

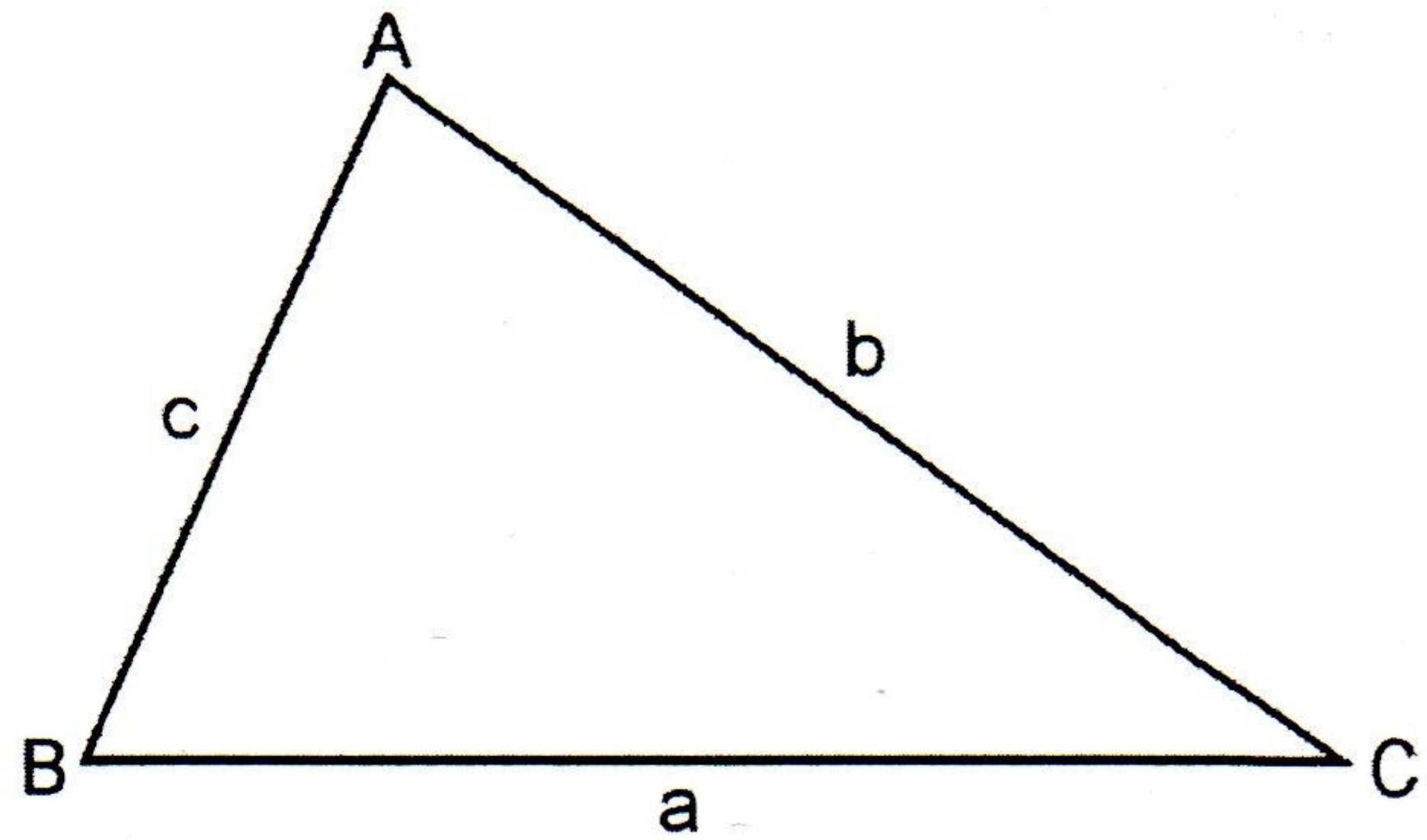
# Sine and cosine rule

(1)

Sine Rule:

It states that

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



$$a / \sin A = b / \sin B$$

or  $a \sin B = b \sin A$

$$b / \sin B = c / \sin C$$

or  $b \sin C = c \sin B$

$$c / \sin C = a / \sin A$$

or  $c \sin A = a \sin C$

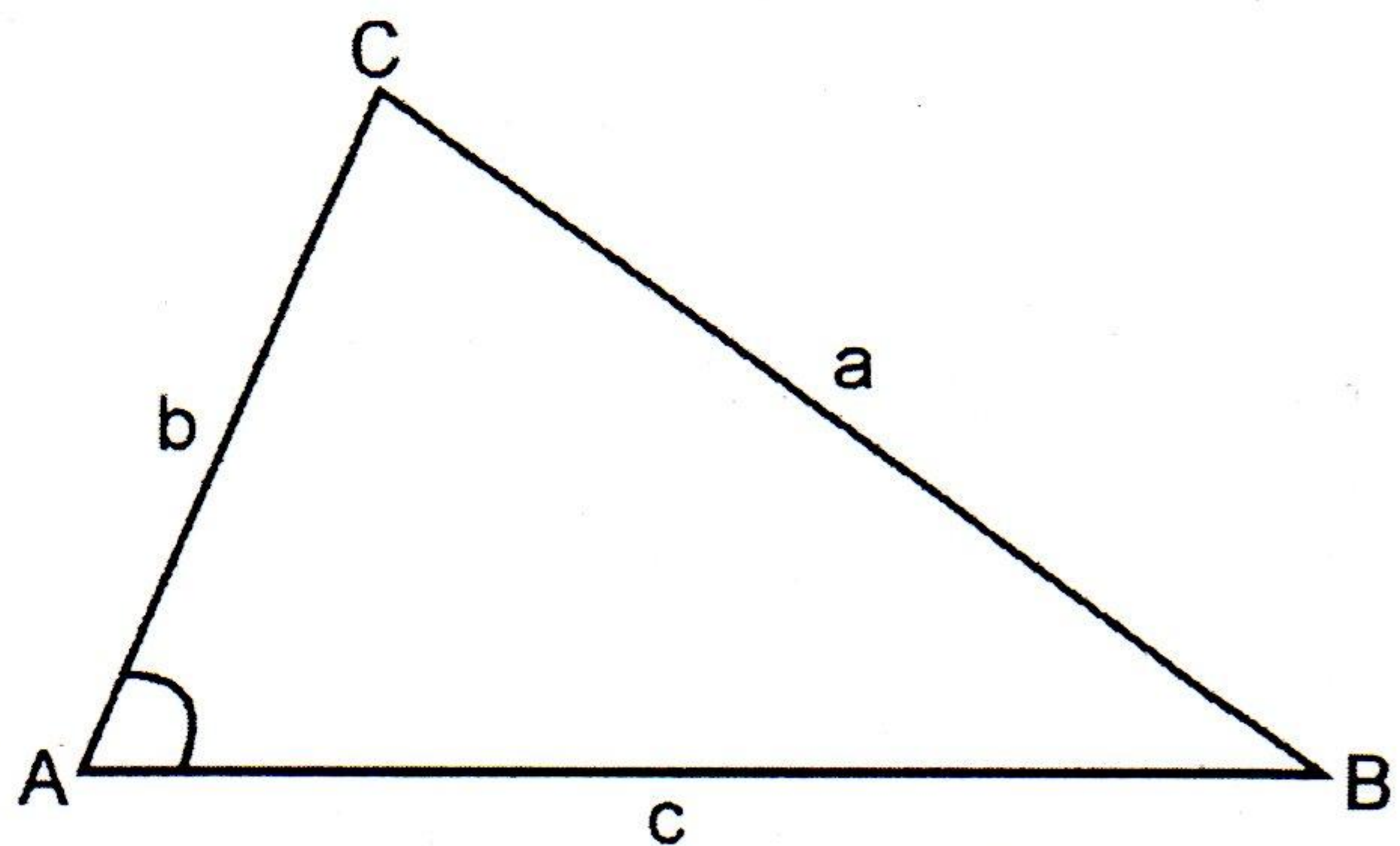
(2)

Cosine Rule:

