

Pythagoras Theorem

The longest side is called the **hypotenuse** and is always opposite the right angle. Pythagoras' theorem can then be stated as follows:

For any right-angled triangle, the area of the square drawn on the hypotenuse is equal to the sum of the areas of the squares drawn on the other two sides.

In any right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Pythagoras' theorem is more usually written as a formula:

$$c^2 = a^2 + b^2 \text{ (Angle C is right angle triangle)}$$

Remember that Pythagoras' theorem can only be used in right-angled triangles.

Formula is as follows: $(\text{Hypotenuse})^2 = (\text{adjacent})^2 + (\text{opposite})^2$

$(\text{Longest side})^2 = \text{Sum of the square of the remaining two shorter side}$

We can derive the formula to find the unknown side.

We have

$$c^2 = a^2 + b^2 \text{ (For Longest side or Hypotenuse)}$$

$$a^2 = c^2 - b^2 \text{ (For Shorter side)}$$

$$b^2 = c^2 - a^2 \text{ (For shorter side)}$$

Example

Find the length of the hypotenuse, marked x on the diagram.

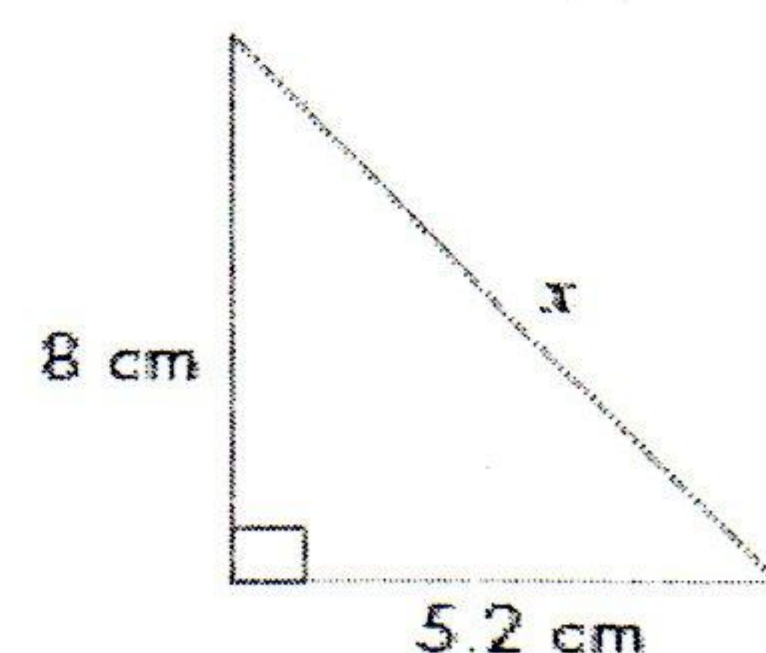
Using Pythagoras' theorem gives:

