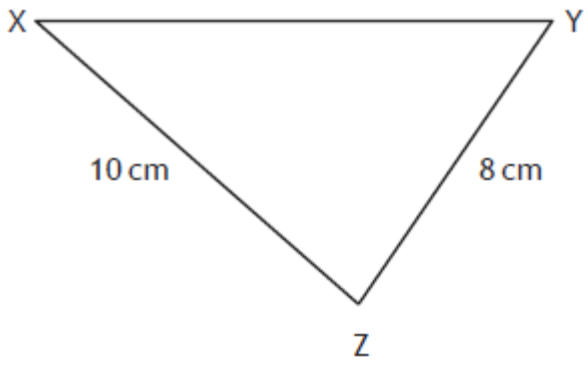
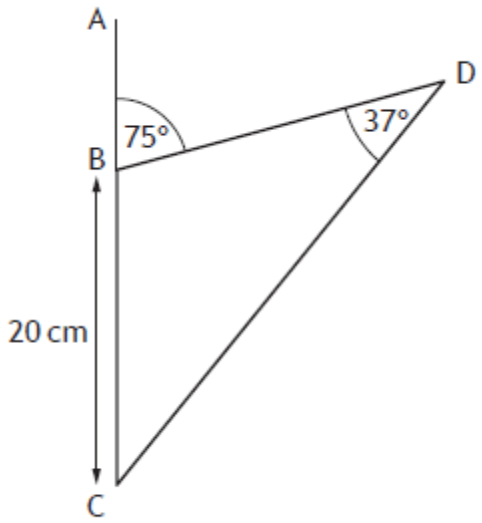
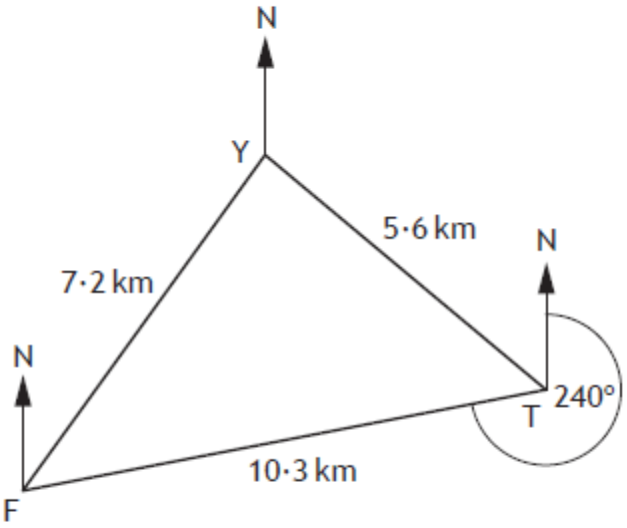
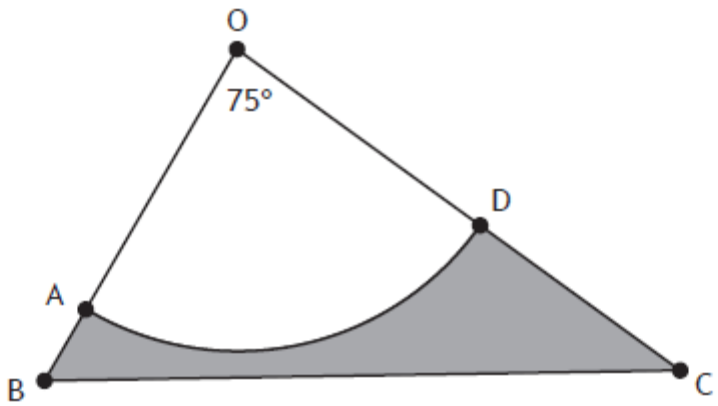
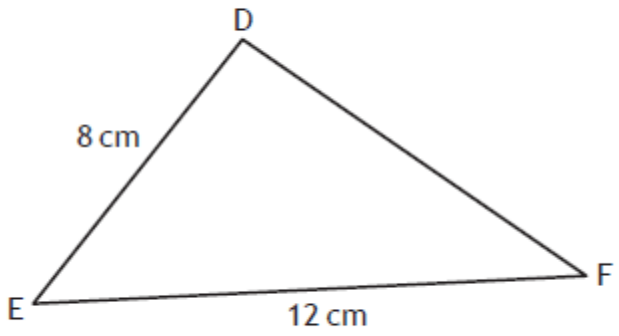
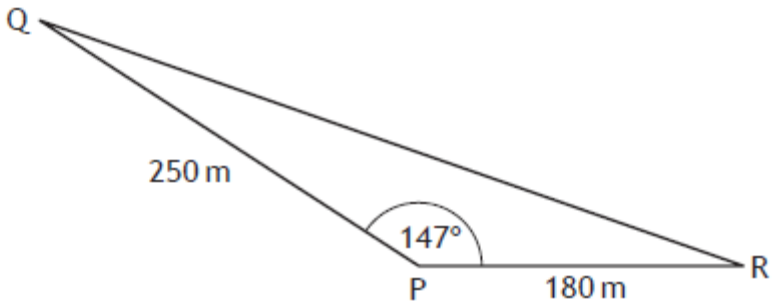
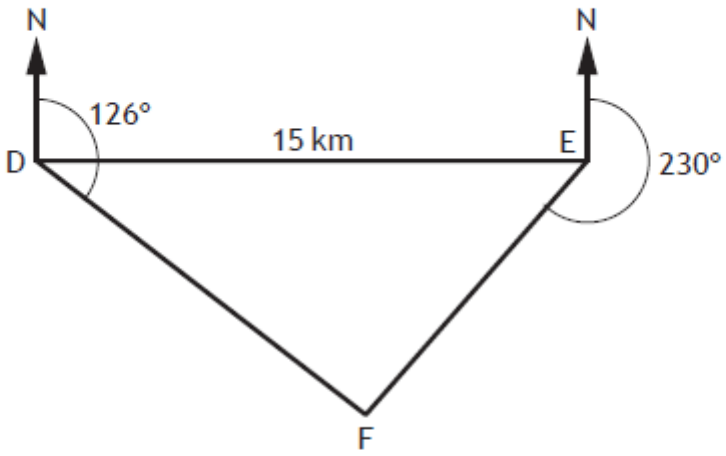
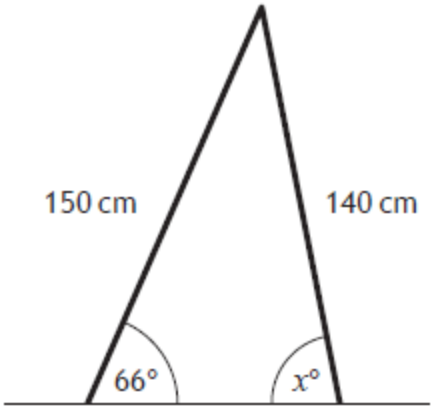
National 5 & Int. 2 — Triangle Trigonometry

