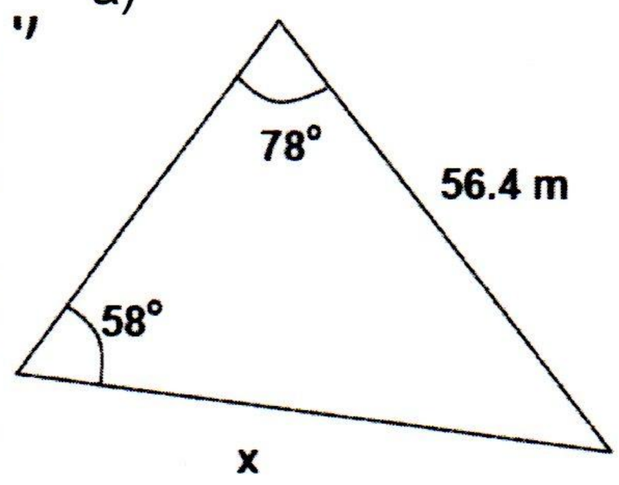
Sin cos rule

Q1. By any suitable method, find the solution to the equation $\sin x = (\cos x)^2$.

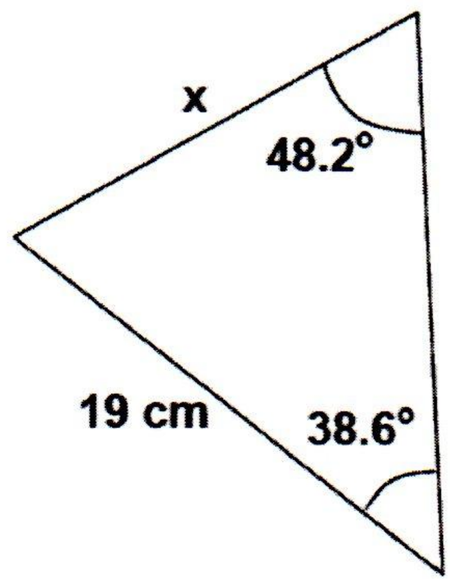
Q2. Find the unknown length or unknown angle '*x*' *in* each of these triangles.

a)



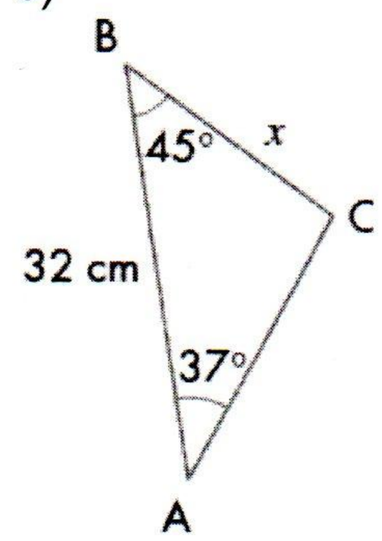
x=_____

b)



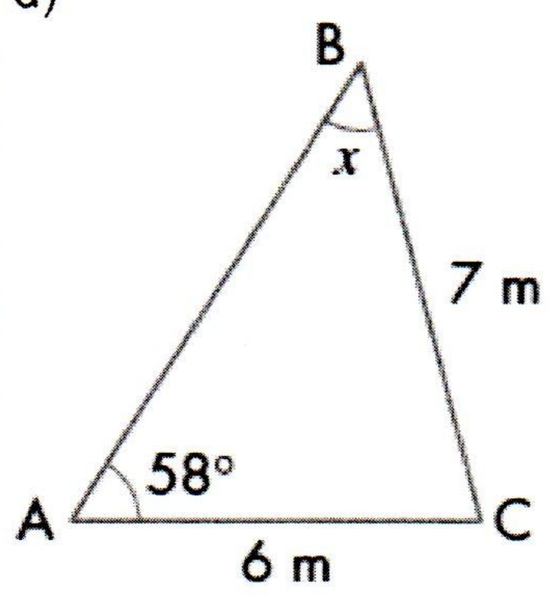
x=_____

c)