It states that

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

$$\rightarrow \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$



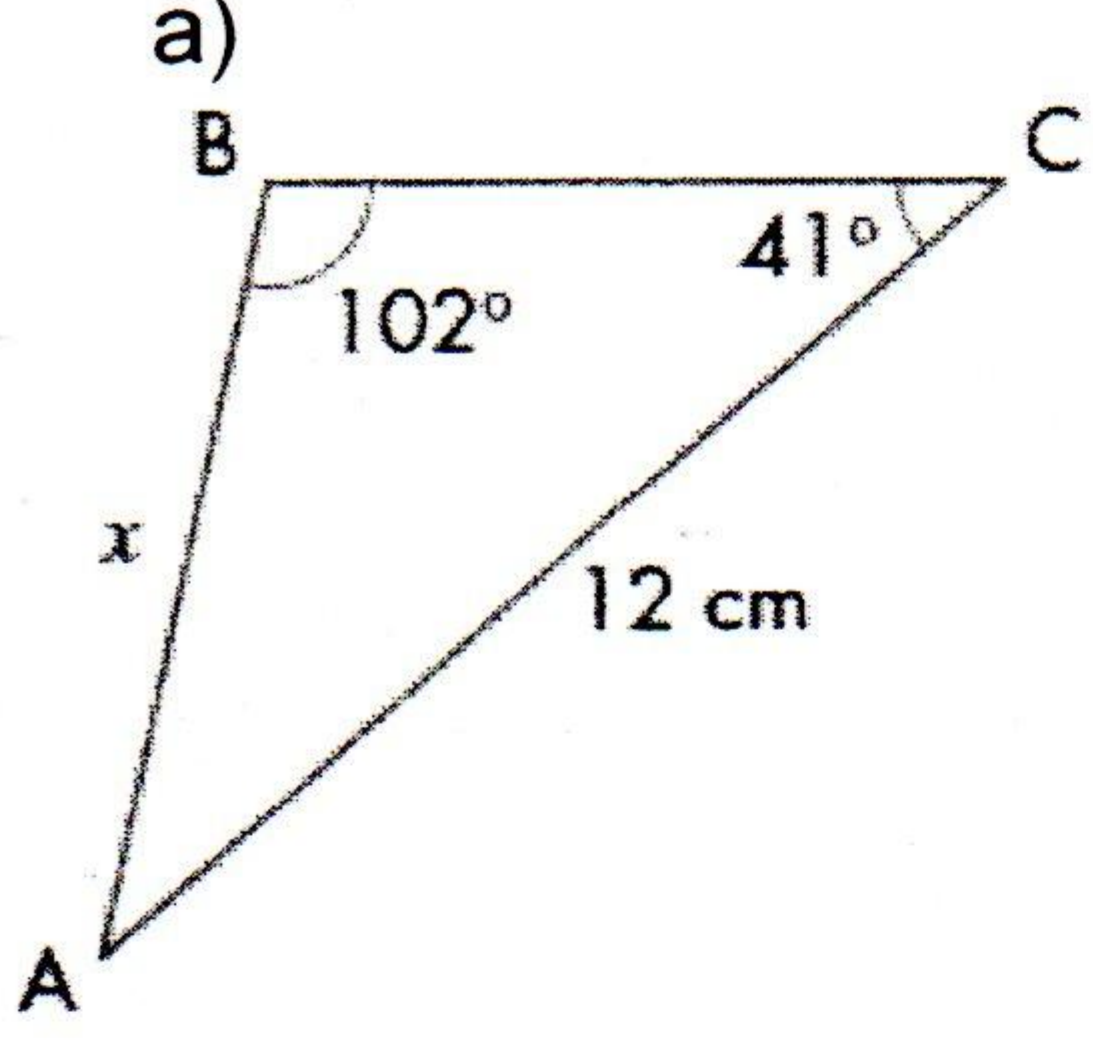
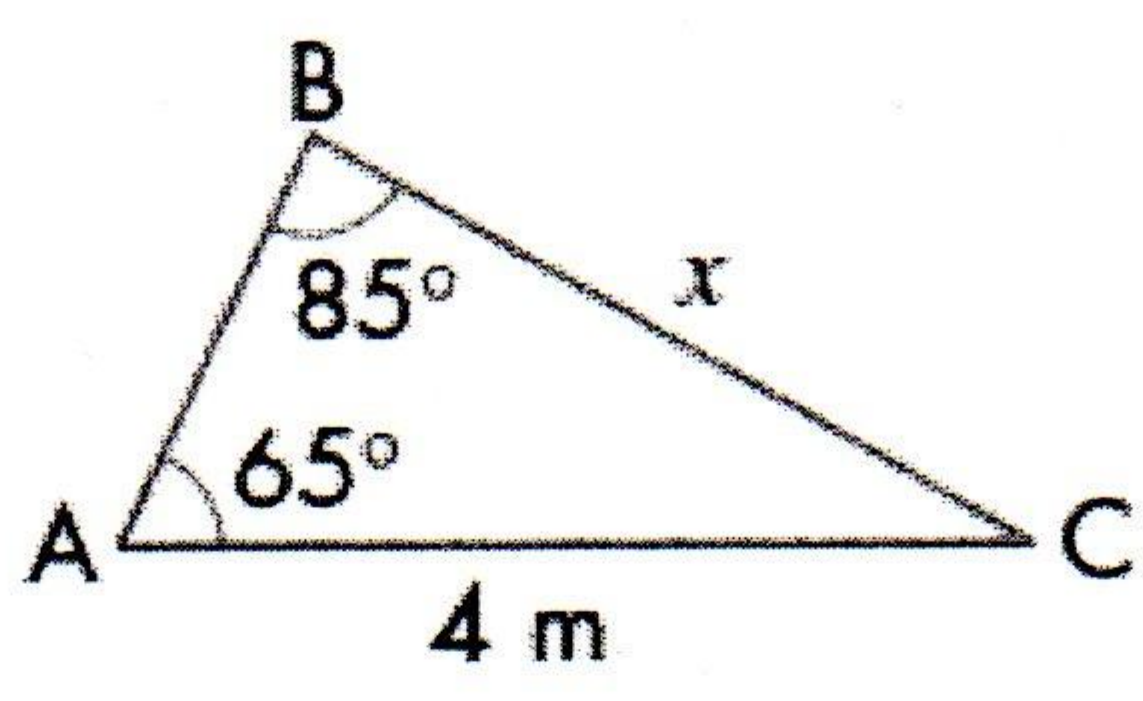