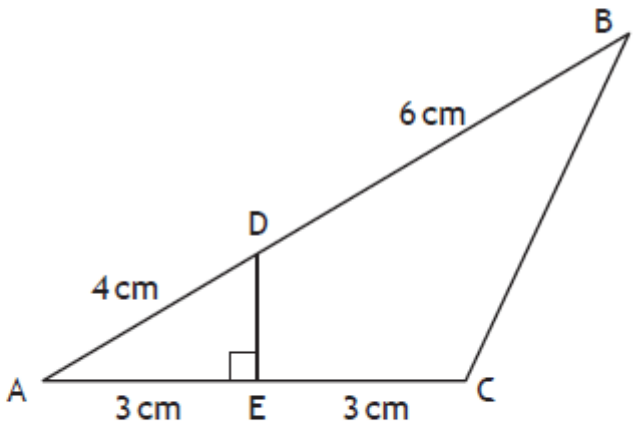
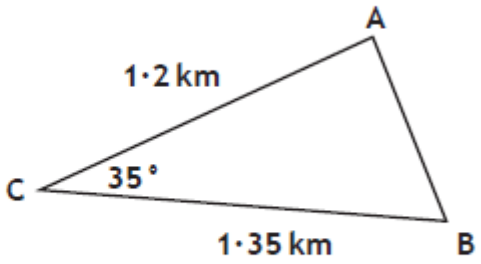
2018 P1 Q10	In triangle XYZ: • XZ = 10 centimetres • YZ = 8 centimetres • $\cos Z = \frac{1}{8}$.  Calculate the length of XY.	3
Ans	*12 cm*	
2018 P2 Q9	In this diagram: • angle ABD = 75° • angle BDC = 37° • BC = 20 centimetres.  Calculate the length of DC.	2
Ans	*32·1 cm*	

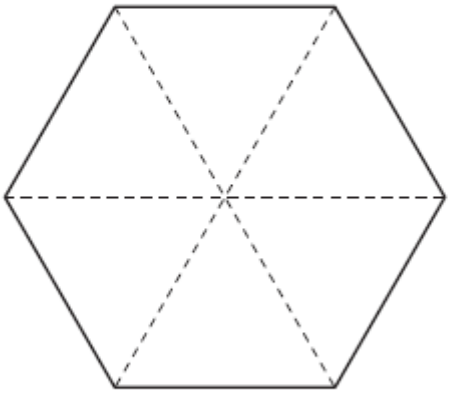
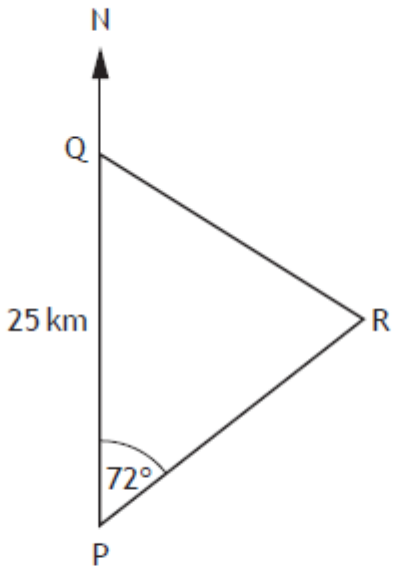
2018 P2 Q13	A ferry and a trawler receive a request for help from a stranded yacht. On the diagram the points F, T and Y show the positions of the ferry, the trawler and the yacht respectively.  • FY is 7·2 kilometres. • TY is 5·6 kilometres. • FT is 10·3 kilometres. • F is on a bearing of 240° from T. Calculate the bearing of the yacht from the trawler.	2
Ans	*282 °*	

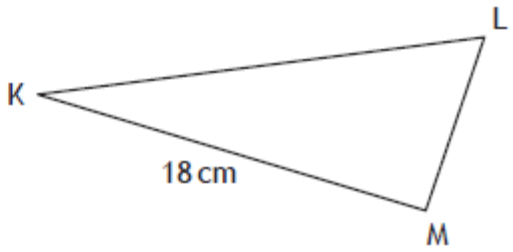
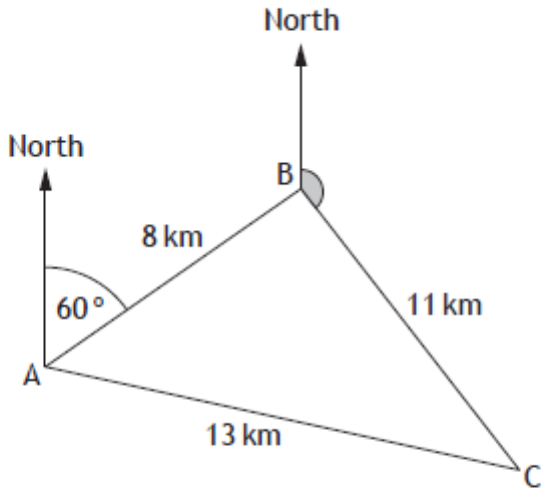
2018 P2 Q17	In the diagram below AOD is a sector of a circle, with centre O, and BOC is a triangle.  In sector AOD: • radius = 30 centimetres • angle AOD = 75°. In triangle OBC: • OB = 38 centimetres • OC = 55 centimetres. Calculate the area of the shaded region, ABCD.	5
Ans	*420·3 cm²*	
2017 P1 Q7	In triangle DEF: • DE = 8 centimetres • EF = 12 centimetres • $\sin E = \frac{2}{3}$  Calculate the area of triangle DEF.	2
Ans	*32cm²*	