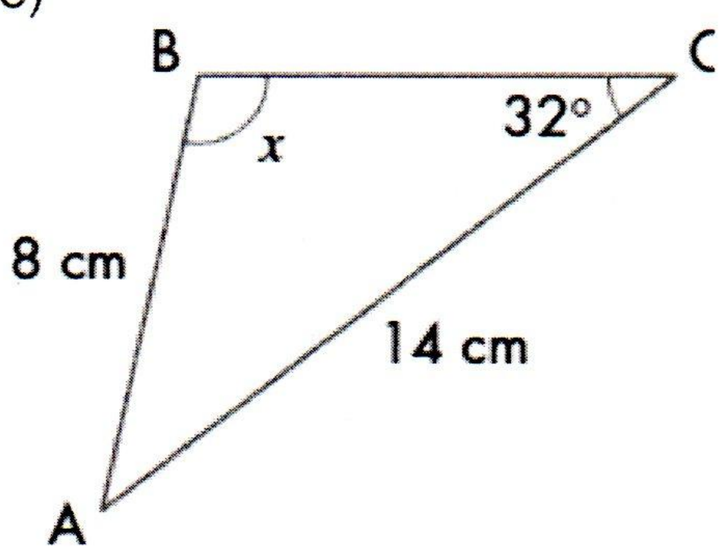
x=_____

d)



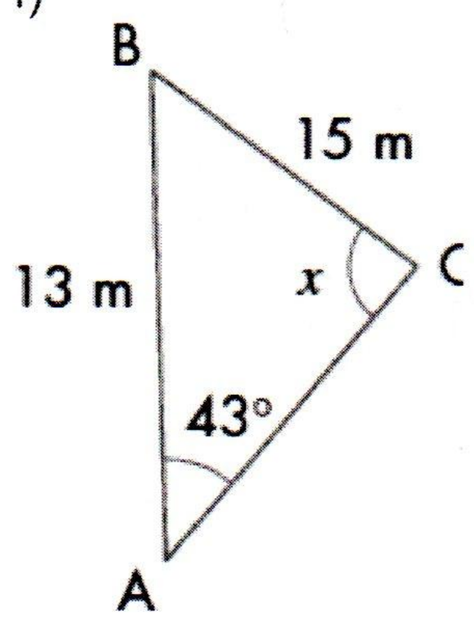
x=_____

e)



x=_____

f)

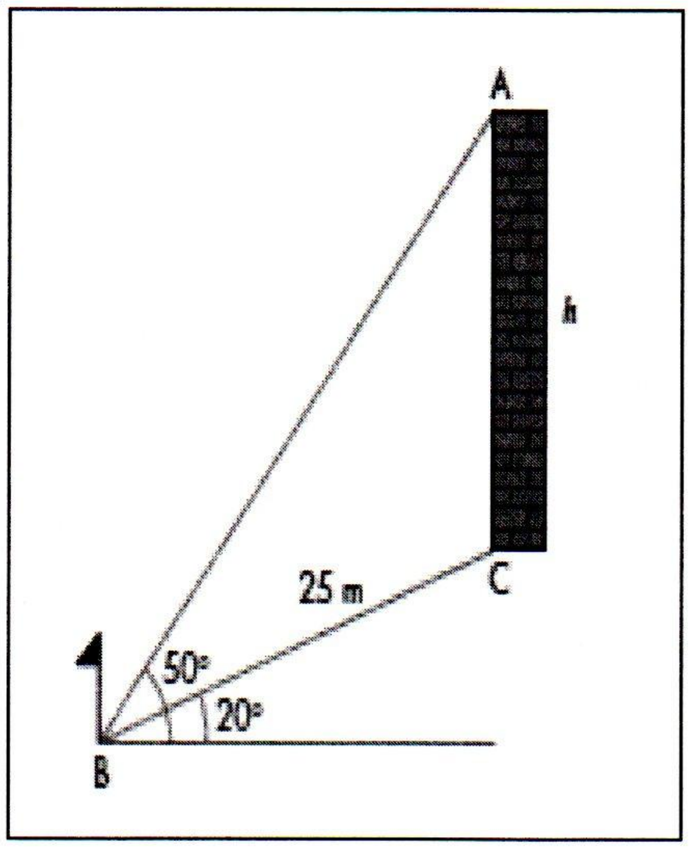


x=_____

Q3 . In triangle ABC, the angle at A is 42°, the side AB is 12 cm and the side BC is 8 cm. Find the two possible values of the angle at C.

Q4 . In triangle ABC, the angle at A is 42°, the side AB is 16 cm and the side BC is 14 cm. Find the two possible values of the side AC.