$$x^2 = 8^2 + 5.2^2$$

$$= 64 + 27.04$$

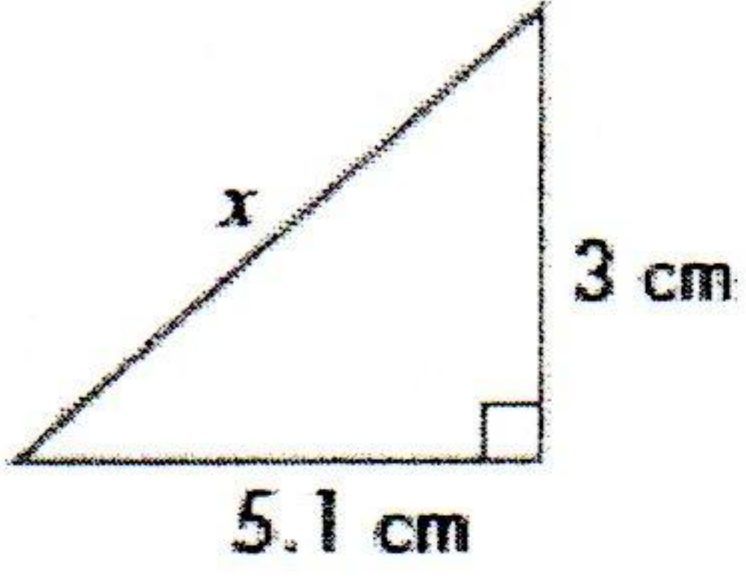
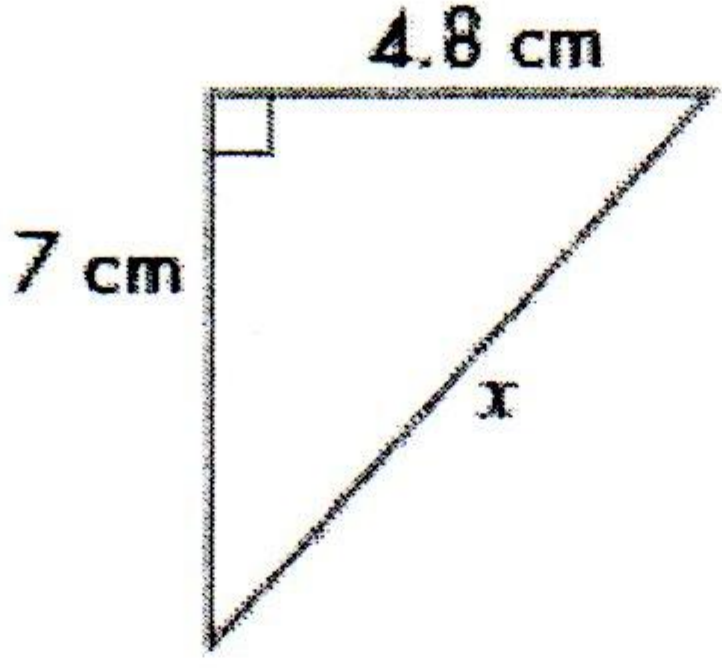