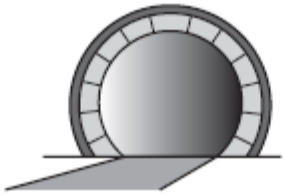
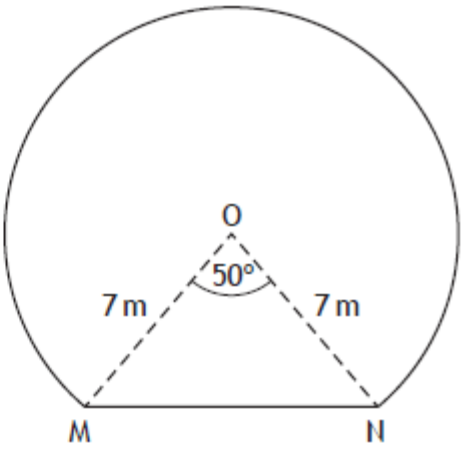
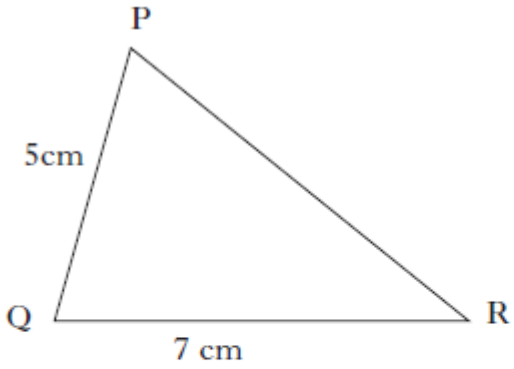
2017 P2 Q3	A piece of land is in the shape of a triangle as shown.  • PQ = 250 metres • PR = 180 metres • angle QPR = 147° The owner wishes to build a fence along the side QR. Calculate the length of the fence.	3
Ans	*413m*	
2017 P2 Q10	In the diagram below D, E and F represent the positions of Dunbridge, Earlsford and Fairtown respectively.  Dunbridge is 15 kilometres west of Earlsford. From Dunbridge, the bearing of Fairtown is 126°. From Earlsford the bearing of Fairtown is 230°. Calculate the distance between Dunbridge and Fairtown. **Do not use a scale drawing.**	4
Ans	*9·9km*	

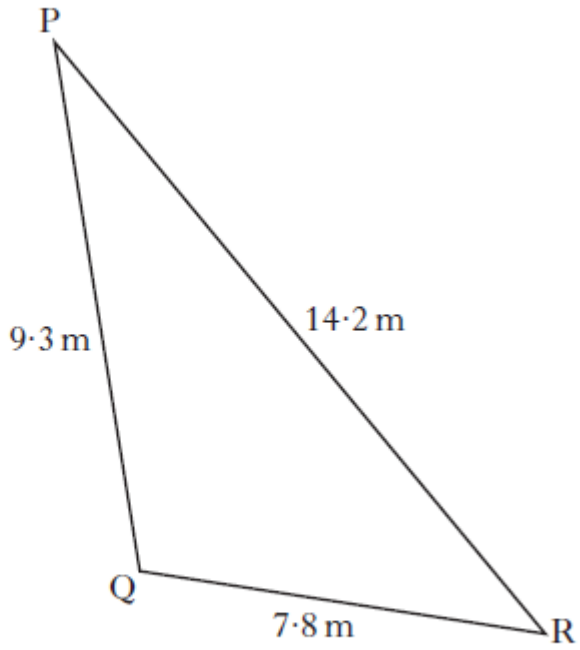
2016 P2 Q8	A set of stepladders has legs 150 centimetres and 140 centimetres long.  When the stepladder is fully open, the angle between the longer leg and the ground is 66°.  Calculate $x°$, the size of the angle between the shorter leg and the ground.	3
Ans	*78·2°*	

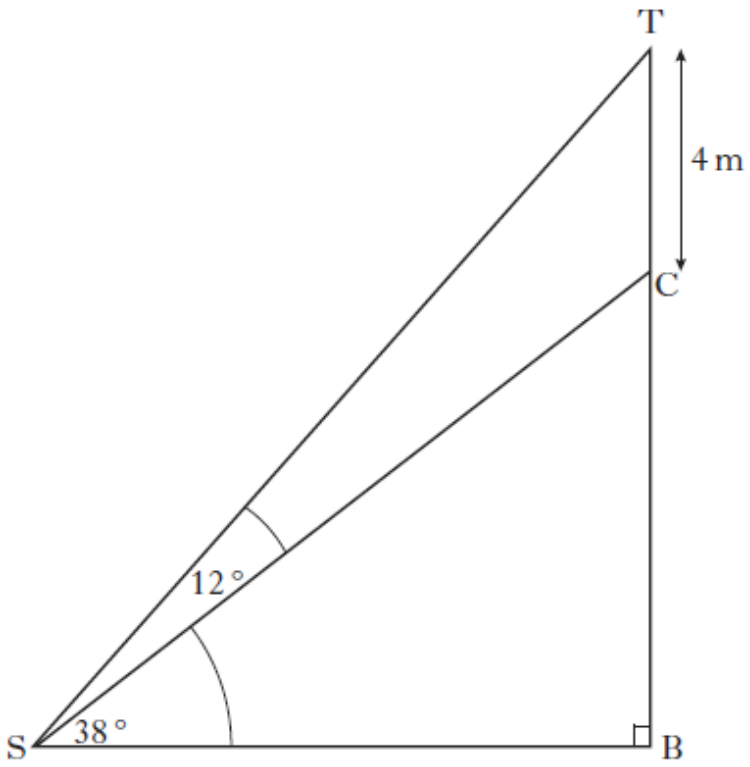
2016 P2 Q16	In the diagram below: • DE is perpendicular to AC. • AD = 4 centimetres. • DB = 6 centimetres. • AE = EC = 3 centimetres.  Calculate the length of BC. Give your answer correct to one decimal place.	4
Ans	*6·8 cm*	
2015 P2 Q3	Triangle ABC is shown below.  Calculate the length of AB.	3
Ans	*0·78km*	