Q5 . To find the height of a tower standing on a small hill, Mary made some measurements (see diagram). From a point B, the angle of elevation of C is 20°, the angle of elevation of A is 50°, and the distance BC is 25 m.



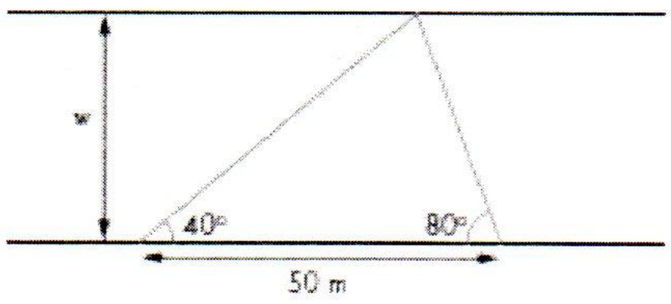
a Calculate these angles.

i ABC

ii BAC

b Using the sine rule and triangle ABC, calculate the height *h* of the tower.

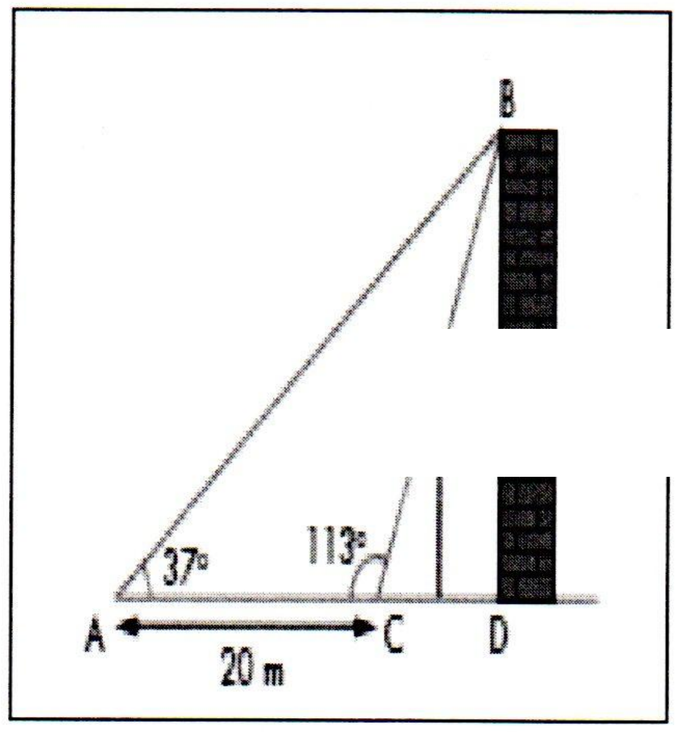
Q**6** . Use the information on this sketch to calculate the width, *w*, of the river.



Q**7** . An old building is unsafe, so it is protected by a fence. To work out the height of the building, Annie made the
measurements shown on the diagram.

a Use the sine rule to work out the distance AB.