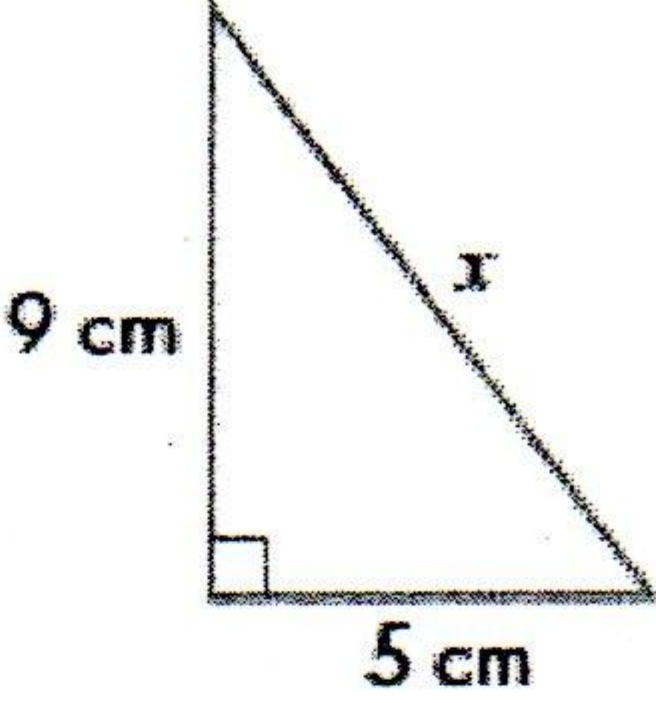
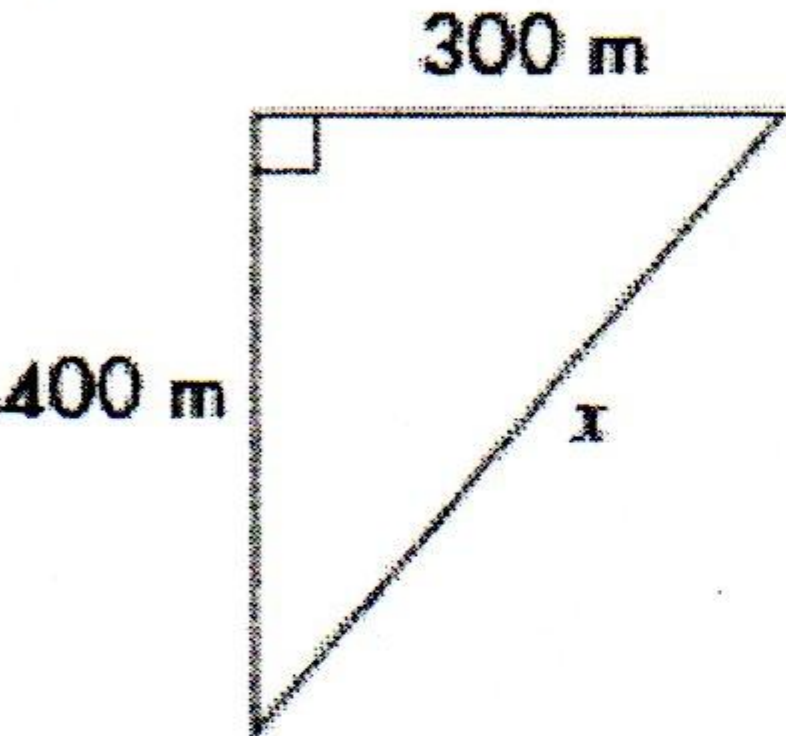
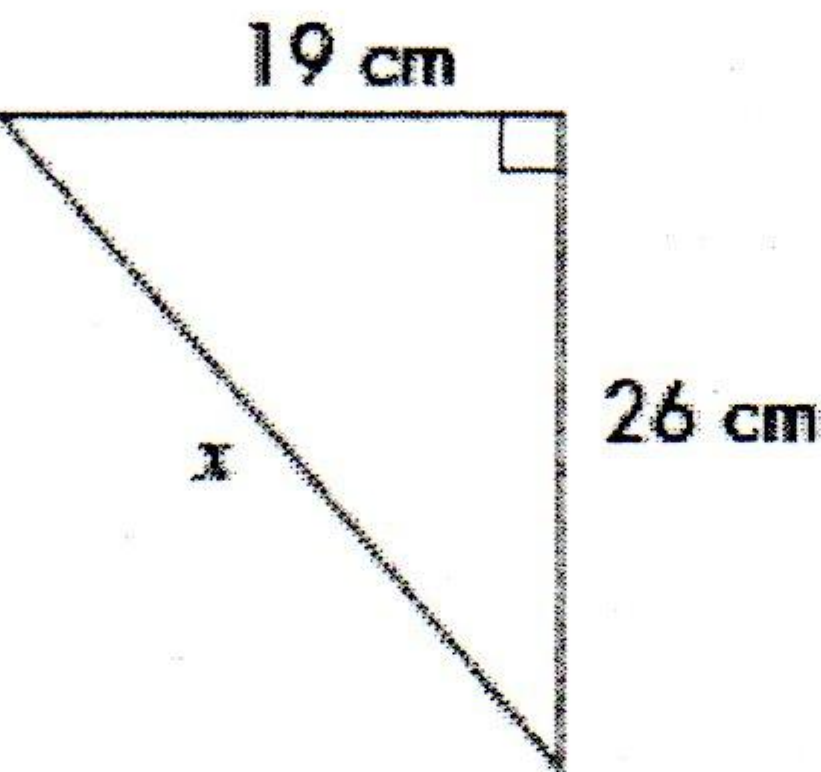