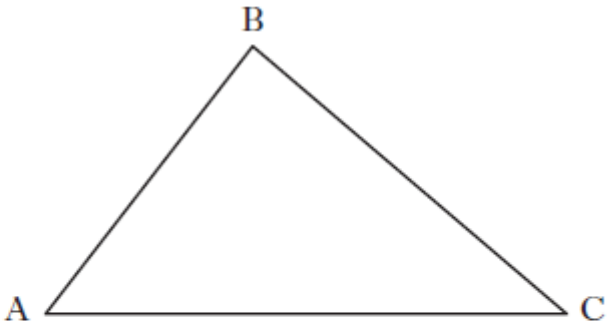
2015 P2 Q11	The top of a table is in the shape of a regular hexagon. The three diagonals of the hexagon which are shown as dotted lines in the diagram below each have length 40 centimetres.   Calculate the area of the top of the table.	4
Ans	*1039·2cm²*	
2015 P2 Q13	In the diagram below P, Q and R represent 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	*23·8km*	

2014 P1 Q5	In triangle KLM • KM = 18 centimetres • sin K = 0·4 • sin L = 0·9 Calculate the length of LM.  	3
Ans	*8cm*	
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.	3 2
Ans	*(a) 84·8º (b) 155·2 °*	

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	*151·3m²*	
2014 P1 Q3	 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 $\sqrt{a}$.	3
Ans	*√60 cm*	

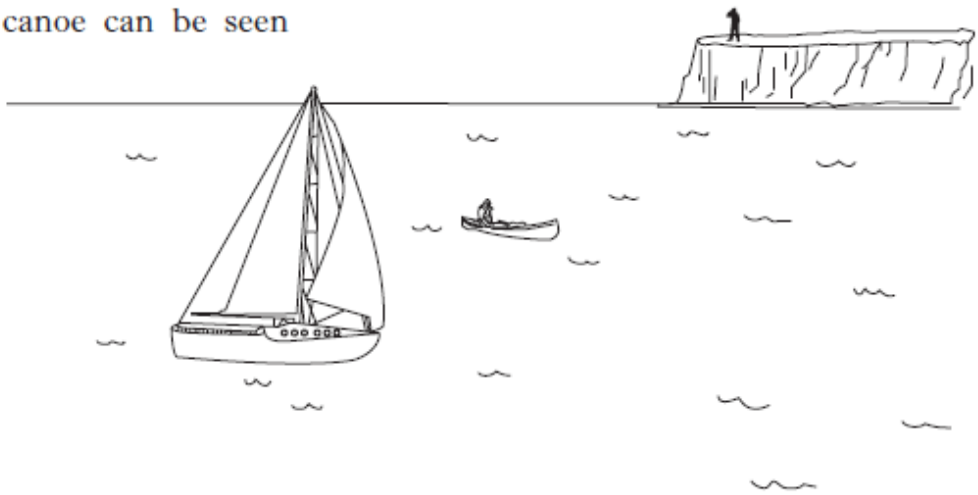
2013 P2 Q4	Triangle PQR is shown below.  Calculate the size of angle QPR.	3
Ans	*30·6°*	

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 metres*	

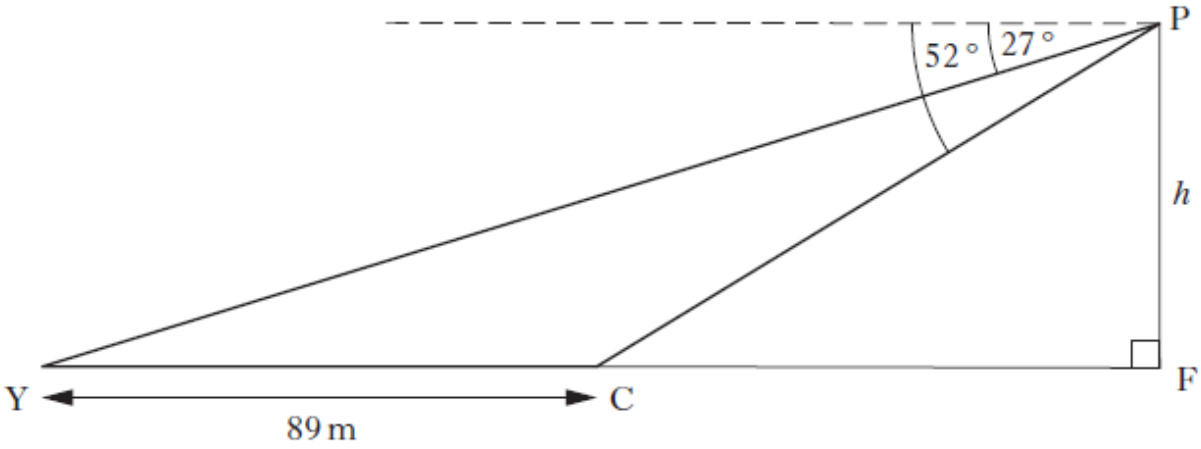
2012 P1 Q7	 The area of triangle ABC is 20 square centimetres. AC = 16 centimetres and $\sin C = \frac{1}{4}$. Calculate the length of BC.	2
Ans	*10cm*	

2012 P2 Q10

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:

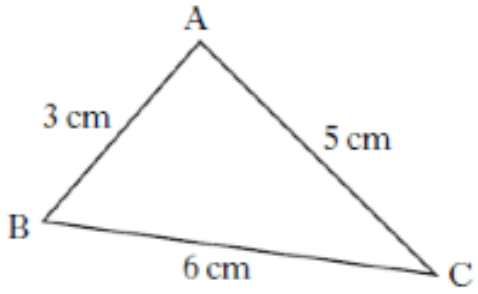
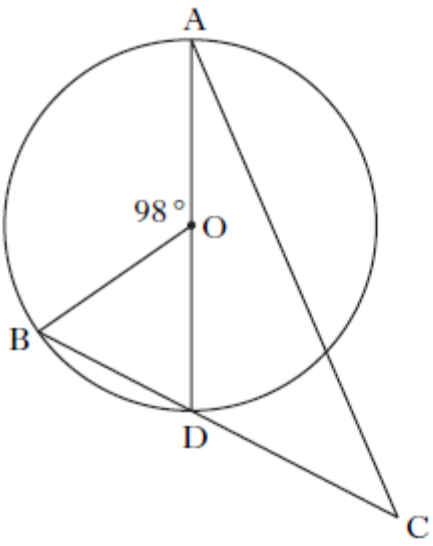
- the angle of depression of the yacht is 27 °;
- the angle of depression of the canoe is 52 °.