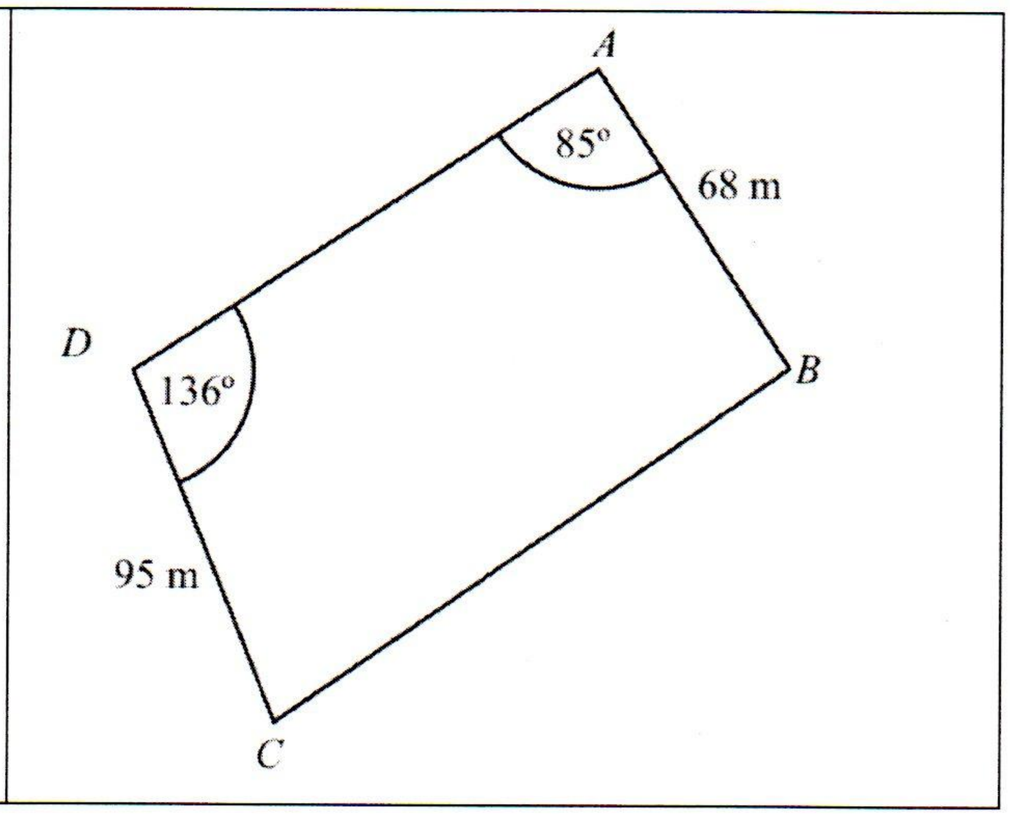
b Calculate the height of the building, BD.



Q**8** . A weight is hung from a horizontal beam using two strings. The shorter string is 2.5 m long and makes an angle of 71° with the horizontal. The longer string makes an angle of 43° with the horizontal. What is the length of the longer string?

Q**9** . An aircraft is flying over an army base. Suddenly, two searchlights, 3 km apart, are switched on. The two beams of light meet on the aircraft at an angle of 125° vertically above the line joining the searchlights. One of the beams of light makes an angle of 31° with the horizontal. Calculate the height of the aircraft.

Q**10**. The diagram shows the plan of a field.
AB = 68 m.
DC = 95 m.
Angle *ADC* = 136°.
Angle *DAB* = 85°.
DB = 240 m.
Work out the area of the field.
Give your answer correct to 3 significant figures.

