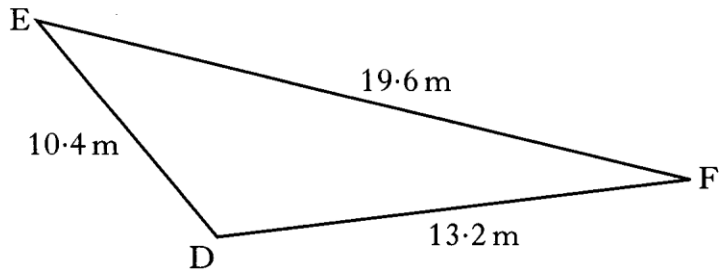
Int 2 2013 P2 Q4	Triangle PQR is shown below.  Calculate the size of angle QPR.	3
Ans	30.6°	

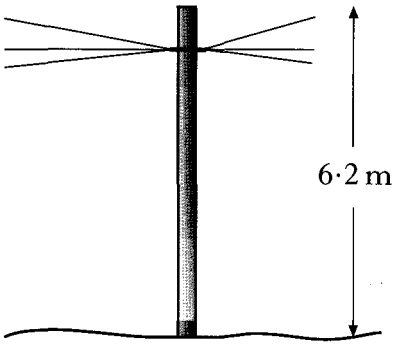
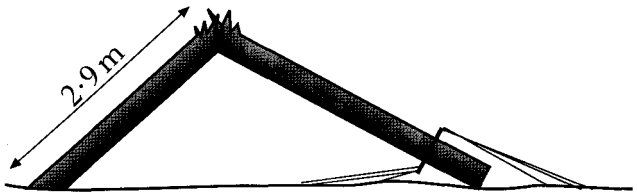
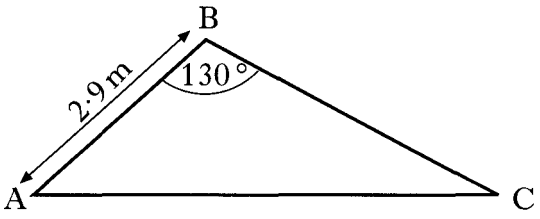
Int 2 2012 P2 Q12	A yacht and a canoe can be seen from a clifftop.  In the diagram below, Y and C represent the positions of the yacht and the canoe.  From a point P on the clifftop: • the angle of depression of the yacht is 27°; • the angle of depression of the canoe is 52°. The distance between the yacht and the canoe is 89 metres. Calculate the height, h, metres, of the cliff.	5
Ans	75.3 m	

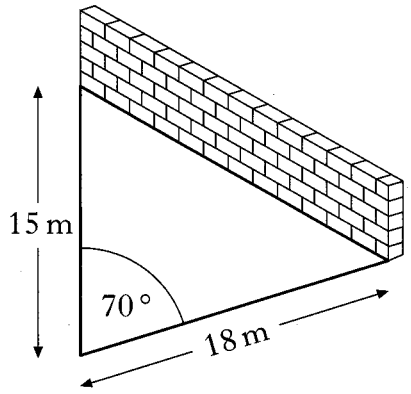
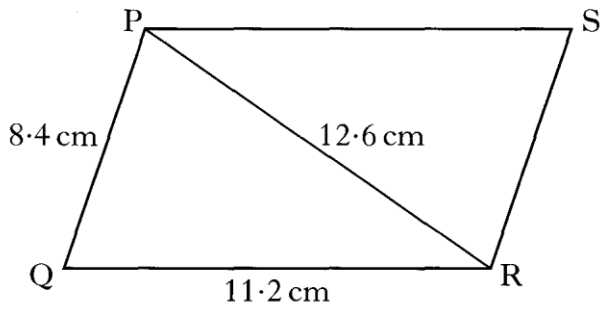
Int 2 2012 P1 Q7	 The area of triangle ABC is 20 square centimetres. AC = 16 centimetres and $\sin C = \frac{1}{4}$. Calculate the length of BC.	2
Ans	10 cm	
Int 2 2011 P2 Q12	 AD is a diameter of a circle, centre O. B is a point on the circumference of the circle. The chord BD is extended to a point C, outside the circle. Angle BOA = 98°. DC = 9 centimetres. The radius of the circle is 7 centimetres. Calculate the length of AC.	5
Ans	21 cm	

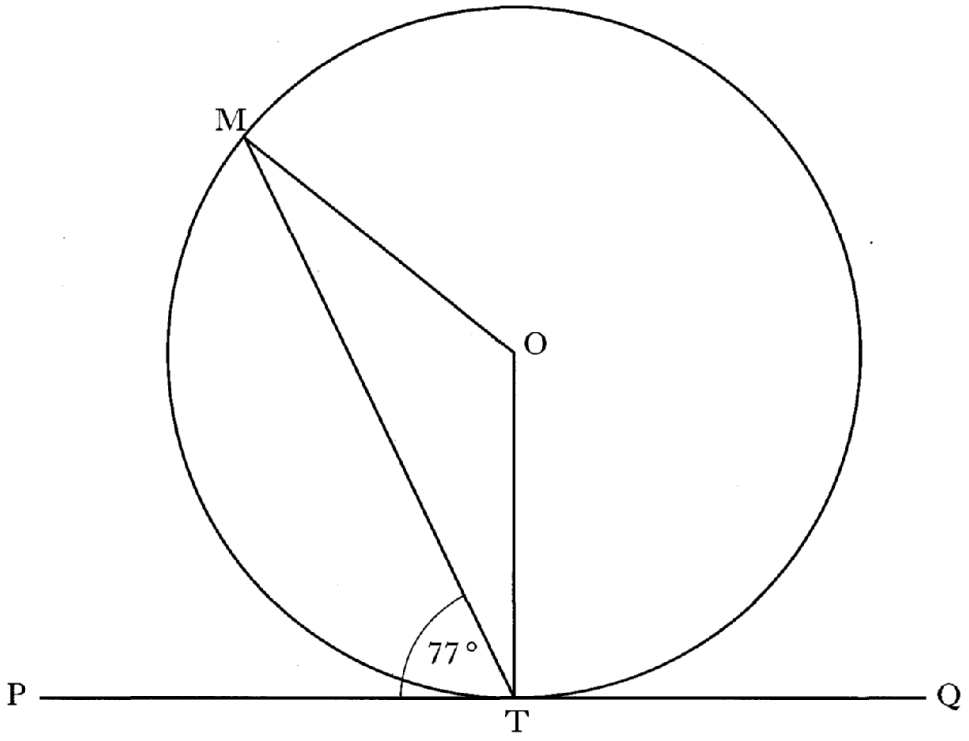
Int 2 2011 P1 Q5	 In triangle ABC, show that $\cos B = \frac{5}{9}$.	3
Ans	Proof	
Int 2 2010 P2 Q12	Two ships have located a wreck on the sea bed. In the diagram below, the points P and Q represent the two ships and the point R represents the wreck.  The angle of depression of R from P is 27°. The angle of depression of R from Q is 42°. The distance PQ is 350 metres. Calculate QS, the distance ship Q has to travel to be directly above the wreck. **Do not use a scale drawing.**	5
Ans	126.5 metres	
Int 2 2010 P1 Q6	 In triangle ABC, AB = 12 centimetres, $\sin C = \frac{1}{2}$ and $\sin B = \frac{1}{3}$. Find the length of side AC.	3
Ans	8	