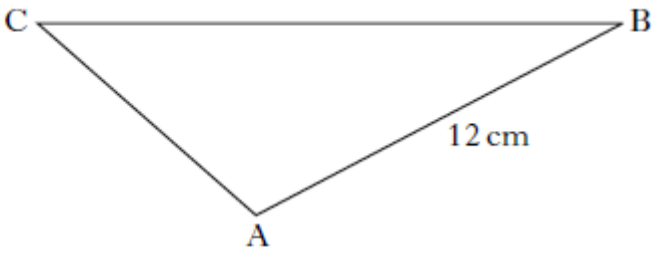
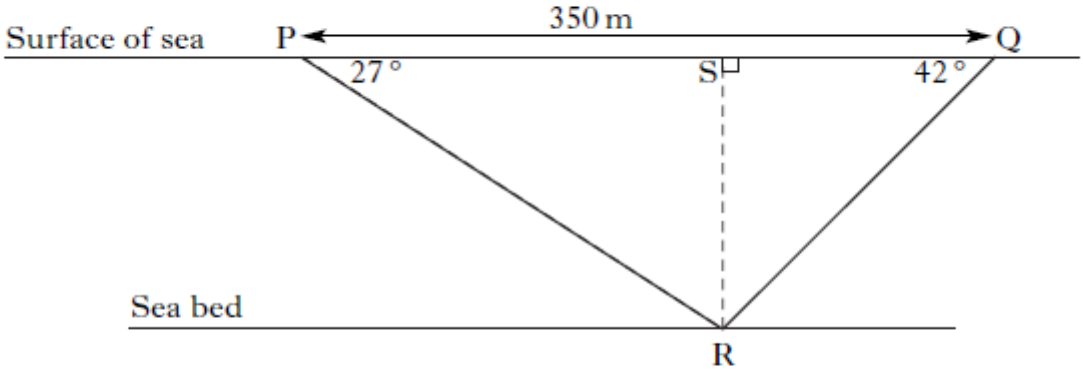
The distance between the yacht and the canoe is 89 metres.

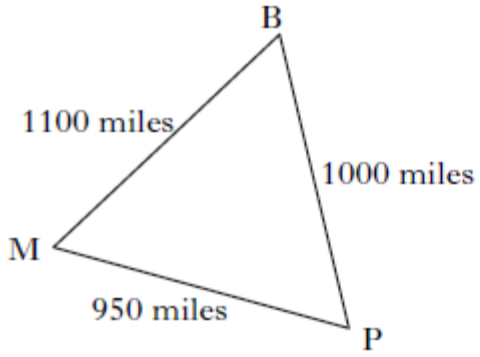
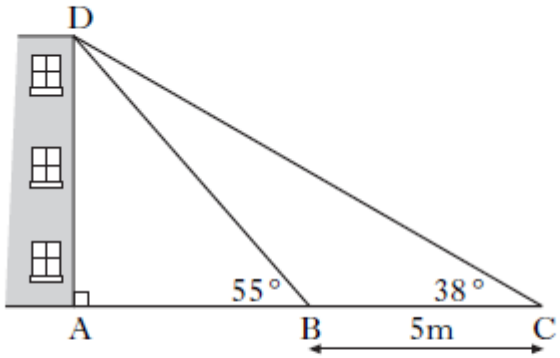
Calculate the height, h, metres, of the cliff.

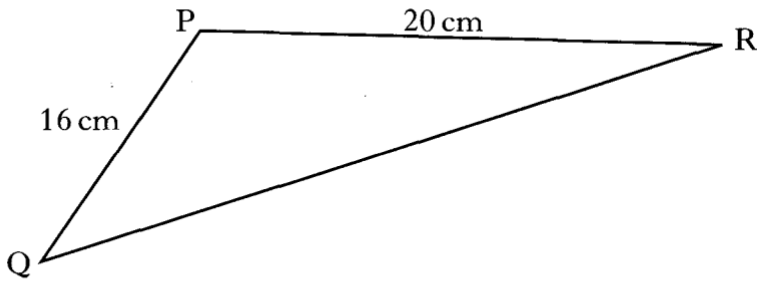
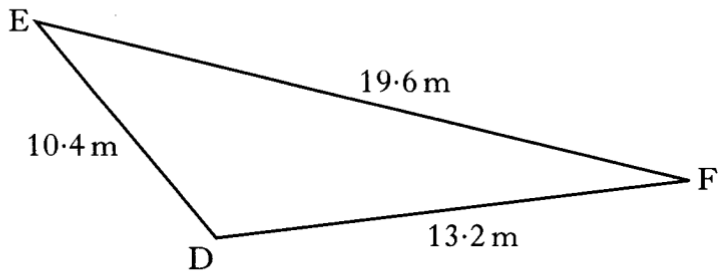
4