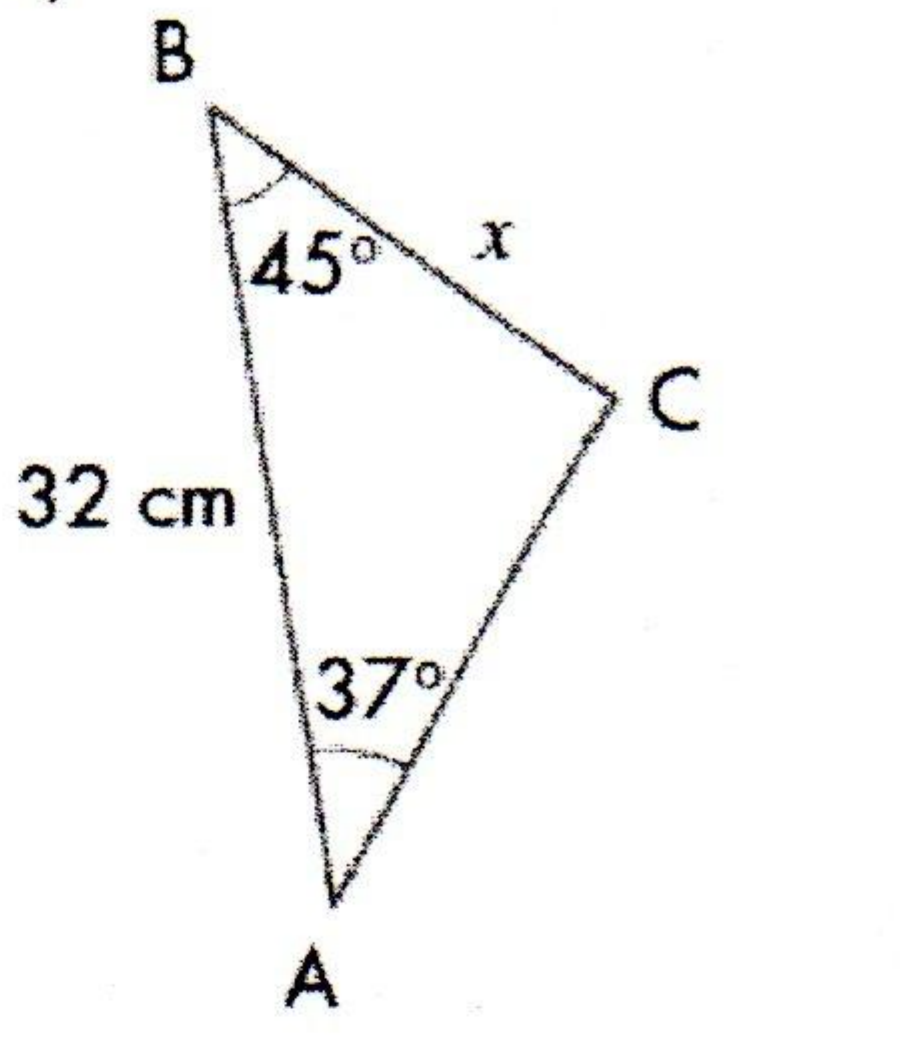
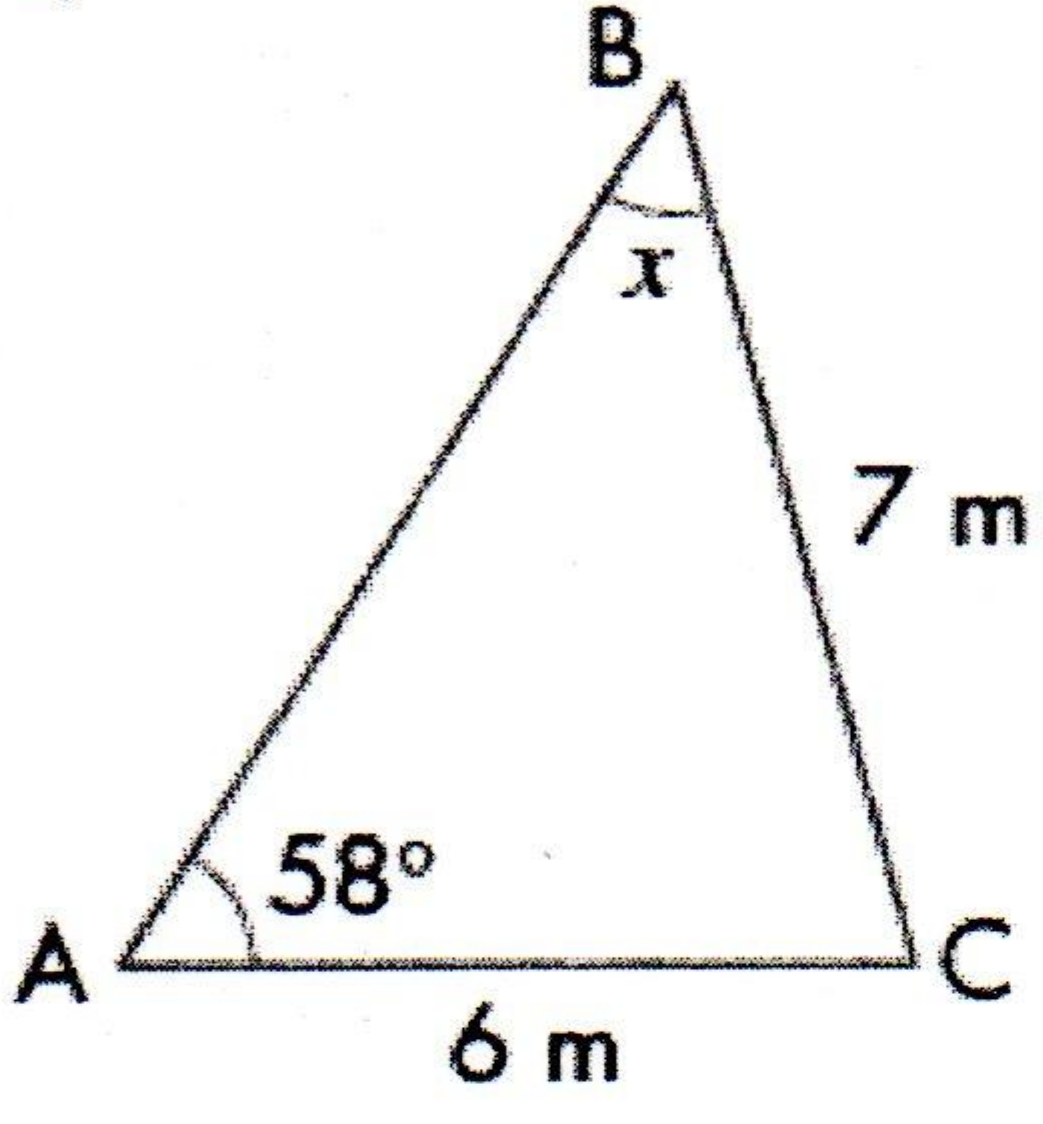
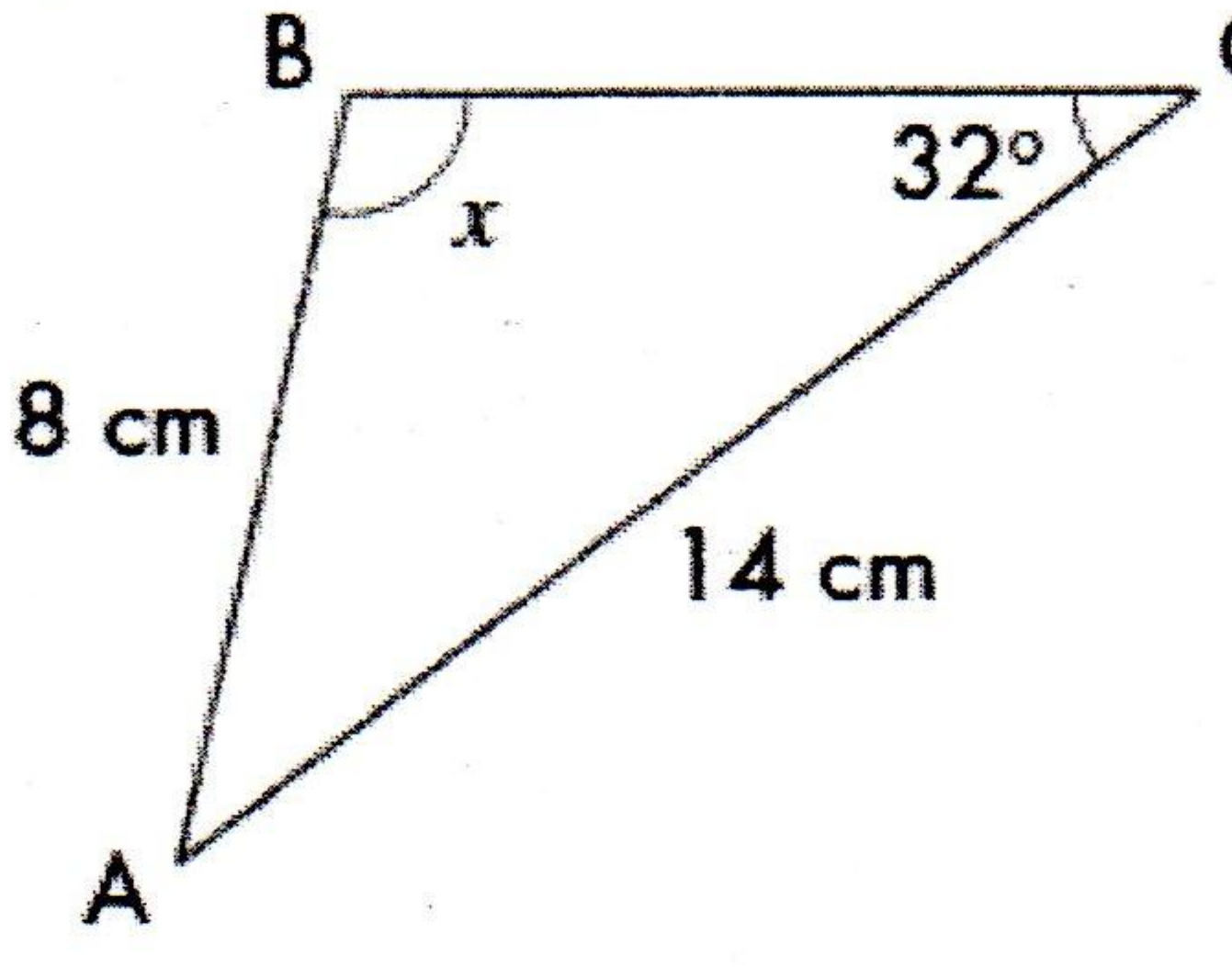
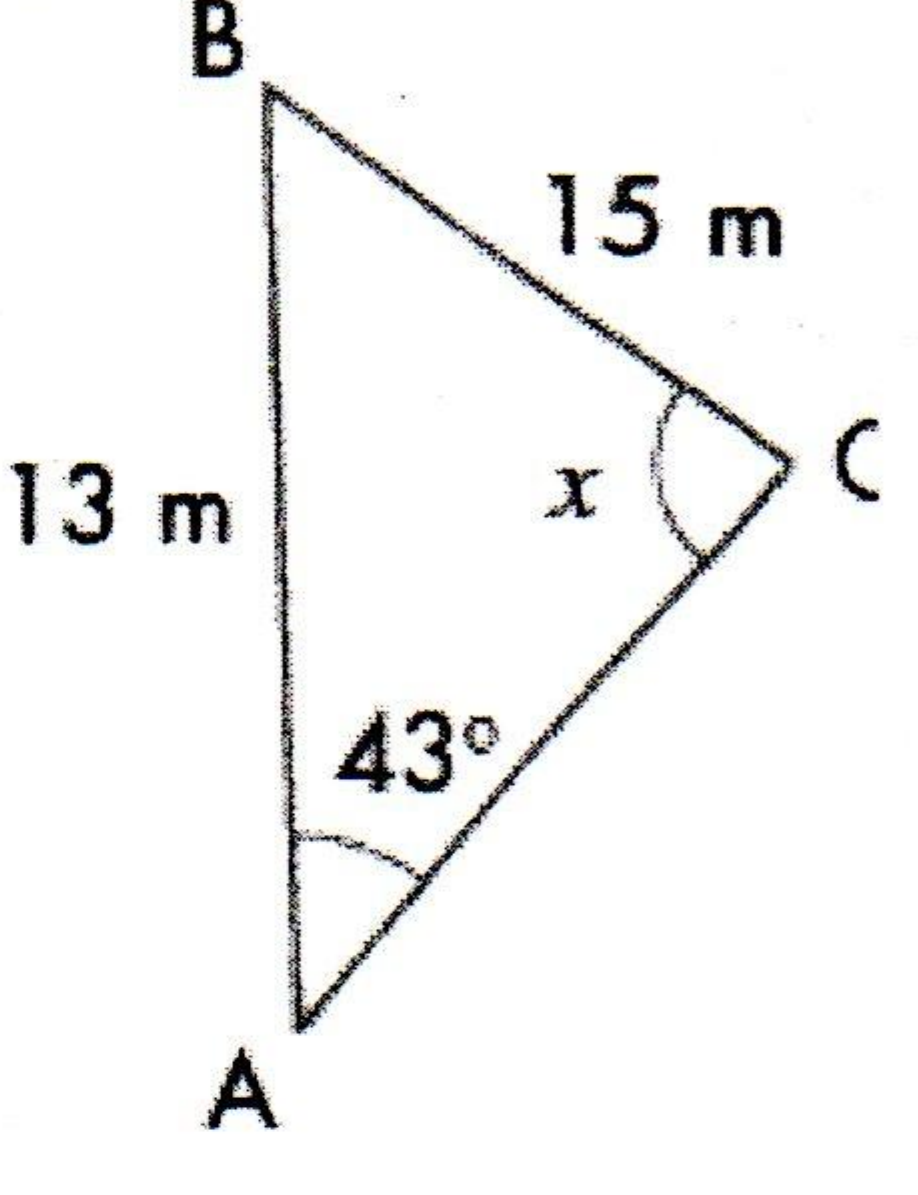
(3) Area of  $\triangle ABC = \frac{1}{2} ab \sin C$