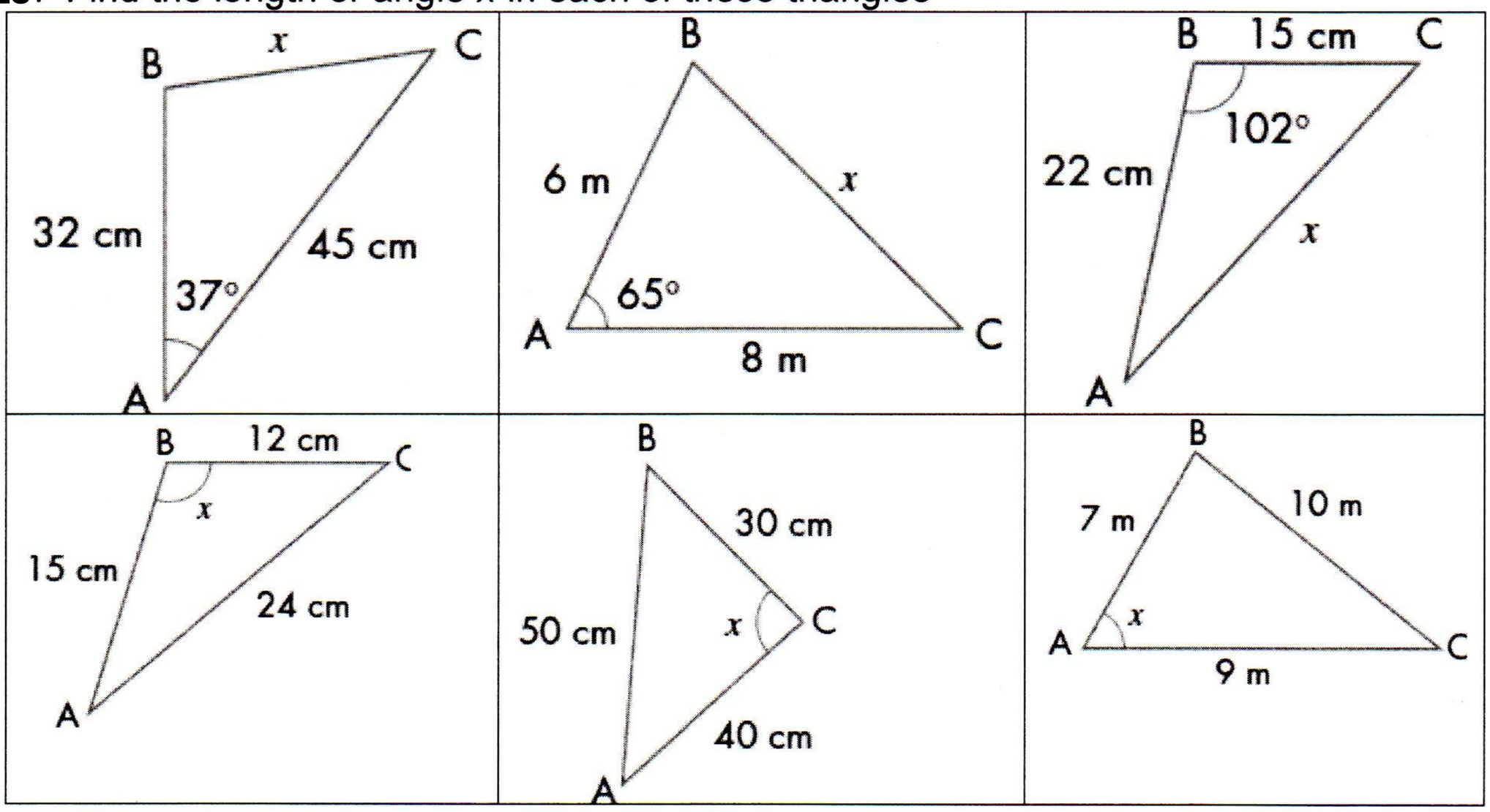


Q11. Two ships leave a port in directions that are 41° from each other. After half an hour, the ships are 11 km apart. If the speed of the slower ship is 7 km/h, what is the speed of the faster ship?

Q12. For any triangle ABC, prove the sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Q13. Find the length or angle *x* in each of these triangles



Q14.The three sides of a triangle are given as 3*a*, 5*a* and 7*a*. Calculate the smallest angle in the triangle.

_____

Q15. ABCD is a trapezium where AB is parallel to CD. AB = 4 cm, BC = 5 cm, CD = 8 cm, DA = 6 cm. A line BX is parallel to AD and cuts DC at X. Calculate these.

a angle BCD

_____

b length BD

_____

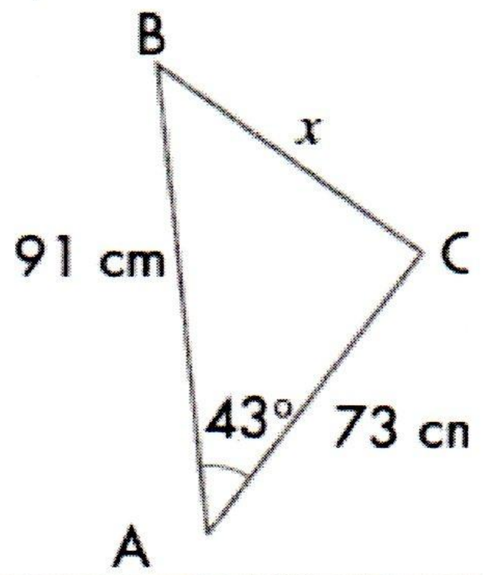
Q16. For any triangle ABC prove the cosine rule

$a^2 = b^2 + c^2 - 2bc \cos A$

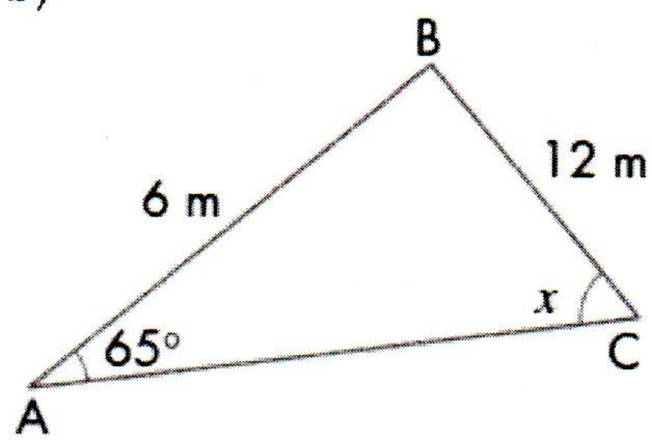
_____

Q17. Find the length or angle *x* in each of these triangles.