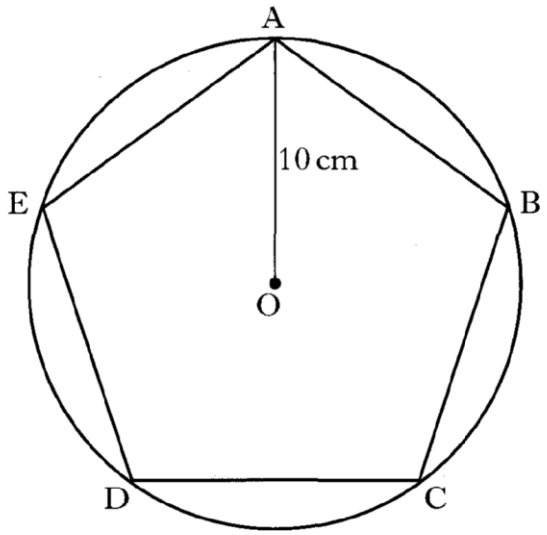
Int 2 2009 P2 Q13	For reasons of safety, a building is supported by two wooden struts, represented by DB and DC in the diagram below.  Angle ABD = 55°. Angle BCD = 38°. BC is 5 metres. Calculate the height of the building represented by AD.	5
Ans	8.6 metres	
Int 2 2009 P2 Q6	The Bermuda triangle is an area in the Atlantic Ocean where many planes and ships have mysteriously disappeared. Its vertices are at Bermuda (B), Miami (M) and Puerto Rico (P).   Calculate the size of angle BPM.	3
Ans	68.6◦	

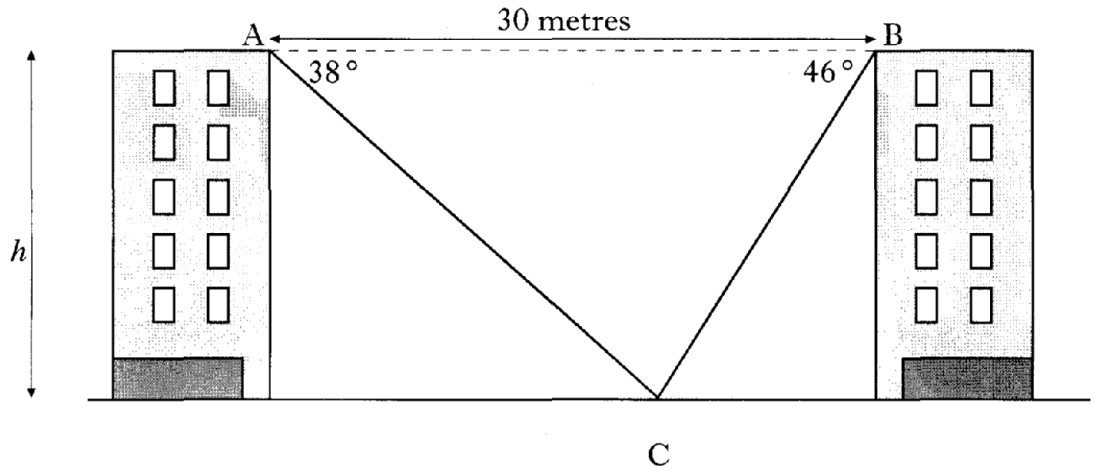
Int 2 2008 P1 Q6	Triangle PQR is shown below.  If sin P = $\frac{1}{4}$, calculate the area of triangle PQR.	2
Ans	40cm^2	
Int 2 2008 P2 Q5	Triangle DEF is shown below.  It has sides of length 10·4 metres, 13·2 metres and 19·6 metres. Calculate the size of angle EDF. **Do not use a scale drawing.**	3
Ans	111.8º	

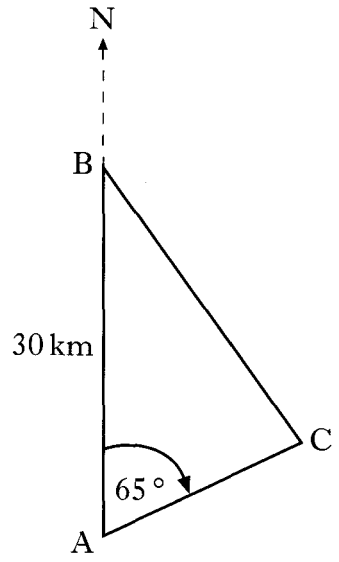
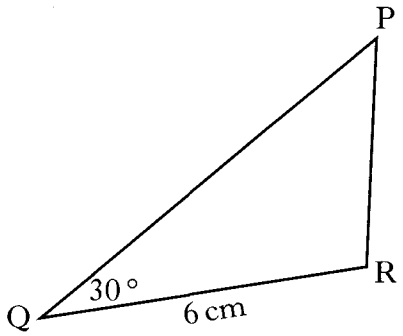
Credit 2008 P2 Q7	**7.** A telegraph pole is 6·2 metres high.  The wind blows the pole over into the position as shown below.   AB is 2·9 metres and angle ABC is 130°. Calculate the length of AC.	4
Ans	5.62 m	