$$\text{Area of } \triangle ABC = \frac{1}{2} bc \sin A$$

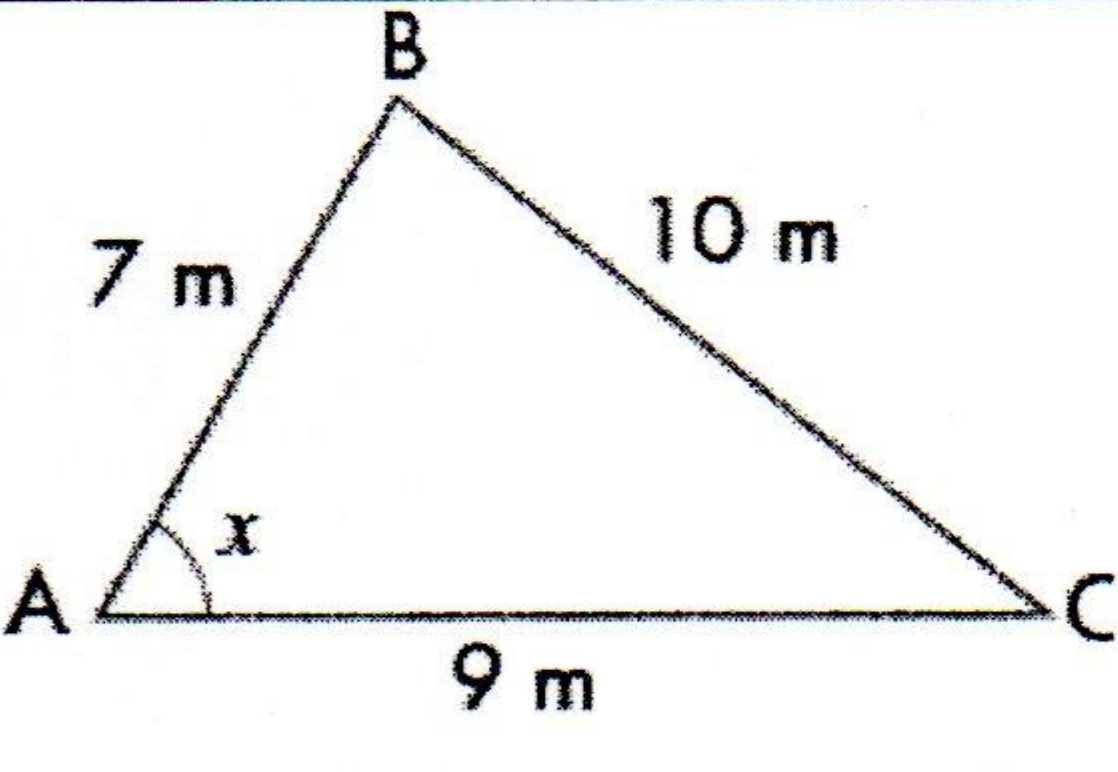
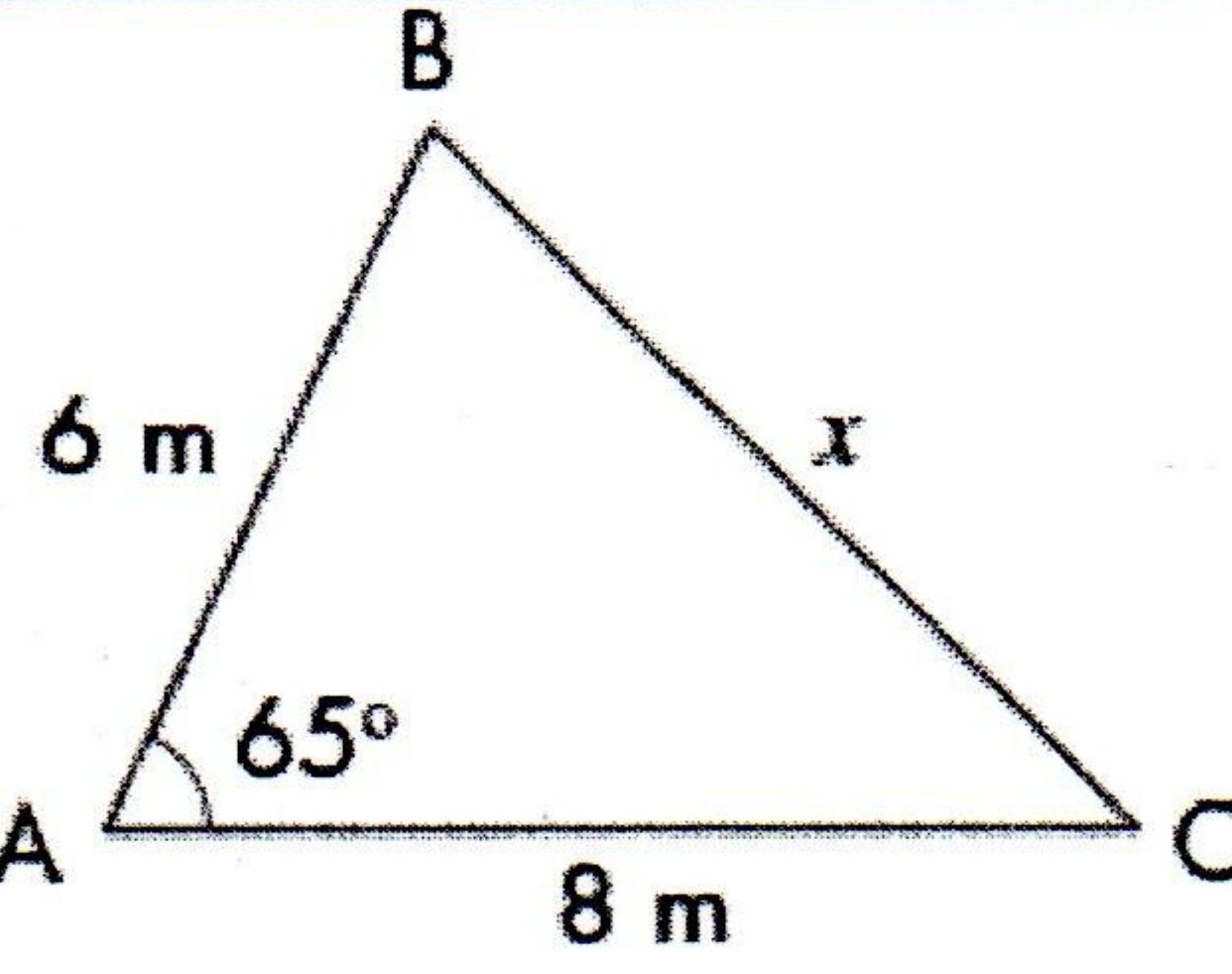
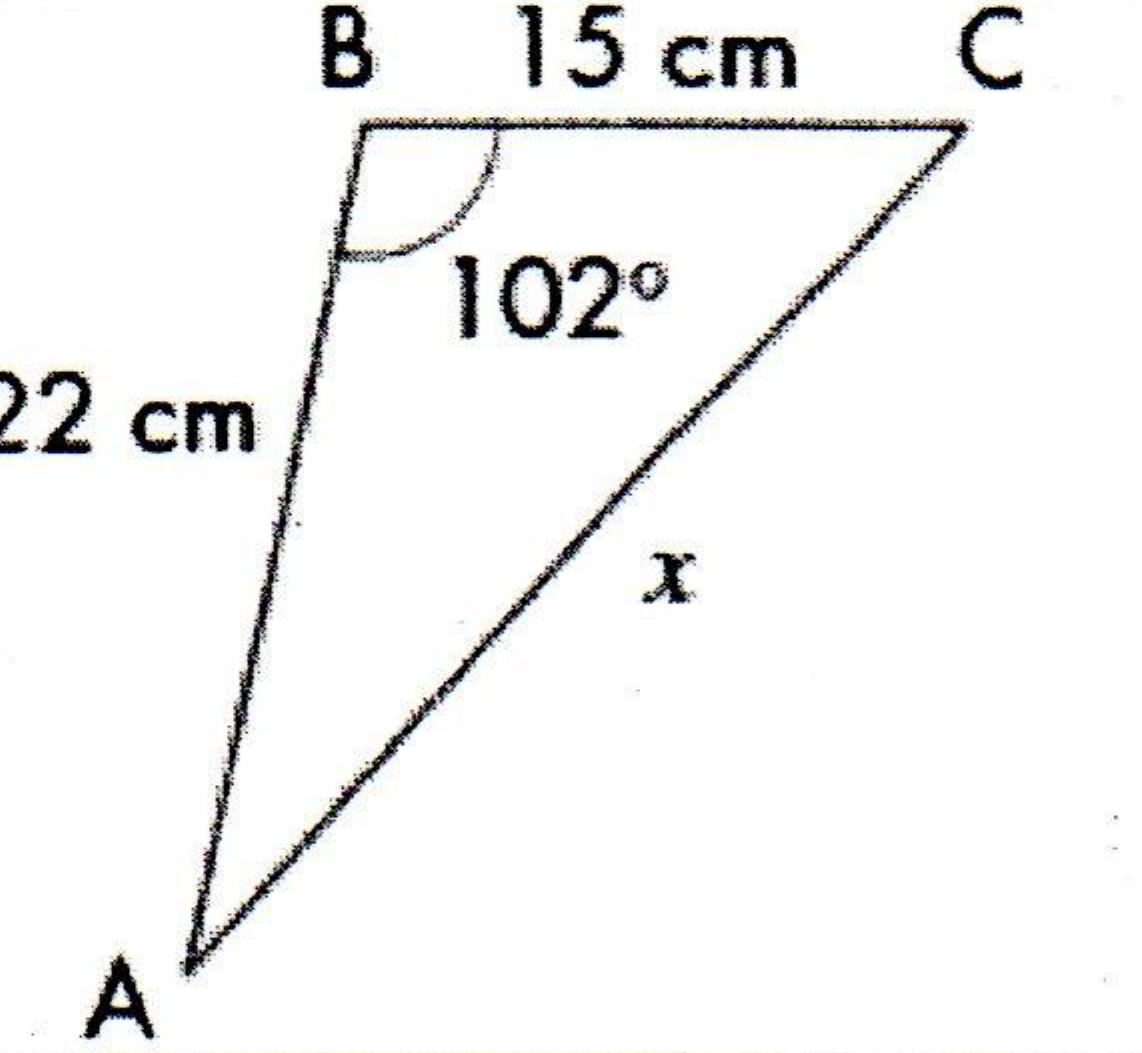