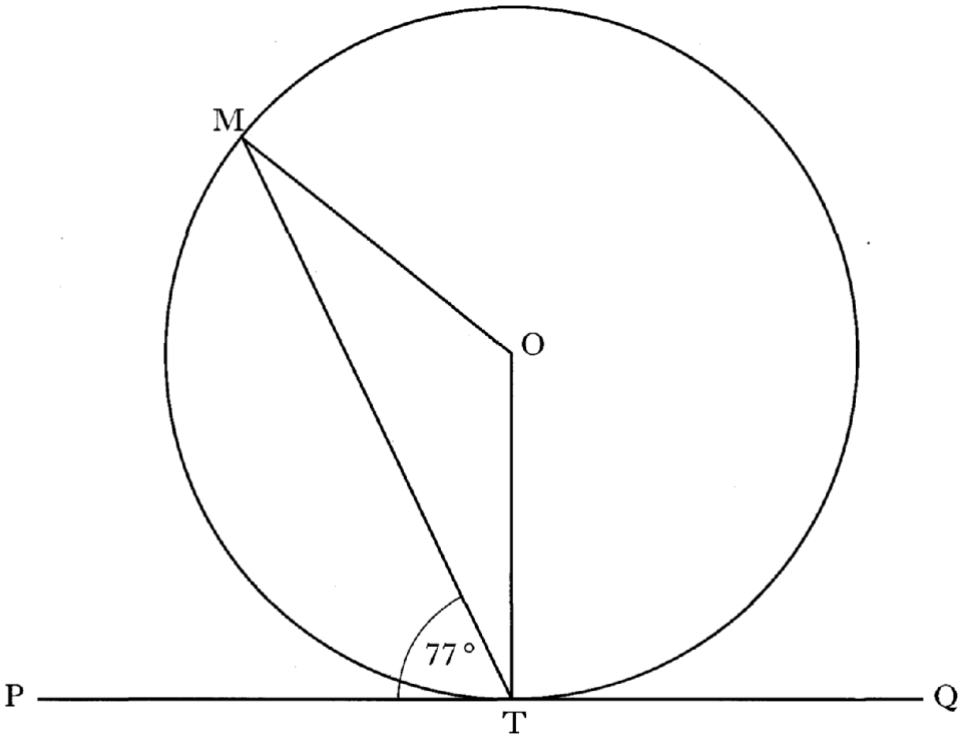
Ans *0·4m*

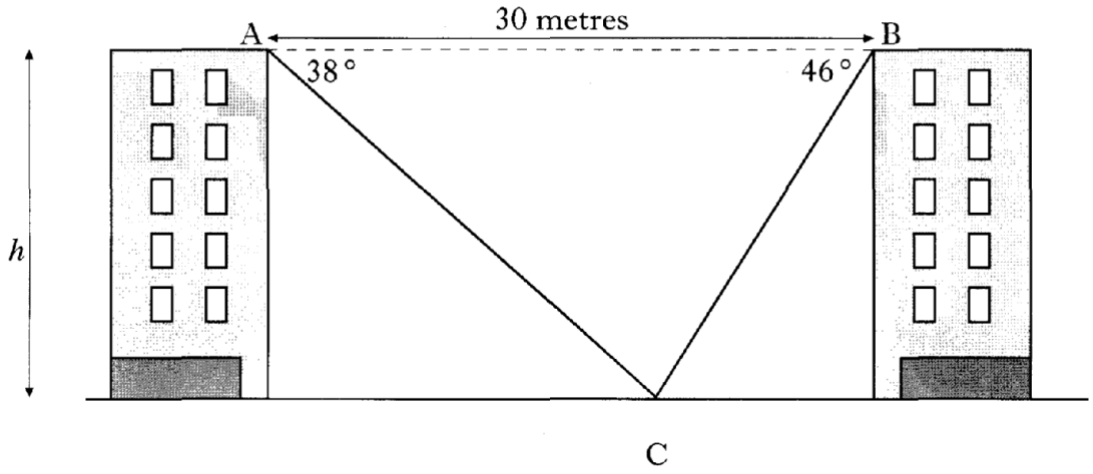
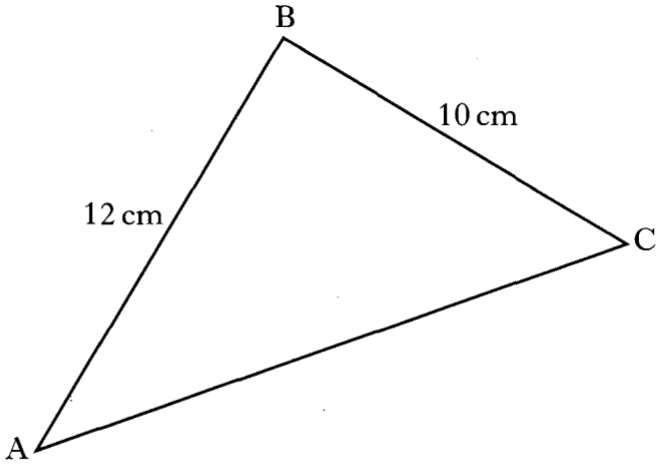
2011 P1 Q5	 In triangle ABC, show that $\cos B = \frac{5}{9}$.	3
Ans	*Proof*	
2011 P2 Q12	 AD is a diameter of a circle, centre O. B is a point on the circumference of the circle. The chord BD is extended to a point C, outside the circle. Angle BOA = 98 °. DC = 9 centimetres. The radius of the circle is 7 centimetres. Calculate the length of AC.	5
Ans	*21cm*	

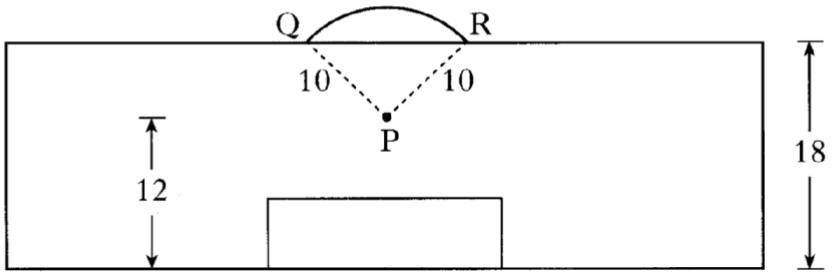
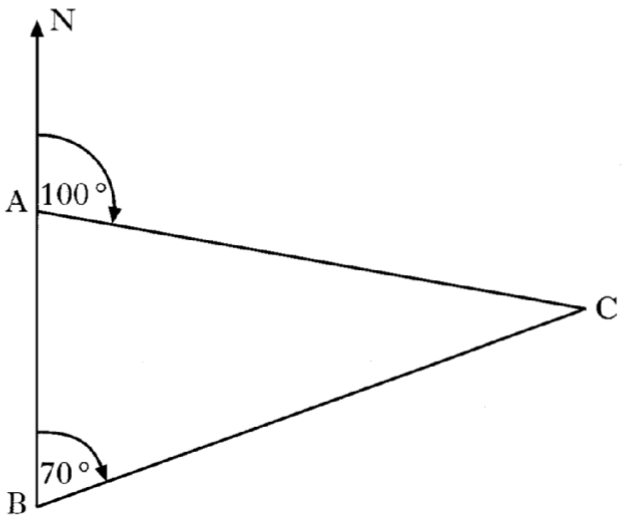
2010 P1 Q6	 In triangle ABC, AB = 12 centimetres, $\sin C = \frac{1}{2}$ and $\sin B = \frac{1}{3}$. Find the length of side AC.	3
Ans	*8cm*	
2010 P2 Q12	Two ships have located a wreck on the sea bed. In the diagram below, the points P and Q represent the two ships and the point R represents the wreck.  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	*126·5metres*	