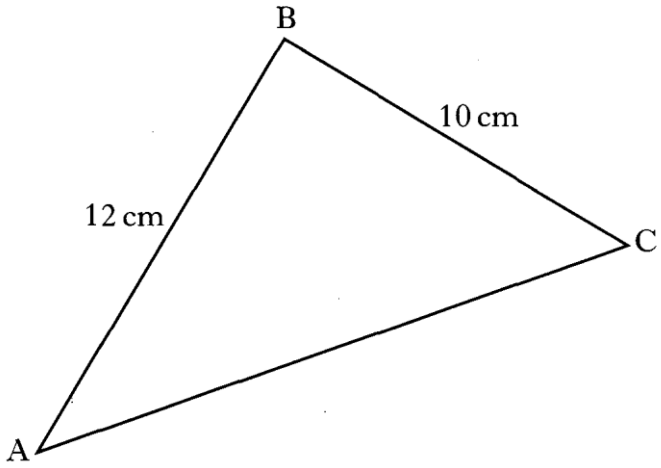
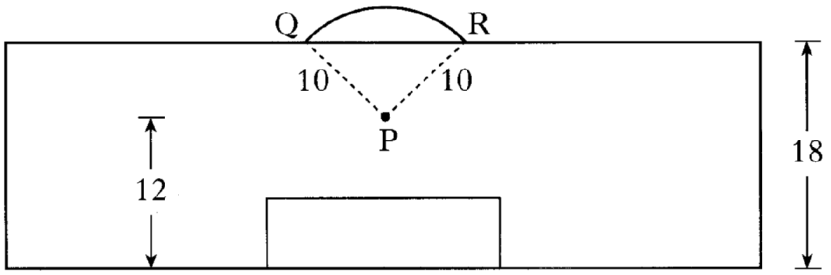
Credit 2008 P2 Q8	**8.** A farmer builds a sheep-pen using two lengths of fencing and a wall.  The two lengths of fencing are 15 metres and 18 metres long. (*a*) Calculate the area of the sheep-pen, when the angle between the fencing is 70 °. (*b*) What angle between the fencing would give the farmer the largest possible area?	4
Ans	(a) 126.9 m^2 (b) 90°	
Int 2 2003 P2 Q10	The sketch shows a parallelogram, PQRS.  (*a*) Calculate the size of angle PQR. **Do not use a scale drawing.** (*b*) Calculate the area of the parallelogram.	3 3
Ans	(a) 78.6º (b) 92.2cm^2	

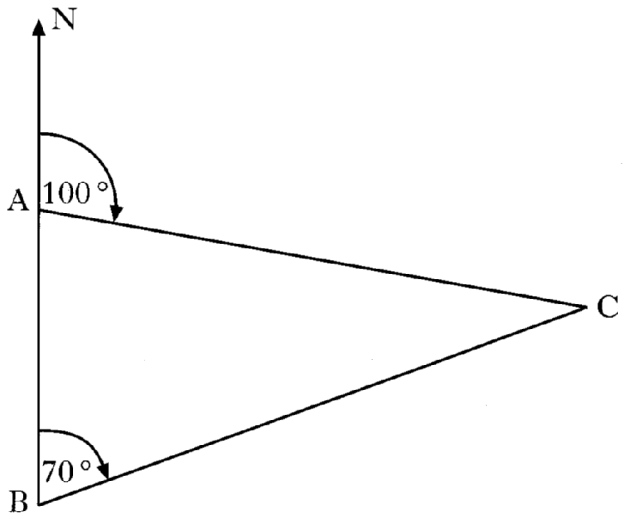
Int 2 2007 P2 Q4	 The tangent PQ touches the circle, centre O, at T. Angle MTP is 77°. (*a*) Calculate the size of angle MOT. (*b*) The radius of the circle is 8 centimetres. Calculate the length of chord MT.	2 3
Ans	(a) 154º (b)15.6cm	

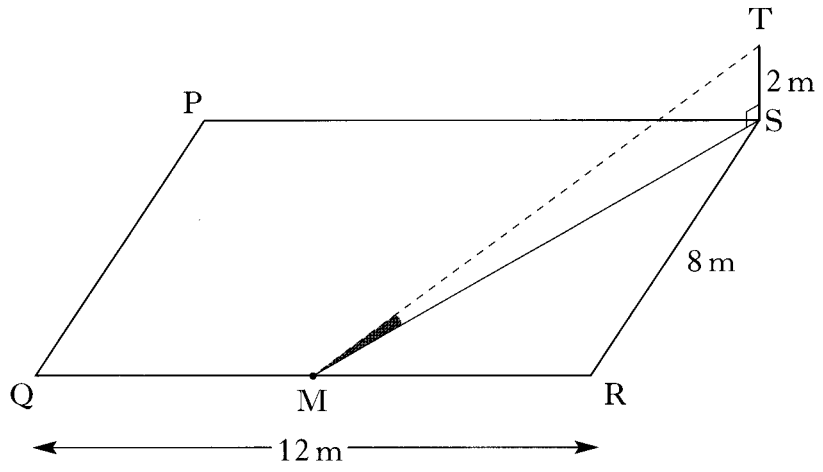
Int 2 2001 P2 Q8	 A regular pentagon ABCDE is drawn in a circle, centre O, with radius 10 centimetres. Calculate the area of the regular pentagon.	5
Ans	238cm^2	

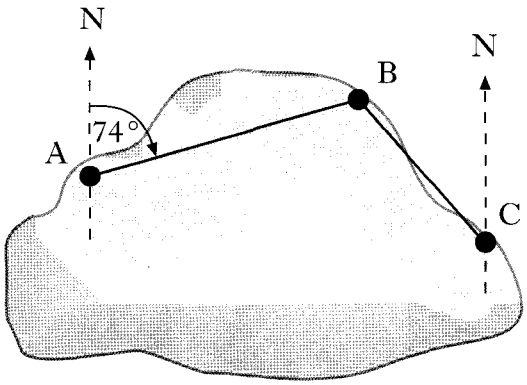
Int 2 2007 P2 Q9	. The diagram shows two blocks of flats of equal height.  A and B represent points on the top of the flats and C represents a point on the ground between them. To calculate the height, h, of each block of flats, a surveyor measures the angles of depression from A and B to C. From A, the angle of depression is 38°. From B, the angle of depression is 46°. The distance AB is 30 metres. Calculate the height, h, in metres.	5
Ans	13.4 metres	