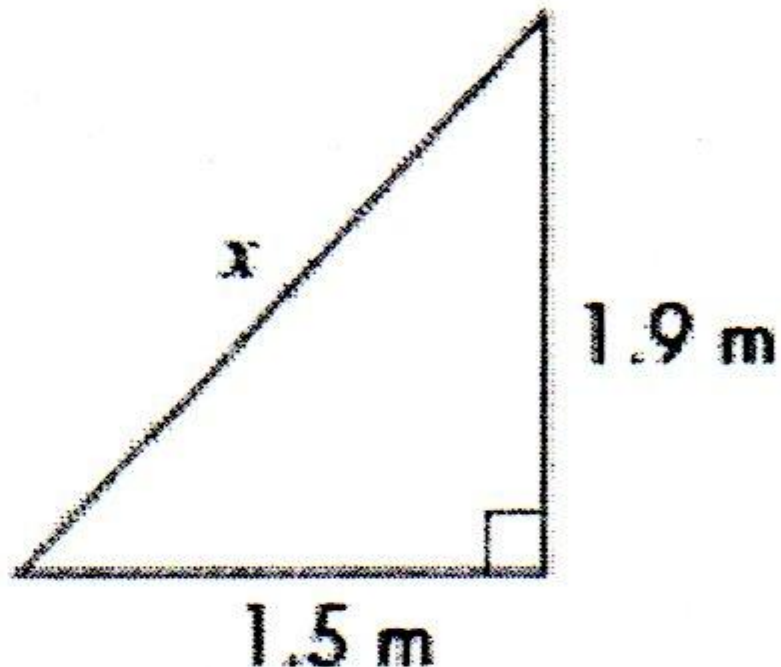
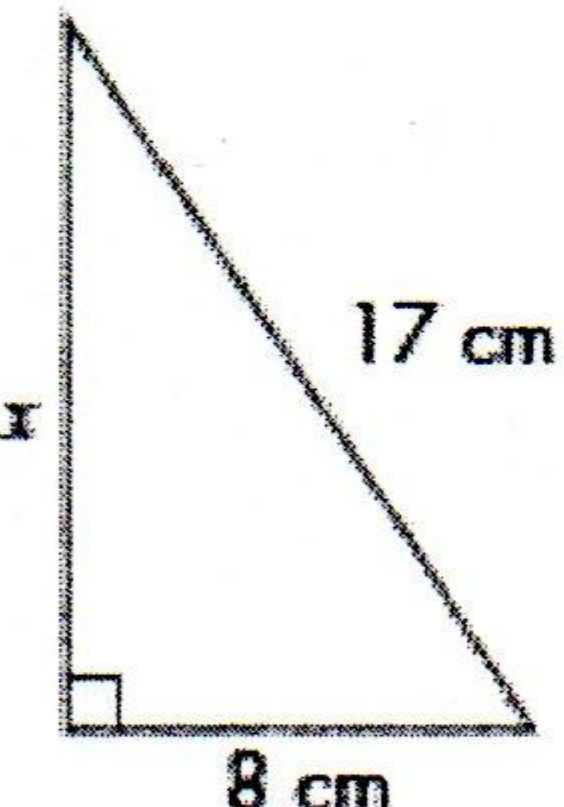