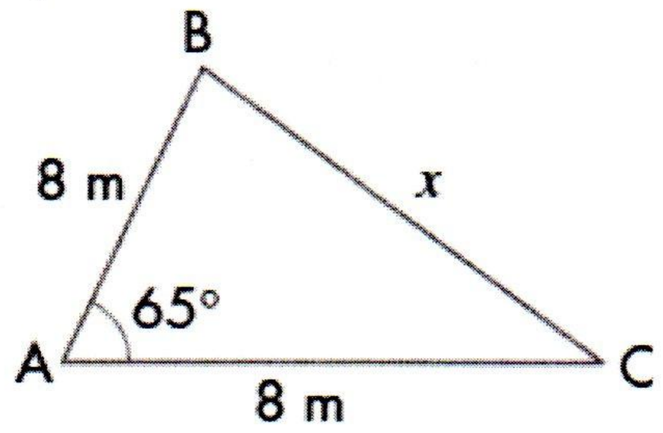
a)



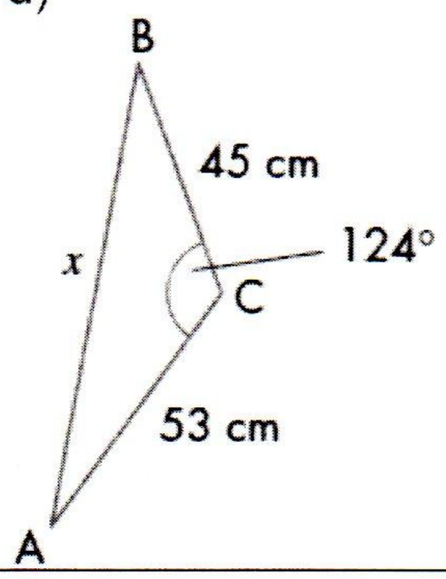
b)



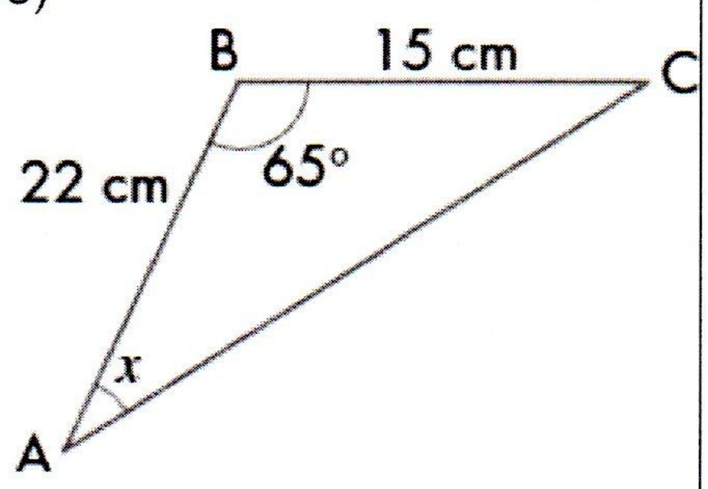
c)



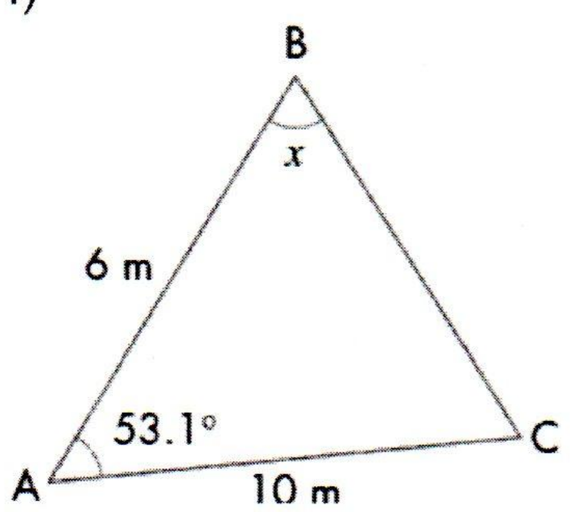
d)