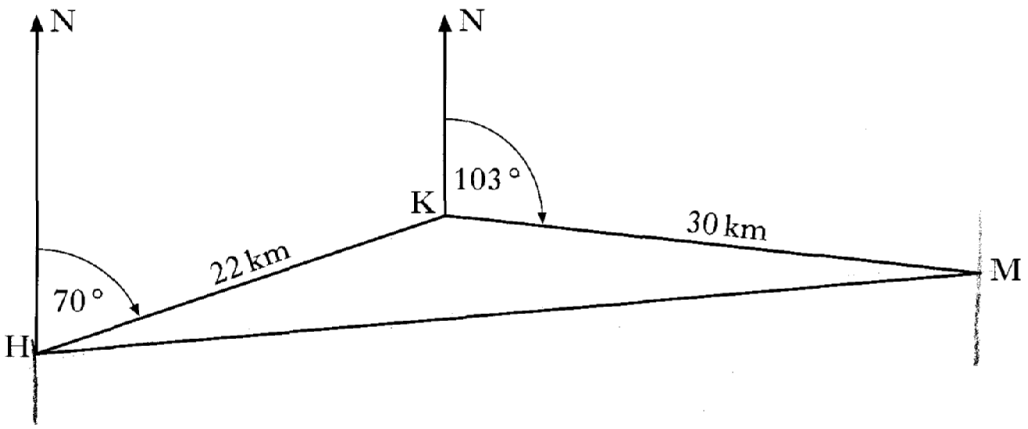
Credit 2007 P2 Q6	**6.** Brunton is 30 kilometres due North of Appleton. From Appleton, the bearing of Carlton is 065 °. From Brunton, the bearing of Carlton is 153 °.  Calculate the distance between Brunton and Carlton.	4
Ans	27.2 km	
Credit 2007 P2 Q8	**8.** In triangle PQR: • QR = 6 centimetres • angle PQR = 30 ° • area of triangle PQR = 15 square centimetres.  Calculate the length of PQ.	3
Ans	10 cm	

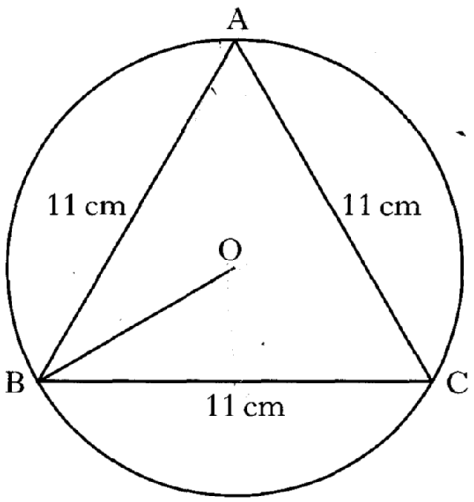
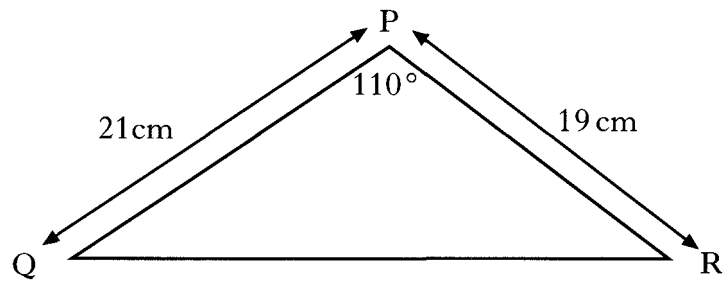
Int 2 2006 P1 Q4	 Calculate the area of triangle ABC if sin B = $\frac{2}{3}$.	2
Ans	$40cm^2$	
Int 2 2006 P2 Q8	The diagram shows the penalty area in a football pitch. All measurements are given in yards.  The penalty spot is marked at point P. QR is an arc of a circle, centre P, radius 10 yards. The width of the penalty area is 18 yards and the distance of the penalty spot from the goal line is 12 yards, as shown. (*a*) Calculate the size of angle QPR. (*b*) Calculate the length of arc QR.	3 2
Ans	(a) 106.3º (b) 18.6 yards	

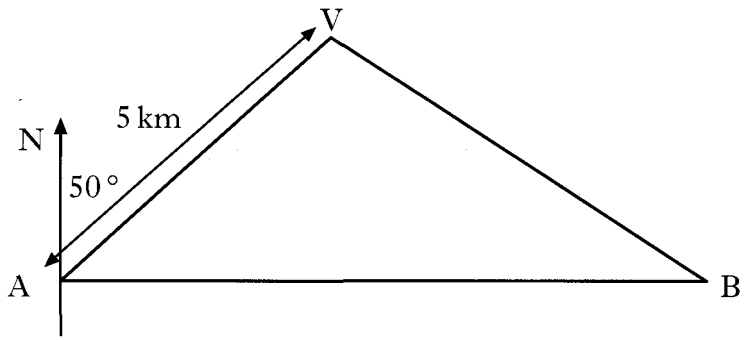
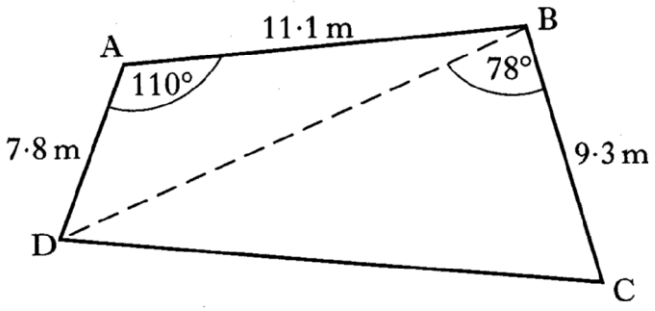
Int 2 2006 P2 Q10	The diagram below shows the position of three campsites A, B and C.  Alan sets off from campsite A on a bearing of 100° at an average speed of 5·6 kilometres per hour. At the same time Bob sets off from campsite B on a bearing of 070°. **After 3 hours** they both arrive at campsite C. Who has the faster average speed and by how much?	5
Ans	Bob has the faster average speed by 0.3kmph.	