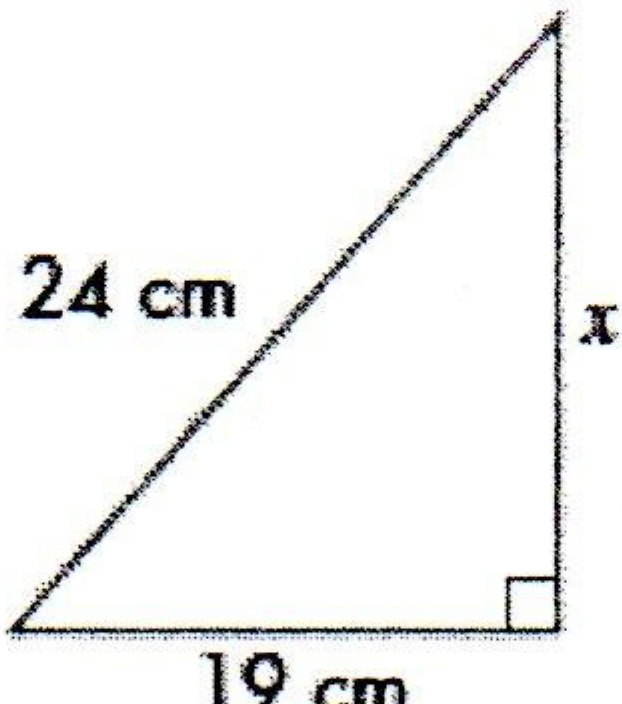
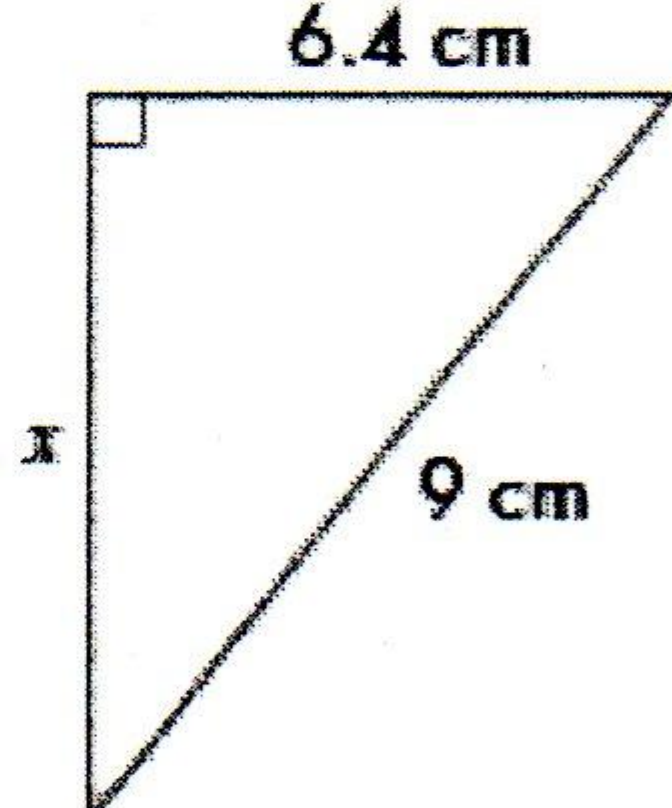
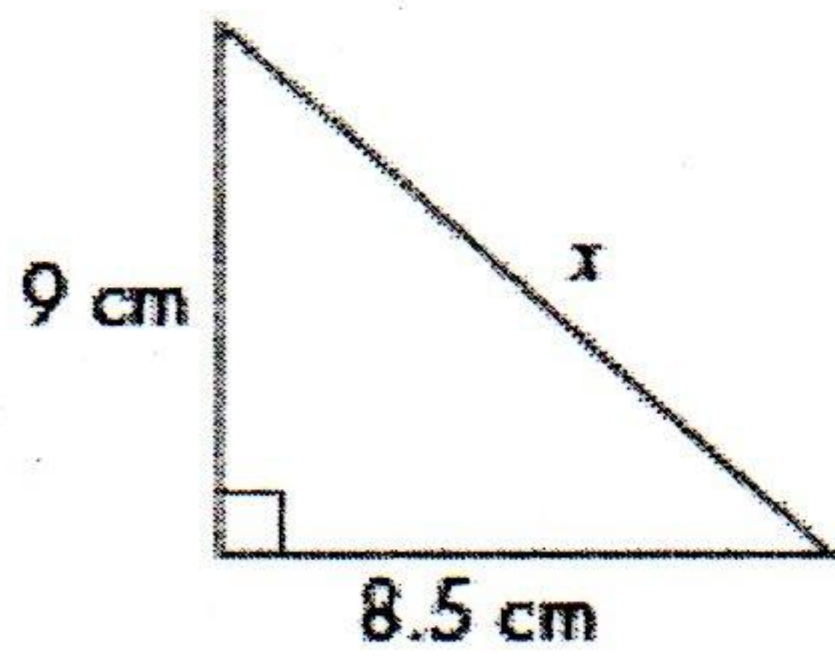
$$= 91.04$$