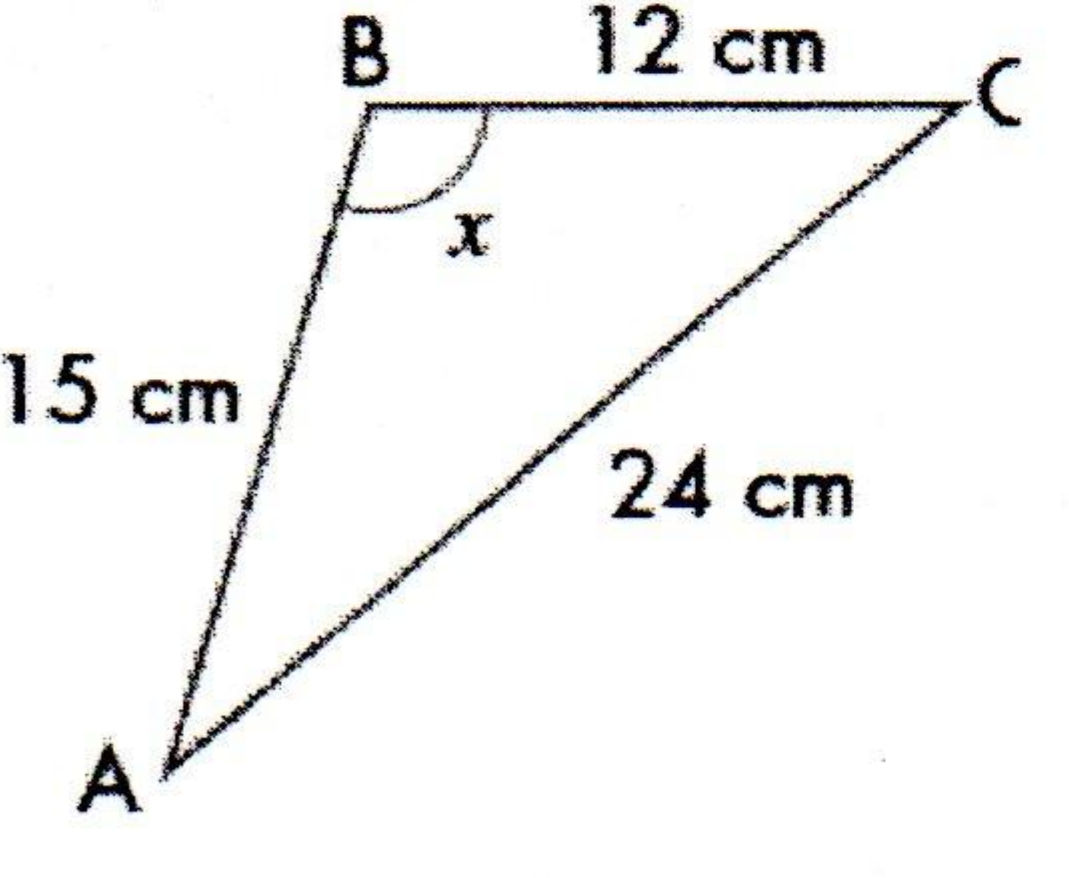
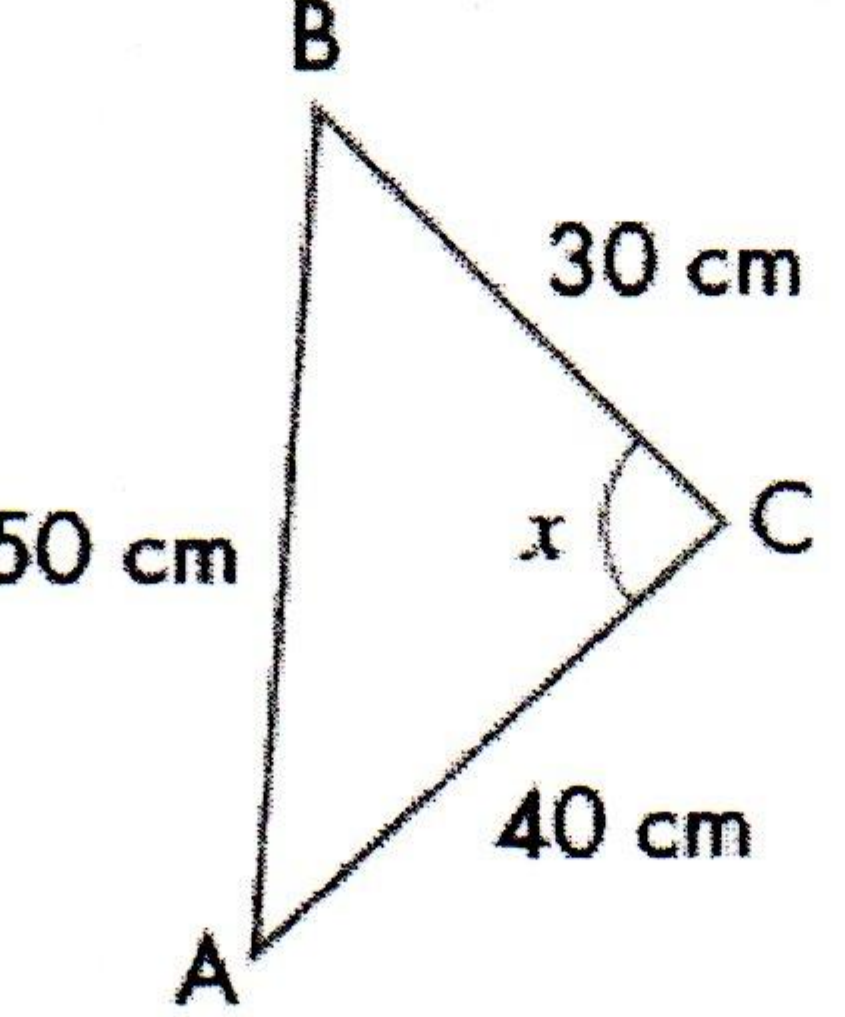
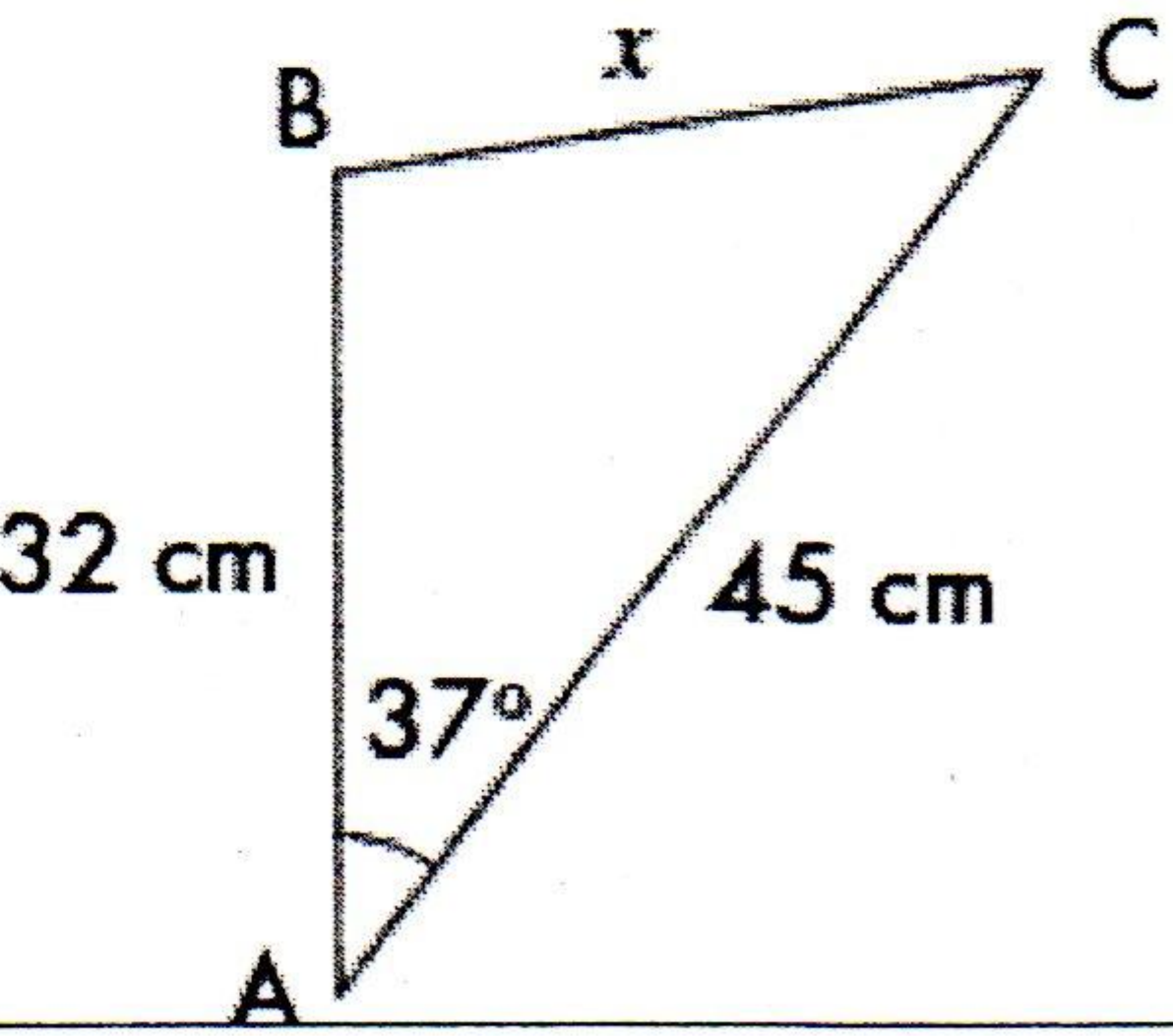
$$\text{Area of } \triangle ABC = \frac{1}{2} ca \sin B$$