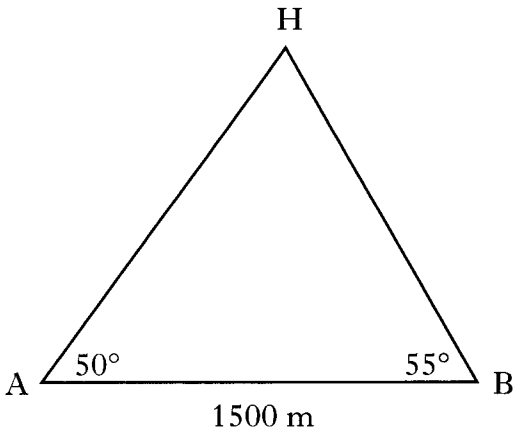
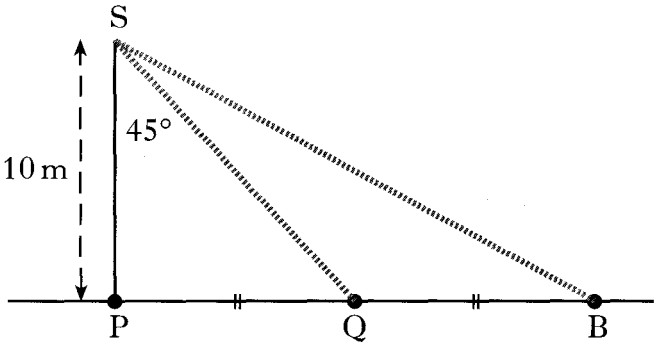
Credit 2006 P2 Q5	**5.** ST, a vertical pole 2 metres high, is situated at the corner of a rectangular garden, PQRS. RS is 8 metres long and QR is 12 metres long.  The pole casts a shadow over the garden. The shadow reaches M, the midpoint of QR. Calculate the size of the shaded angle TMS.	4
Ans	11.3 degrees	

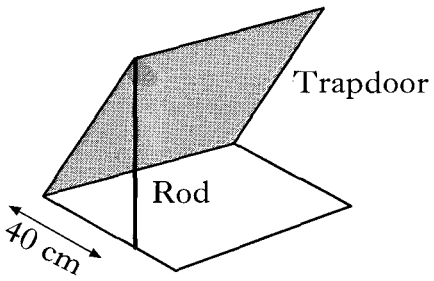
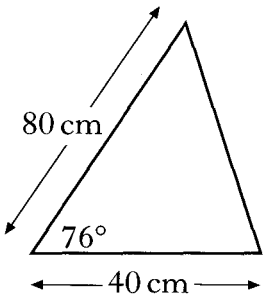
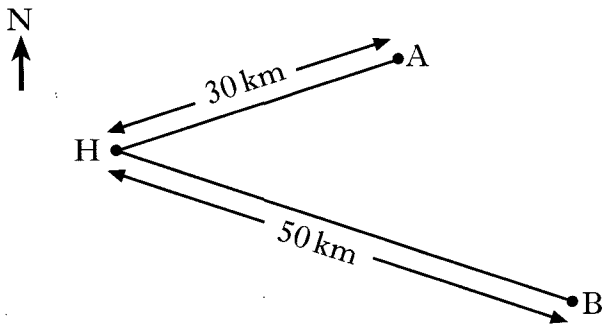
Credit 2006 P2 Q6	**6.** (*a*) There are three mooring points A, B and C on Lake Sorling.  From A, the bearing of B is 074°. From C, the bearing of B is 310°. Calculate the size of angle ABC. (*b*) B is 230 metres from A and 110 metres from C. Calculate the direct distance from A to C. Give your answer **to 3 significant figures**.	6
Ans	(a) 124 degrees (b) 305 metres	

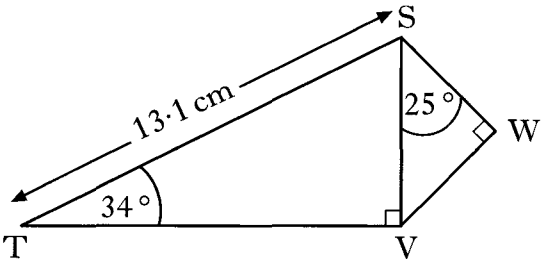
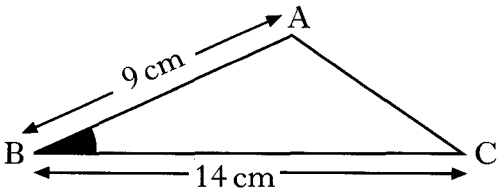
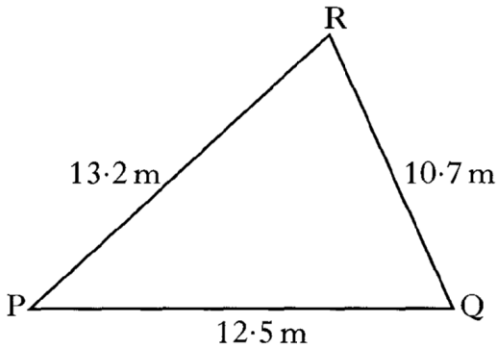
Int 2 2005 P2 Q6	In the diagram below three towns, Holton, Kilter and Malbrigg are represented by the points H, K and M respectively.  A helicopter flies from Holton for 22 kilometres on a bearing of 070° to Kilter. It then flies from Kilter for 30 kilometres on a bearing of 103° to Malbrigg. The helicopter then returns directly to Holton. (*a*) (i) Calculate the size of angle HKM. (ii) Calculate the total distance travelled by the helicopter. **Do not use a scale drawing.** (*b*) A climber is reported missing somewhere in the triangle represented by HKM in the diagram. Calculate the area of this triangle.	1 3 2
Ans	(a)(i) 147º (ii) 101.9km (b) 179.7km^2	