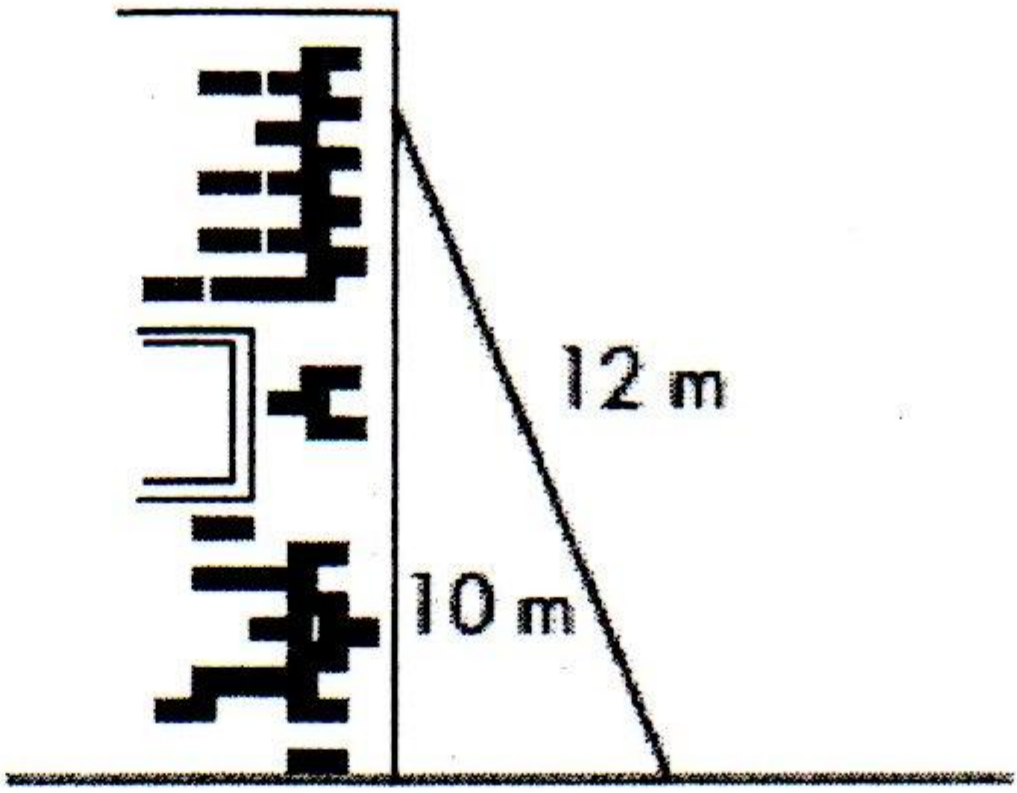
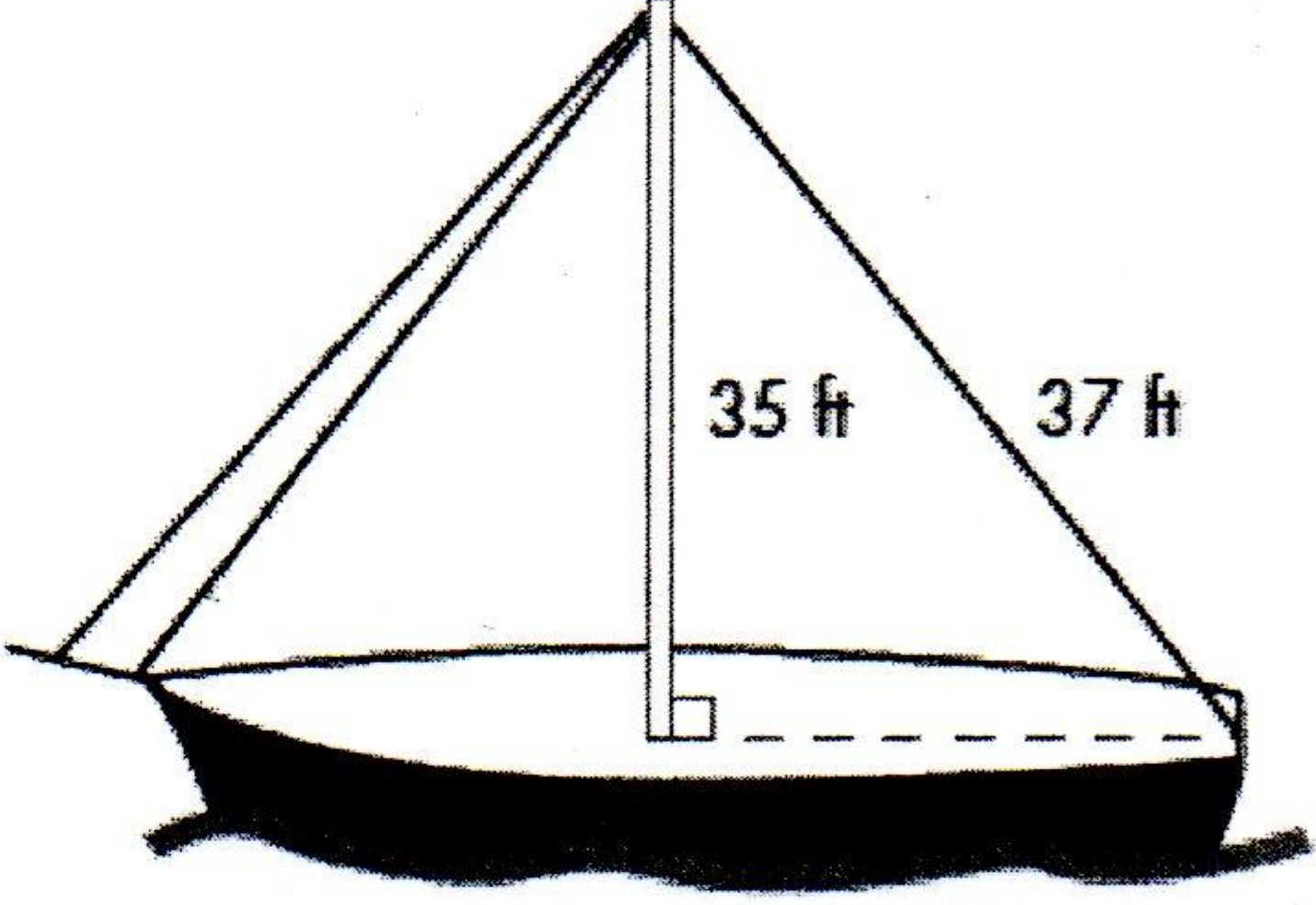
$$\text{So, } x = \sqrt{91.04} = 9.5 \text{ cm (1 decimal place)}$$