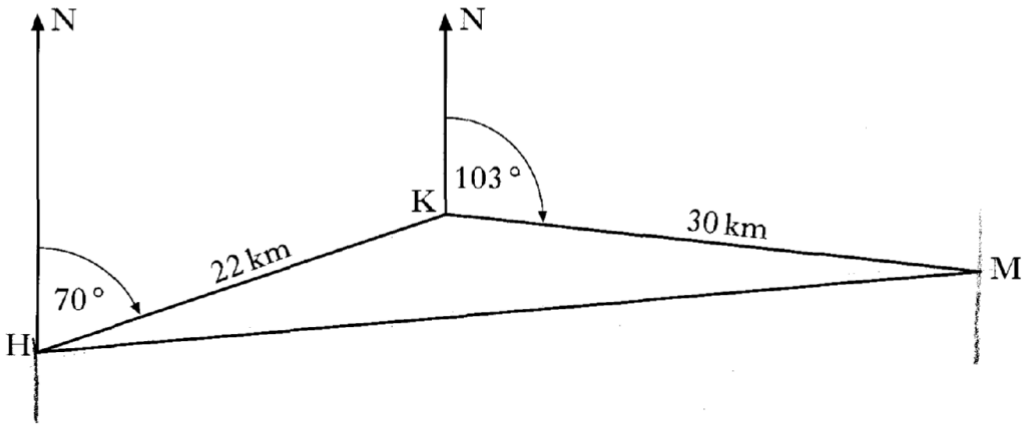
2009 P2 Q6	The Bermuda triangle is an area in the Atlantic Ocean where many planes and ships have mysteriously disappeared. Its vertices are at Bermuda (B), Miami (M) and Puerto Rico (P).   Calculate the size of angle BPM.	3
Ans	*68·6°*	
2009 P2 Q13	For reasons of safety, a building is supported by two 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*	

2008 P1 Q6	Triangle PQR is shown below.  If sin P = $\frac{1}{4}$, calculate the area of triangle PQR.	2
Ans	*40cm²*	
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	*111·8°*	

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) 154° (b)15·6cm*	

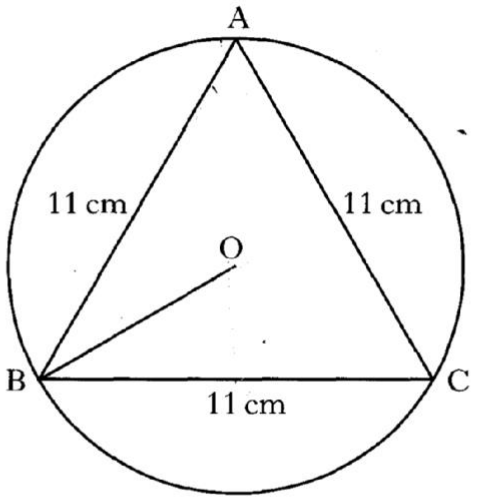
2007 P2 Q9	. The diagram shows two blocks of flats of equal height.  A and B represent points on the top of the flats and C represents a point on the ground between them. To calculate the height, *h*, of each block of flats, a surveyor measures the angles of depression from A and B to C. From A, the 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*	
2006 P1 Q4	 Calculate the area of triangle ABC if sin B = $\frac{2}{3}$.	2
Ans	*40cm²*	

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) 106·3°* *(b) 18·6 yards*	
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.*	

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) 147° (ii) 101·9km (b) 179·7km²*	

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.

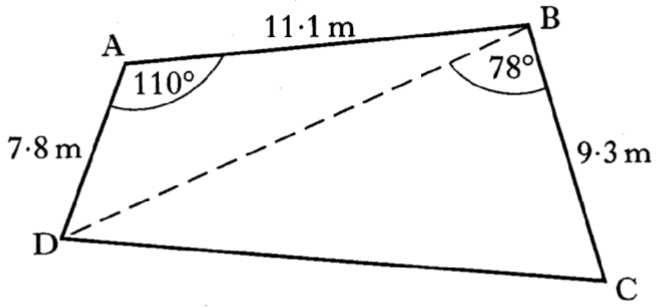
(*a*) Write down the size of angle OBC. 1

(*b*) Calculate the length of the radius OB. 3

Ans *(a) 30º (b) 6·35cm*

2004 P2 Q7

A garden, in the shape of a quadrilateral, is represented in the diagram below.