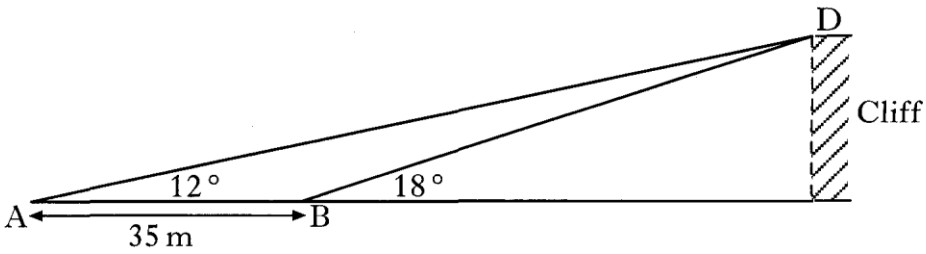
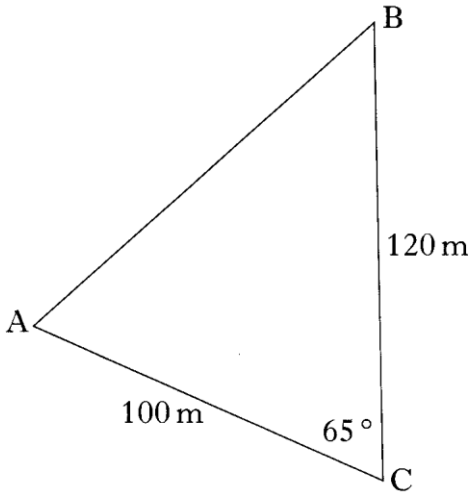
Int 2 2005 P2 Q9	Points A, B and C lie on the circumference of a circle, centre O.  Triangle ABC is equilateral with sides of length 11 centimetres as shown in the diagram. (*a*) Write down the size of angle OBC. (*b*) Calculate the length of the radius OB.	1 3
Ans	(a) 30º (b) 6.35cm	
Credit 2005 P2 Q3	**3.**  Calculate the area of triangle PQR.	4
Ans	187.5 cm^2	

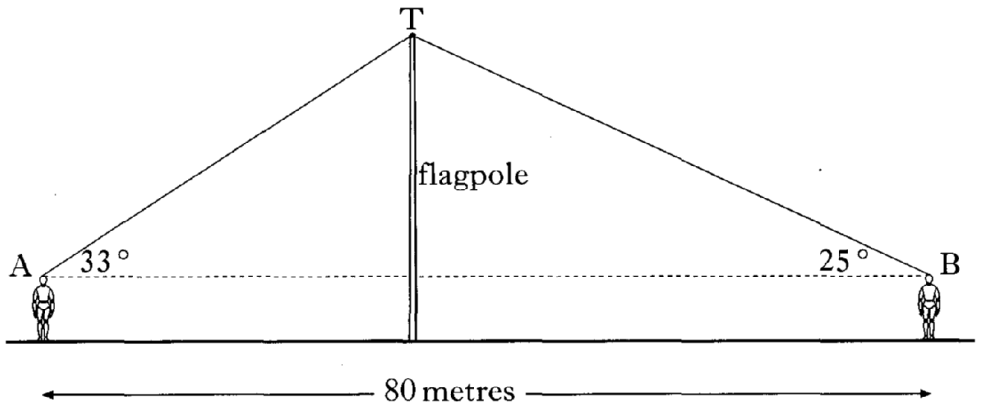
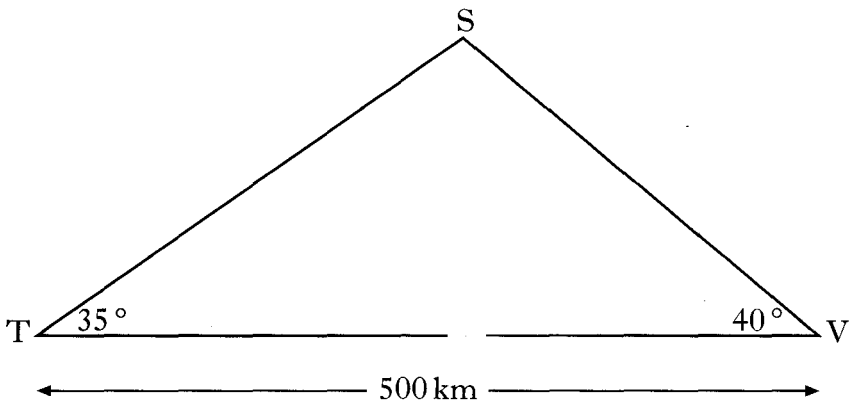
Credit 2005 P2 Q7	**7.** David walks on a bearing of 050° from hostel A to a viewpoint V, 5 kilometres away. Hostel B is due east of hostel A. Susie walks on a bearing of 294° from hostel B to the same viewpoint.  Calculate the length of AB, the distance between the two hostels.	5
Ans	11.0 km	
Int 2 2004 P2 Q7	A garden, in the shape of a quadrilateral, is represented in the diagram below.  Calculate: (*a*) the length of the diagonal BD; **Do not use a scale drawing** (*b*) the area of the garden.	3 4
Ans	(a) 15.6 metres (b) 111.6m^2	

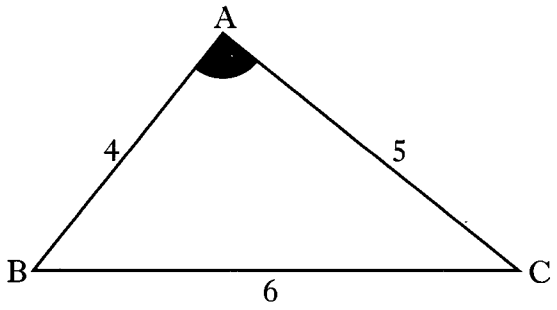
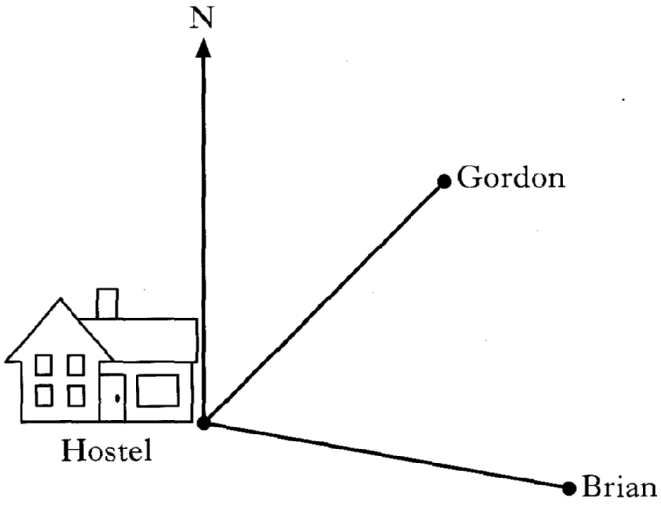
Credit 2004 P2 Q5	**5.** A helicopter, at point H, hovers between two aircraft carriers at points A and B which are 1500 metres apart.  From carrier A, the angle of elevation of the helicopter is 50°. From carrier B, the angle of elevation of the helicopter is 55°. Calculate the distance from the helicopter to the nearer carrier.	4
Ans	1190 m	
Credit 2004 P2 Q6	**6.** The diagram below shows a spotlight at point S, mounted 10 metres directly above a point P at the front edge of a stage. The spotlight swings 45° from the vertical to illuminate another point Q, also at the front edge of the stage.  Through how many **more** degrees must the spotlight swing to illuminate a point B, where Q is the mid-point of PB?	5
Ans	18.4 degrees	