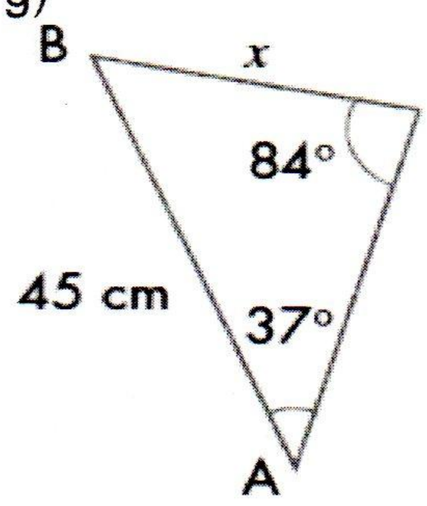
e)



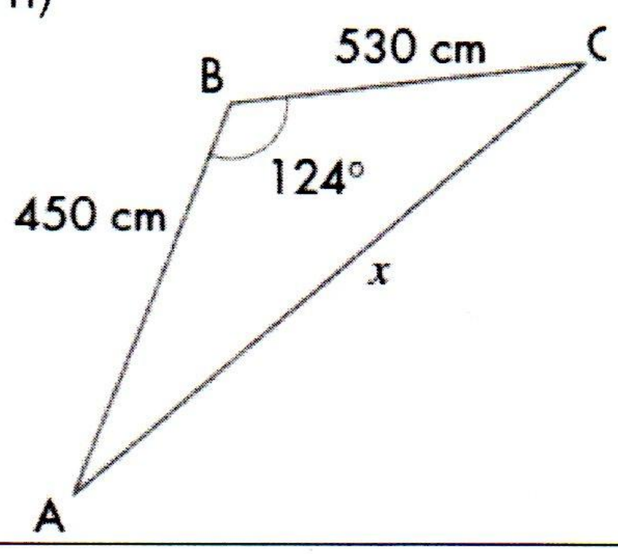
f)



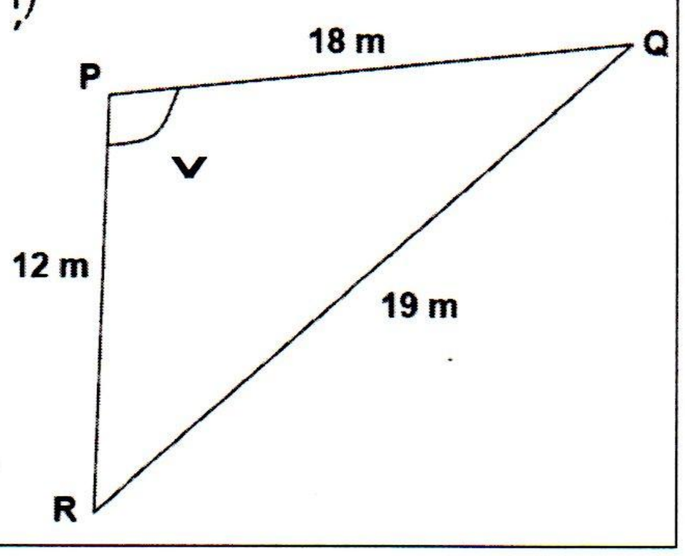
g)



h)



i)



Q18. The hands of a clock have lengths 3 cm and 5 cm. Find the distance between the tips of the hands at 4 o'clock.

Q19. A spacecraft is seen hovering at a point which is in the same vertical plane as two towns, X and F.

Q 20. Its distances from X and F are 8.5 km and 12 km respectively. The angle of elevation of the spacecraft when observed from F is 43°. Calculate the distance between the two towns.

Q21. Two boats, Mary Jo and Suzie, leave port at the same time. Mary Jo sails at 10 knots on a bearing of 065°. Suzie sails on a bearing of 120° and after 1 hour Mary Jo is on a bearing of 330° from Suzie.