1) Find the length or angle  $x$  in each of these triangles (Use Sine Rule).

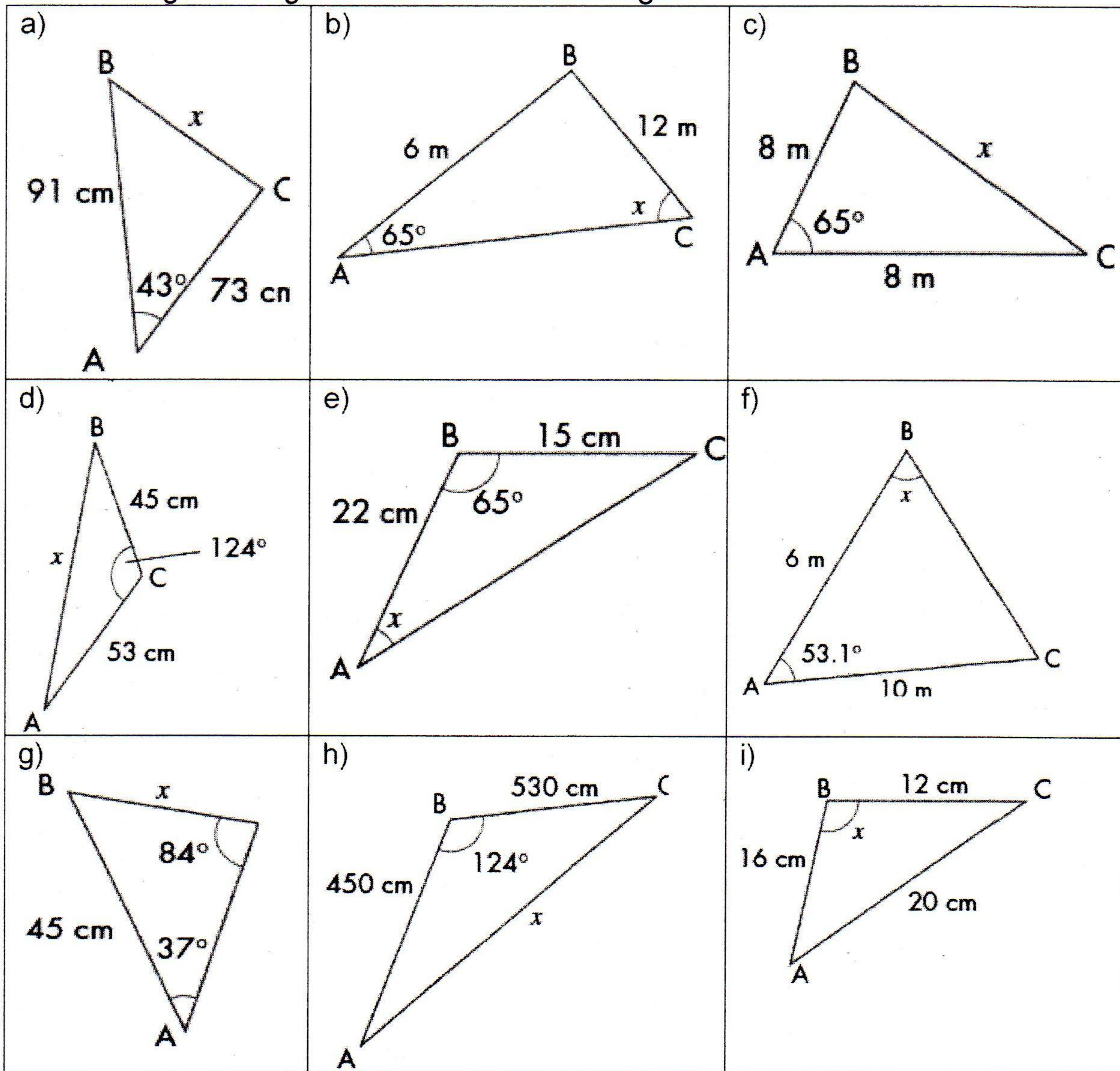
<p>a)</p>  <p><math>x =</math> _____</p>	<p>b)</p>  <p><math>x =</math> _____</p>	<p>c)</p>  <p><math>x =</math> _____</p>
<p>d)</p>  <p><math>x =</math> _____</p>	<p>e)</p>  <p><math>x =</math> _____</p>	<p>f)</p>  <p><math>x =</math> _____</p>

2) Find the length or angle  $x$  in each of these triangles (Use cosine Rule).