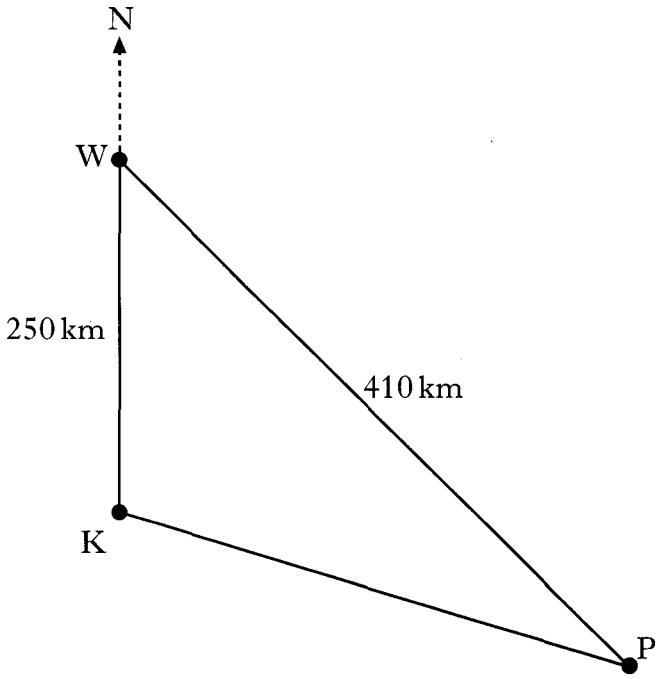
Credit 2004 P2 Q7	**7.** A square trapdoor of side 80 centimetres is held open by a rod as shown.   The rod is attached to a corner of the trapdoor and placed 40 centimetres along the edge of the opening. The angle between the trapdoor and the opening is 76°. Calculate the length of the rod to **2 significant figures**.	4
Ans	80 cm	
Credit 2003 P2 Q3	**3.** Two yachts leave from harbour H. Yacht A sails on a bearing of 072 ° for 30 kilometres and stops. Yacht B sails on a bearing of 140 ° for 50 kilometres and stops.  How far apart are the two yachts when they have both stopped? **Do not use a scale drawing.**	4
Ans	47.7km	

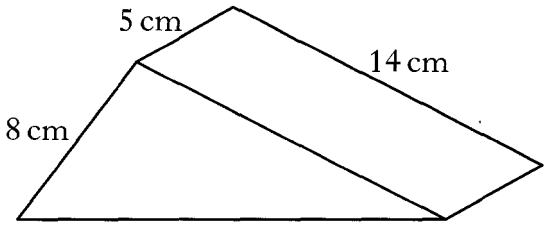
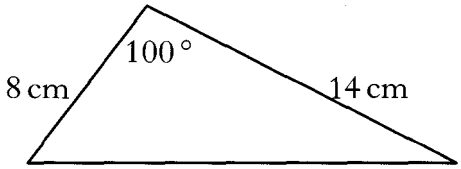
Credit 2003 P2 Q6	**6.** In the diagram, Angle STV = 34 ° Angle VSW = 25 ° Angle SVT = Angle SWV = 90 ° ST = 13·1 centimetres.  Calculate the length of SW.	4
Ans	6.6cm	
Credit 2003 P2 Q7	**7.** The area of triangle ABC is 38 square centimetres. AB is 9 centimetres and BC is 14 centimetres.  Calculate the size of the acute angle ABC.	3
Ans	37 degrees	
Int 2 2002W P2 Q7	A field with sides measuring 12·5 metres, 13·2 metres and 10·7 metres is represented by the triangle PQR shown below.  (*a*) Calculate the size of angle PQR. **Do not use a scale drawing.** (*b*) Calculate the area of the field.	3 2
Ans	(a) 68.9º (b) 62.4m^2	

Int 2 2002W P2 Q9	To calculate the height of a cliff, a surveyor measures the angle of elevation at two positions A and B as shown in the diagram below.  At A, the angle of elevation to D, the top of the cliff, is 12°. At B, the angle of elevation to D is 18°. AB is 35 metres. Calculate the height of the cliff.	5
Ans	21.5m	
Int 2 2002 P2 Q1	The sketch shows a triangle, ABC.  Calculate the area of the triangle.	2
Ans	5438m^2	

Int 2 2002 P2 Q8	The diagram shows two positions of a surveyor as he views the top of a flagpole.  From position A, the angle of elevation to T at the top of the flagpole is 33°. From position B, the angle of elevation to T at the top of the flagpole is 25°. The distance AB is 80 metres and the height of the surveyor to eye level is 1·6 metres. Find the height of the flagpole.	6
Ans	23.3m	
Credit 2002 P2 Q4	**4.** A TV signal is sent from a transmitter T, via a satellite S, to a village V, as shown in the diagram. The village is 500 kilometres from the transmitter.  The signal is sent out at an angle of 35° and is received in the village at an angle of 40°. Calculate the height of the satellite above the ground.	5
Ans	190.8 km	

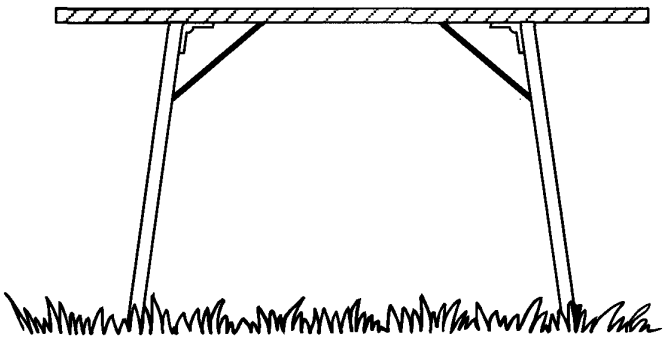
Credit 2002 P1 Q7	**7.** In triangle ABC, AB = 4 units AC = 5 units BC = 6 units.  Show that $\cos A = \frac{1}{8}$.	3
Ans	Proof	
Int 2 2001 P2 Q4	Gordon and Brian leave a hostel at the same time. Gordon walks on a bearing of 045 ° at a speed of 4·4 kilometres per hour. Brian walks on a bearing of 100 ° at a speed of 4·8 kilometres per hour.  If they both walk at steady speeds, how far apart will they be after 2 hours?	5
Ans	8.5km	