Exercise

1) For each of the following triangles, calculate the length of the hypotenuse, x , rounding your answers to 1 decimal place.

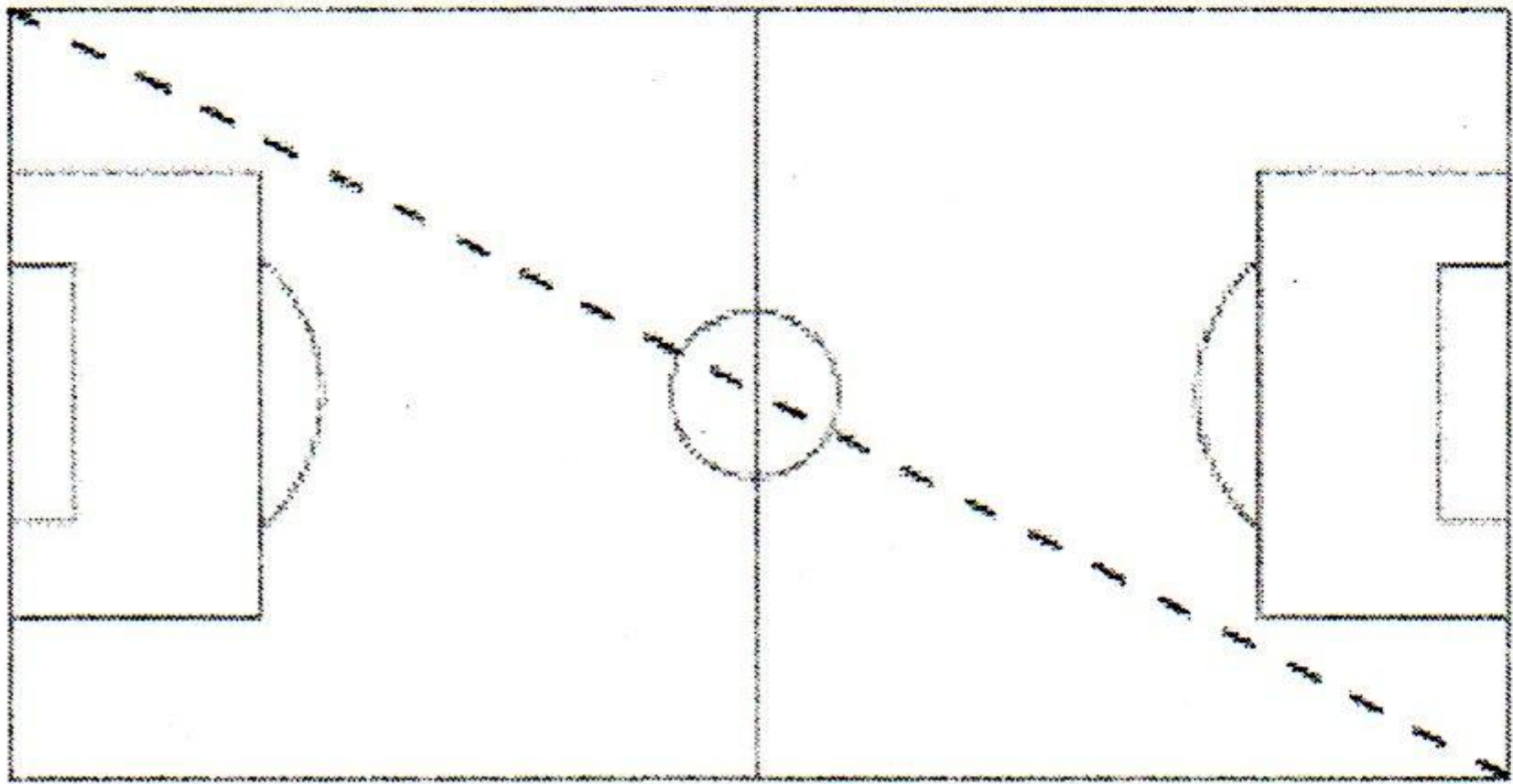
<p>a)</p>  <p>$x =$ _____</p>	<p>b)</p>  <p>$x =$ _____</p>	<p>c)</p>  <p>$x =$ _____</p>
<p>d)</p>  <p>$x =$ _____</p>	<p>e)</p>  <p>$x =$ _____</p>	<p>f)</p>  <p>$x =$ _____</p>
<p>g)</p>  <p>$x =$ _____</p>	<p>h)</p>  <p>$x =$ _____</p>	<p>i)</p>  <p>$x =$ _____</p>
<p>j)</p>  <p>$x =$ _____</p>		

<p>Q2. A ladder, 12 metres long, leans against a wall. The ladder reaches 10 metres up the wall. How far away from the foot of the wall is the foot of the ladder?</p> <p>_____</p>	
<p>3. A mast on a sailboat is strengthened by a wire (called a stay), as shown on the diagram. The mast is 35 feet tall and the stay is 37 feet long. How far from the base of the mast does the stay reach?</p>	

Q4. Find the missing side in right angled triangle ACB ,
where angle C =90 degree and sides are as follows:

- i. c=20cm b=12cm a=? = _____
- ii. c=65cm a=25cm b=? = _____
- iii. c=50cm a=30cm b=? = _____
- iv. c=13cm b=5cm a=? = _____
- v. a=8cm b=10cm c=? = _____

5. A model football pitch is 2 metres long and 0.5 metres wide. How long is the diagonal?



= _____