3) Find the length or angle  $x$  in each of these triangles.



4) Word Problems. (Draw figure and solve)

a) In triangle ABC, the angle at A is  $38^\circ$ , the side AB is 10 cm and the side BC is 8 cm. Find the two possible values of the angle at C. \_\_\_\_\_

b) In triangle ABC, the angle at A is  $42^\circ$ , the side AB is 16 cm and the side BC is 14 cm. Find the two possible values of the side AC. \_\_\_\_\_

c) A weight is hung from a horizontal beam using two strings. The shorter string is 2.5 m long and makes an angle of  $83^\circ$  with the horizontal. The longer string makes an angle of  $43^\circ$  with the horizontal. What is the length of the longer string?

d) Two ships leave a port in directions that are  $61^\circ$  from each other. After half an hour, the ships are 13 km apart. If the speed of the slower ship is 8 km/h, what is the speed of the faster ship? \_\_\_\_\_

e) A quadrilateral ABCD has  $AD = 6$  cm,  $DC = 9$  cm,  $AB = 10$  cm and  $BC = 12$  cm. Angle  $ADC = 120^\circ$ . Calculate angle ABC. \_\_\_\_\_



5) Find the area of each of the following triangles.

a Triangle ABC where  $BC = 17$  cm,  $AC = 18$  cm and angle  $ACB = 79^\circ$  \_\_\_\_\_

b Triangle ABC where angle  $BAC = 86^\circ$ ,  $AC = 6.7$  cm and  $AB = 8$  cm \_\_\_\_\_

c Triangle PQR where  $QR = 27$  cm,  $PR = 19$  cm and angle  $QRP = 109^\circ$  \_\_\_\_\_

d Triangle XYZ where  $XY = 231$  cm,  $XZ = 191$  cm and angle  $YXZ = 73^\circ$  \_\_\_\_\_

e Triangle LMN where  $LN = 63$  cm,  $LM = 39$  cm and angle  $NLM = 85^\circ$  \_\_\_\_\_

6) The area of triangle ABC is  $45 \text{ cm}^2$ . If  $BC = 14$  cm and angle  $BCA = 115^\circ$ , find AC. \_\_\_\_\_

7) The area of triangle LMN is  $113 \text{ cm}^2$ ,  $LM = 16$  cm and  $MN = 21$  cm. Angle LMN is acute. Calculate these angles.

a LMN \_\_\_\_\_

b MNL \_\_\_\_\_

8) In a quadrilateral ABCD,  $DC = 4$  cm,  $BD = 11$  cm, angle  $BAD = 32^\circ$ , angle  $ABD = 48^\circ$  and angle  $BDC = 61^\circ$ . Calculate the area of the quadrilateral. \_\_\_\_\_

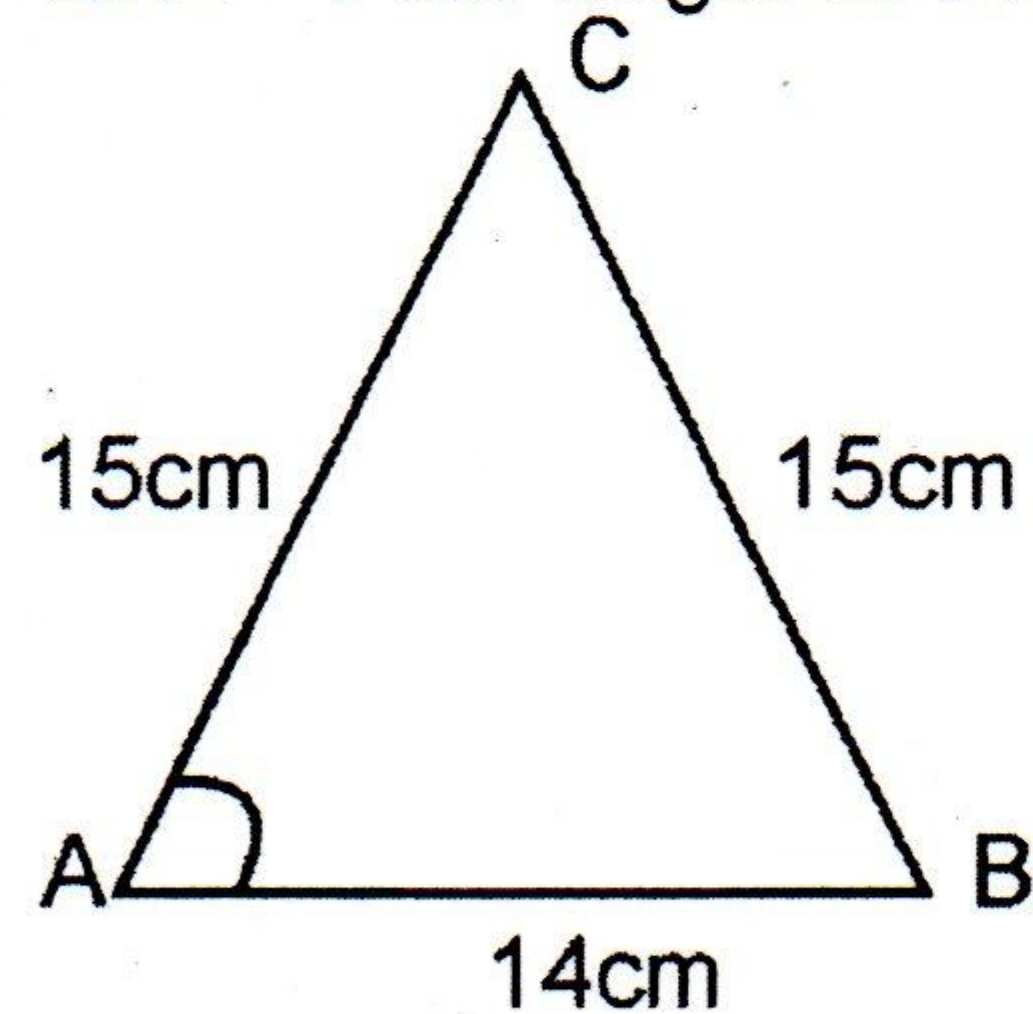
9) A board is in the shape of a triangle with sides 60 cm, 70 cm and 80 cm. Find the area of the board. \_\_\_\_\_

10) 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 \_\_\_\_\_

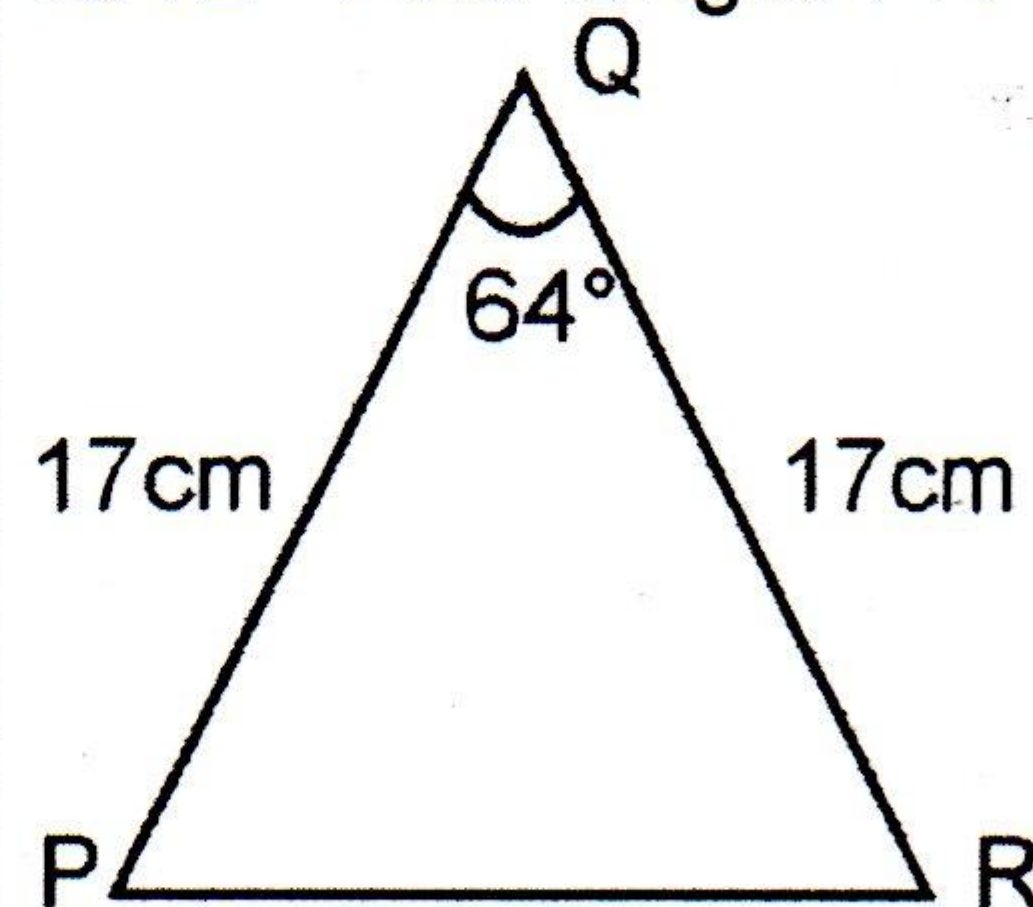
b area of quadrilateral OABC \_\_\_\_\_

Q.11 Find angle BAC:



Angle BAC= \_\_\_\_\_

Q.12 Find length PR

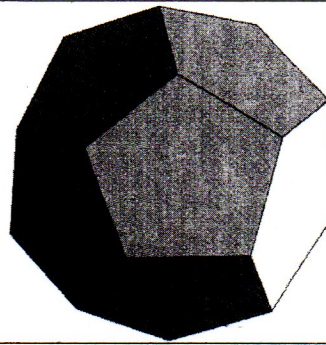


PR= \_\_\_\_\_



12) Here is a regular dodecahedron.  
A dodecahedron is a solid with 12 faces.  
Each face is a regular pentagon.

Calculate the total surface area of a  
regular dodecahedron with edges of  
length 10 cm.



13) In triangle  $ABC$ ,

$AC = 5$  cm.

$BC = 8$  cm.

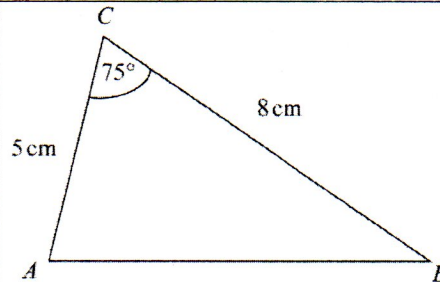
Angle  $ACB = 75^\circ$ .

(a) Calculate the area of triangle  $ABC$ .  
Give your answer correct to 3 significant  
figures.

.....  $\text{cm}^2$

(b) Calculate the length of  $AB$ .  
Give your answer correct to 3 significant  
figures.

..... cm



14)  $ABC$  is a triangle.

$AB = 8$  cm

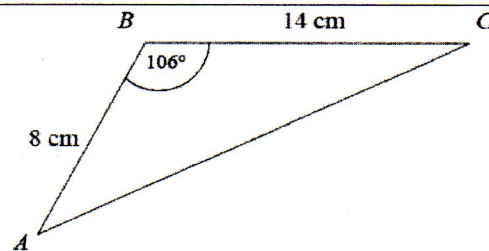
$BC = 14$  cm

Angle  $ABC = 106^\circ$

Calculate the area of the triangle.

Give your answer correct to 3 significant  
figures.

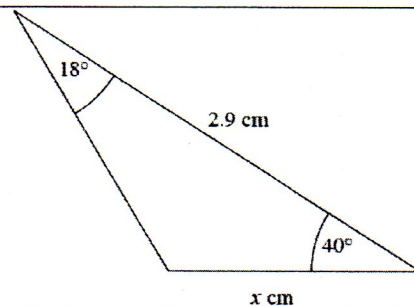
.....  $\text{cm}^2$



15) Work out the value of  $x$ .

Give your answer correct to 3 significant  
figures.

$x =$  .....



16) The diagram shows a tetrahedron.

$AD$  is perpendicular to both  $AB$  and  $AC$ .

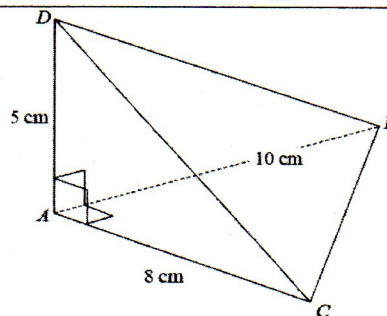
$AB = 10$  cm.  $AC = 8$  cm.

$AD = 5$  cm. Angle  $BAC = 90^\circ$ .

Calculate the size of angle  $BDC$ .

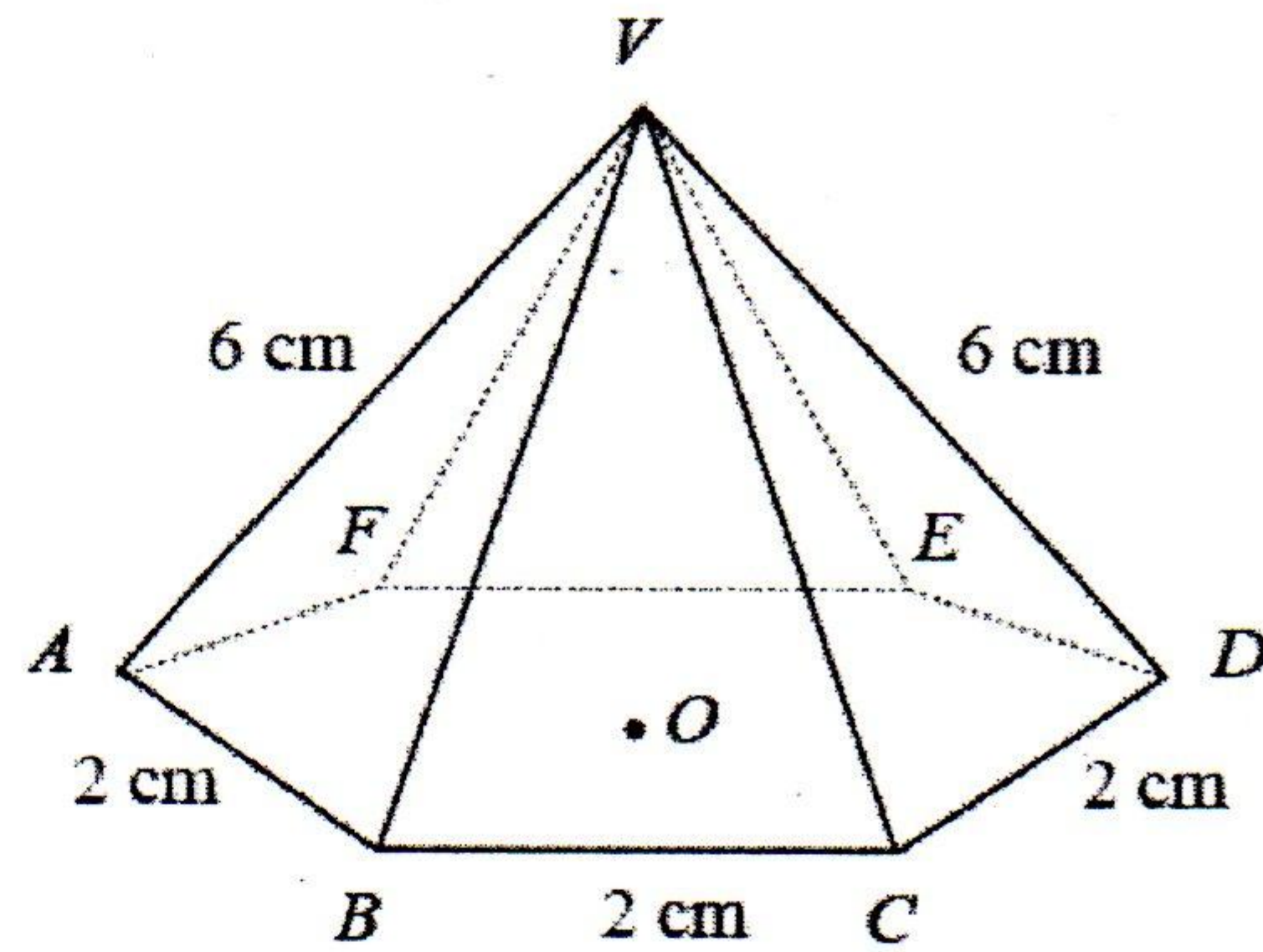
Give your answer correct to 1 decimal  
place.

.....





17) The diagram shows a pyramid. The apex of the pyramid is  $V$ . Each of the sloping edges is of length 6 cm. The base of the pyramid is a regular hexagon with sides of length 2 cm.  $O$  is the centre of the base. Calculate the height of  $V$  above the base of the pyramid. Give your answer correct to 3 significant figures. Calculate the size of angle  $DVA$ . Calculate the size of angle  $AVC$ .



18)  $PQR$  is a triangle.  $PQ = 10$  cm,  $QR = 12$  cm and angle  $PQR = 78^\circ$ . Calculate the length  $PR$ .