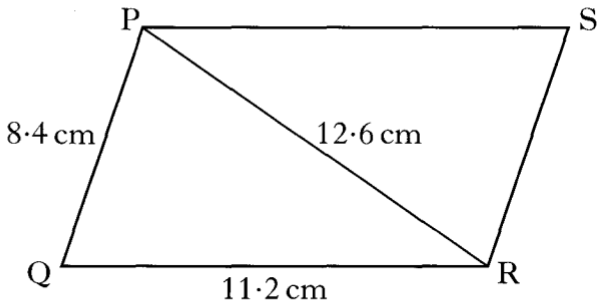
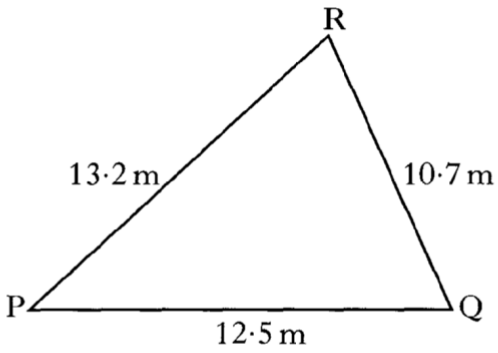
Calculate:

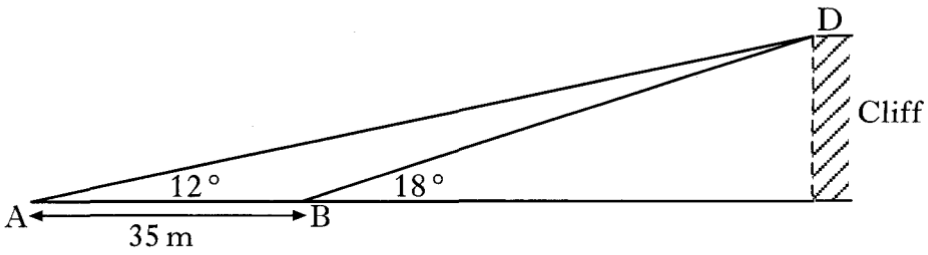
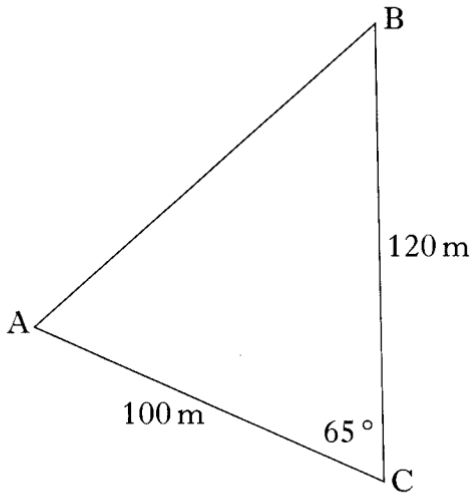
(*a*) the length of the diagonal BD; 3

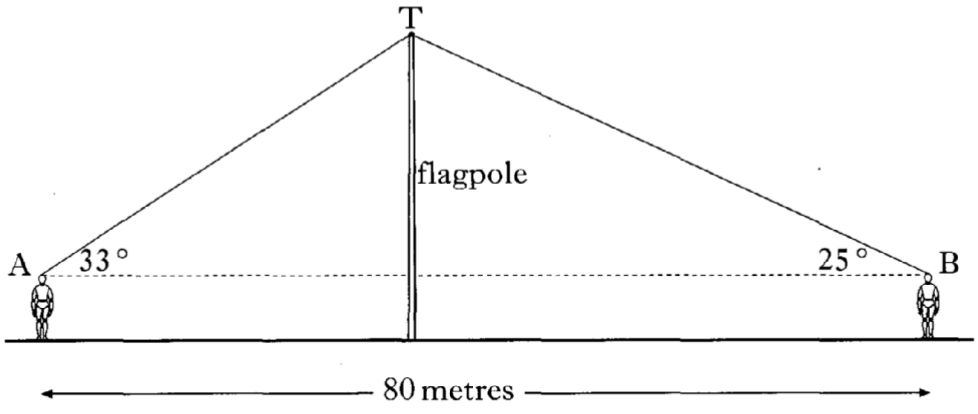
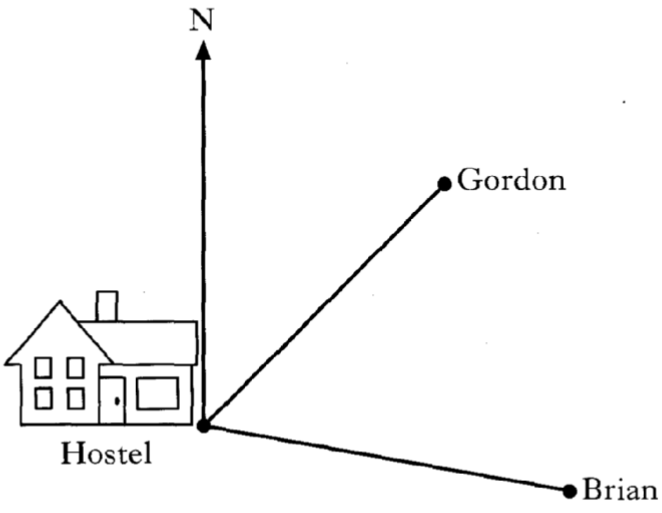
Do not use a scale drawing

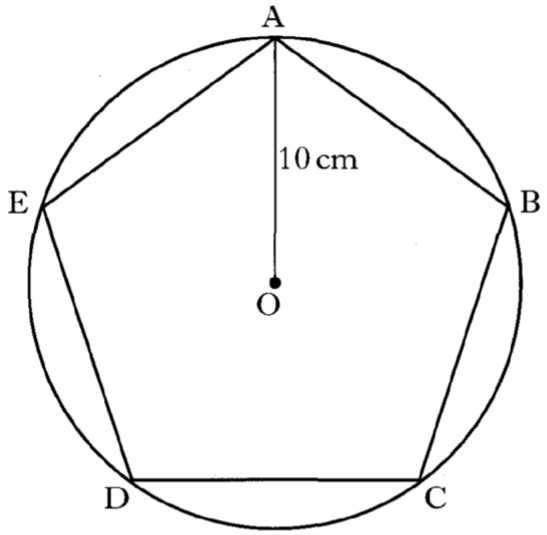
(*b*) the area of the garden. 4

Ans *(a) 15·6 metres (b) 111·6m²*

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) 78·6° (b) 92·2cm²*	
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) 68·9° (b) 62·4m²*	

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*	
2002 P2 Q1	The sketch shows a triangle, ABC.  Calculate the area of the triangle.	2
Ans	*5438m²*	

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*	
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*	

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*	