_____

What is Suzie's speed? (A knot is a nautical mile per hour.) _____

Q22. Two ships leave port at the same time, Darling Dave sailing at 12 knots on a bearing of 055°, and Merry Mary at 18 knots on a bearing of 280°.

a How far apart are the two ships after 1 hour? _____

b What is the bearing of Merry Mary from Darling Dave? _____

Q23. The sine of angle x is $^4/_5$. Work out the cosine of angle x.

_____

Q24. The cosine of angle x is . Work out the sine of angle x. _____

The two short sides of a right-angled triangle are $\sqrt{6}$ and $\sqrt{13}$. Write down the exact value of the hypotenuse of this triangle, and the exact value of the sine, cosine and tangent of the smallest angle in the triangle.

_____

Q25. The tangent of angle A is $^6/_{11}$. Use this fact to label two sides of the triangle.
a Calculate the third side of the triangle. _____

b Write down the exact values of sin A and cos A. _____

Q26. Calculate the exact value of the area of an equilateral triangle of side 6 cm. Work out the exact value of the area of a right-angled isosceles triangle whose hypotenuse is 40 cm.

_____

Q27. Find the area of each of the following triangles.

a Triangle ABC where BC = 7 cm, AC = 8 cm and angle ACB = 59° _____

b Triangle ABC where angle BAC = 86°, AC = 6.7 cm and AB = 8 cm _____

c Triangle PQR where QR = 27 cm, PR = 19 cm and angle QRP = 109° _____

d Triangle XYZ where XY = 231 cm, XZ = 191 cm and angle YXZ = 73° _____

e Triangle LMN where LN = 63 cm, LM = 39 cm and angle NLM = 85° _____

Q . The area of triangle ABC is 27 cm^2. If BC = 14 cm and angle BCA = 115°, find AC.

The area of triangle LMN is 113 cm^2, LM = 16 cm and MN = 21 cm. Angle LMN is acute.

Calculate these angles. **a** LMN _____ **b** MNL _____

Q . In a quadrilateral ABCD, DC = 4 cm, BD = 11 cm, angle BAD = 32°, angle ABD = 48° and angle BDC = 61°. Calculate the area of the quadrilateral.

_____

Q . A board is in the shape of a triangle with sides 60 cm, 70 cm and 80 cm. Find the area of the board.

_____

Q . Two circles, centres P and Q, have radii of 6 cm and 7 cm respectively. The circles intersect at X and Y. Given that PQ = 9 cm, find the area of triangle PXQ.

_____

Q . The points A, B and C are on the circumference of a circle, centre O and radius 7 cm. AB = 4 cm and BC = 3.5 cm. Calculate these.

a angle AOB

b area of quadrilateral OABC

Q . Prove that for any triangle ABC

Area = 1/2 *ab* sin *C*

Q . A section of straight road 1.5 Km long rises 75 metres over its length. What is the average angle that the road makes with the horizontal?

Q . Which bearings are represented by the following compass directions:

a) East **b)** West **c)** South

d) North **e)** North East **f)** South West

Q . A ship travels 135 Km on a bearing of 135°. How far is it east of its starting point?

Q . An aircraft flies 340 Km on a bearing of 285°. How far is it west of its starting point and how far is it north of its starting point?

Q . A mountain P is 45 Km east and 34 Km north of another mountain Q. What is the bearing of mountain Q from mountain P ? What is the back bearing of mountain P from mountain Q ?

Q46. The angle of elevation to the top of a mountain from the base camp of a mountaineering expedition is measured very accurately to be 3.582o. The horizontal distance from the base camp to the mountain is 56.43 Km. How high is the mountain above the base camp?

Q47. A ship sails from a port P on a bearing of 206o for a distance of 56 Km to an island Q and then changes direction to a bearing of 143o for a distance of 98 Km to another port R. How far is the ship now east of its starting point and how far is it south of its starting point?
Give each distance correct to the nearest 100 metres.

Q48. An aircraft flies 890 Km from an airport on a bearing of 340o and then changes to a bearing
of 203° and flies another 760 Km.
a) How far is the plane now west of the airport?

b) Is the plane now north or south of the airport and by how much?

c) What bearing must the plane now fly in order to return directly to the airport?

d) How far is the return flight assuming a direct return?

Q49. Michelle measures the angle of elevation to the top of a tower from the ground to be 63°.

Q50. Peter stands 22 metres behind her and measures the angle of elevation to the top of the
tower to be 35°.

a) How far is Michelle from the tower?

b) How tall is the tower?