Credit 2001 P2 Q6	**6.** Three radio masts, Kangaroo (K), Wallaby (W) and Possum (P) are situated in the Australian outback.  Kangaroo is 250 kilometres due south of Wallaby. Wallaby is 410 kilometres from Possum. Possum is on a bearing of 130° from Kangaroo. Calculate the bearing of Possum from Wallaby. **Do not use a scale drawing.**	4
Ans	157.8 degrees	

Credit 2001 P2 Q8	**8.** A metal door-stop is prism shaped, as shown.  The uniform cross-section is shown below.  Find the volume of metal required to make the door-stop.	4
Ans	275.7cm^3	

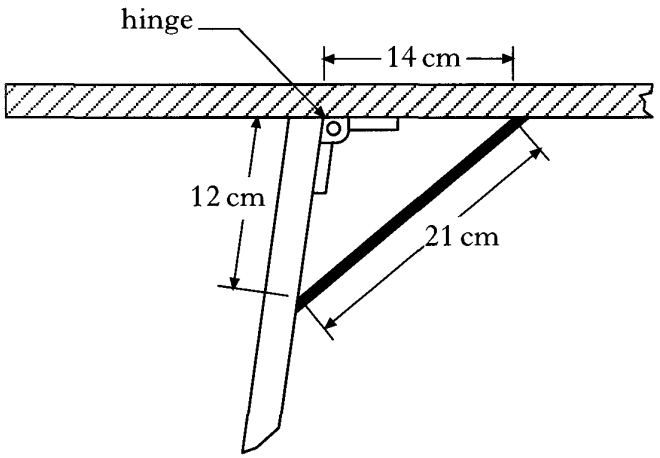
Credit 2001 P2 Q10

10. Each leg of a folding table is prevented from opening too far by a metal bar.



The metal bar is 21 centimetres long.

It is fixed to the table **top** 14 centimetres from the hinge and to the table **leg** 12 centimetres from the hinge.



(*a*) Calculate the size of the obtuse angle which the table top makes with the leg.

(*b*) Given that the table leg is 70 centimetres long, calculate the height of the table.

6

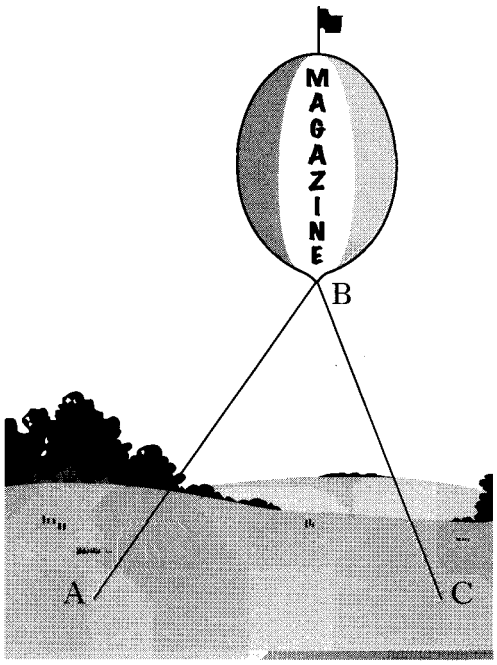
Ans

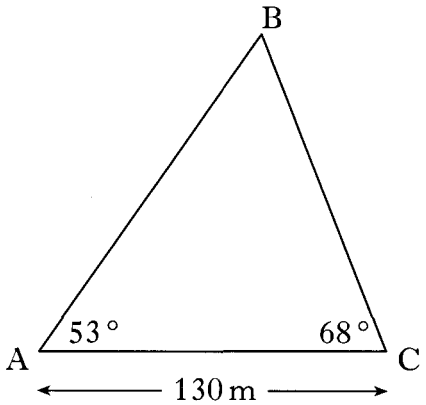
(*a*) 107·5°

(*b*) 66·8 cm

Credit 2000 P2 Q7

7. A newspaper group advertises a new magazine on a helium balloon. 5





From the base of the balloon, B, two holding wires are attached to the ground at A and C.

The distance from A to C is 130 metres.

From A, the angle of elevation of B is 53°.

From C, the angle of elevation of B is 68°.

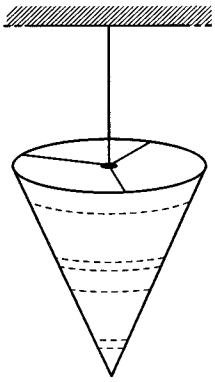
Calculate the height of point B above the ground.

Do not use a scale drawing.

Ans	112.3m

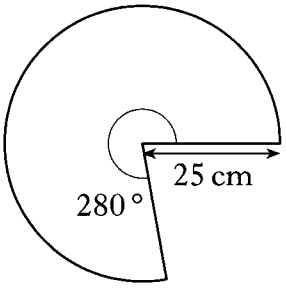
Credit 2000 P2 Q11

11. A lampshade is made in the shape of a cone, as shown.



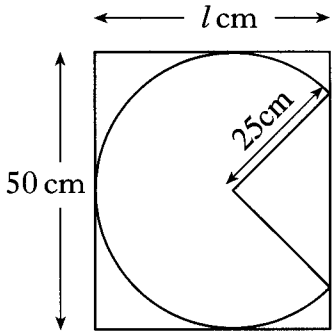
The shape of the material used for the lampshade is a sector of a circle.

The circle has radius 25 centimetres and the angle of the sector is 280°.



(*a*) Find the area of the sector of the circle.

Each sector is cut from a rectangular piece of material, 50 centimetres wide.



(*b*) Find, to the nearest centimetre, the **minimum** length, *l*, required for the piece of material.

Ans (a) 1527.2cm^2 (b) Minimum is 45cm