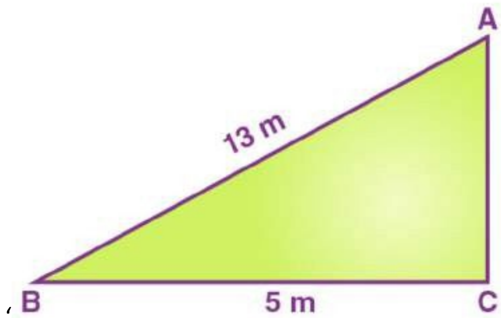
EXERCISE 13A

1. A ladder 13 m long rests against a vertical wall. If the foot of the ladder is 5 m from the foot of the wall, find the distance of the other end of the ladder from the ground.

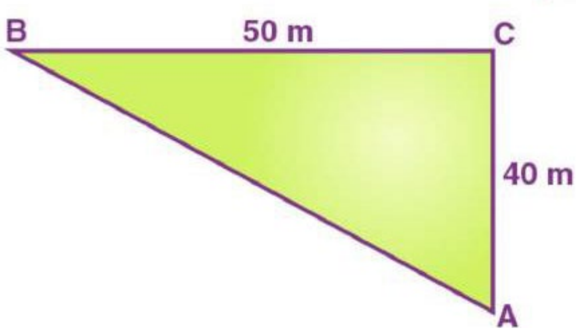
Solution:
The pictorial representation of the given problem is given below,



Pythagoras theorem states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.
(i) Here, AB is the hypotenuse. Therefore, applying the Pythagoras theorem, we get,
$AB^2 = BC^2 + CA^2$
$13^2 = 5^2 + CA^2$
$CA^2 = 13^2 - 5^2$
$CA^2 = 144$
CA = 12m
Therefore, the distance of the other end of the ladder from the ground is 12m

2. A man goes 40 m due north and then 50 m due west. Find his distance from the starting point.

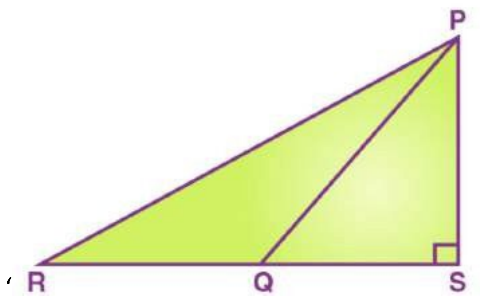
Solution:
Here, we need to measure the distance AB as shown in the figure below,



Pythagoras theorem states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.
Therefore, in this case

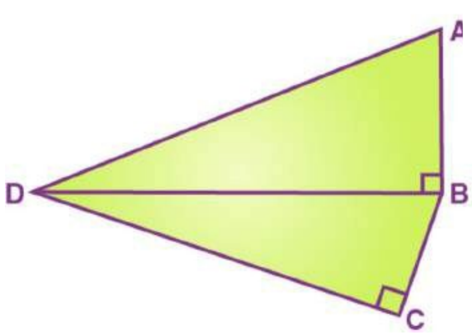
$AB^2 = BC^2 + CA^2$
$AB^2 = 50^2 + 40^2$
$AB^2 = 2500 + 1600$
$AB^2 = 4100$
AB = 64.03
Therefore, the required distance is 64.03 m.

3. In the figure: ∠PSQ = 90°, PQ = 10 cm, QS = 6 cm and RQ = 9 cm. Calculate the length of PR.



Solution:
Pythagoras theorem states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.
First, we consider the triangle PQS and applying Pythagoras theorem we get,
$PQ^2 = PS^2 + QS^2$
$10^2 = PS^2 + 6^2$
$PS^2 = 100 - 36$
$PS^2 = 64$
PS = 8
Now, we consider the triangle PRS and applying Pythagoras theorem we get,
$PR^2 = RS^2 + PS^2$
$PR^2 = 15^2 + 8^2$
PR = 17
Therefore, the length of PR = 17cm

4. The given figure shows a quadrilateral ABCD in which AD = 13 cm, DC = 12 cm, BC = 3 cm and ∠ABD = ∠BCD = 90°. Calc



Solution:

Pythagoras theorem states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.

First, we consider the triangle BDC and applying Pythagoras theorem we get,

$DB^2 = DC^2 + BC^2$

$DB^2 = 12^2 + 3^2$

$= 144 + 9$

$= 153$

Now, we consider the triangle ABD and applying Pythagoras theorem we get,

$DA^2 = DB^2 + BA^2$

$13^2 = 153 + BA^2$

$BA^2 = 169 – 153$

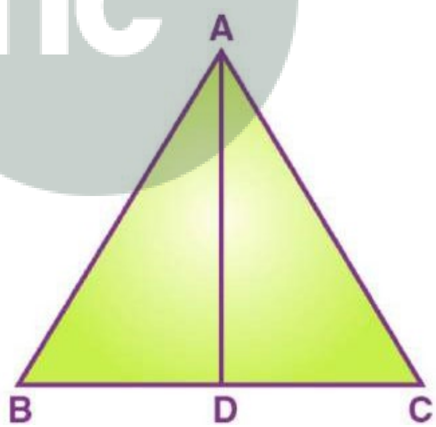
$BA = 4$

The length of AB is 4 cm.

5. AD is drawn perpendicular to base BC of an equilateral triangle ABC. Given BC = 10 cm, find the length of AD, correct to 1 place of decimal.

Solution:

Since ABC is an equilateral triangle therefore, all the sides of the triangle are of same measure and the perpendicular AD will divide BC in two equal parts.



Pythagoras theorem states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.

Here, we consider the triangle ABD and applying Pythagoras theorem we get,

$AB^2 = AD^2 + BD^2$

$AD^2 = 100^2 – 5^2$

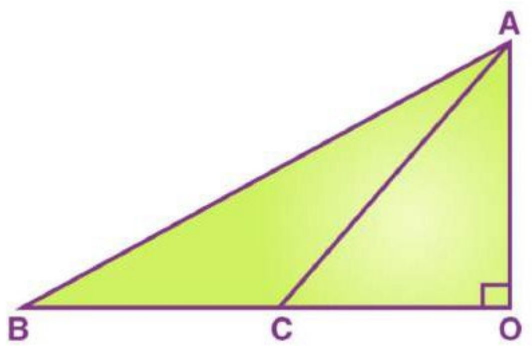
$AD^2 = 100 – 25$

$AD^2 = 75$

$= 8.7$

Therefore, the length of AD is 8.7 cm

6. In triangle ABC, given below, AB = 8 cm, BC = 6 cm and AC= 3 cm. Calculate the length of OC.



Solution:

We have Pythagoras theorem which states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.

First, we consider the triangle ABO and applying Pythagoras theorem we get,

$AB^2 = AO^2 + OB^2$

$AO^2 = AB^2 – OB^2$

$AO^2 = AB^2 – (BC + OC)^2$

Let OC = x

$AO^2 = AB^2 – (BC + x)^2$ ……… (1)

First, we consider the triangle ACO and applying Pythagoras theorem we get

$AC^2 = AO^2 + x^2$

$AO^2 = AC^2 – x^2$ ……… (2)

From 1 and 2

$AB^2 – (BC + x)^2 = AC^2 – x^2$

$8^2 – (6 + x)^2 = 3^2 – x^2$

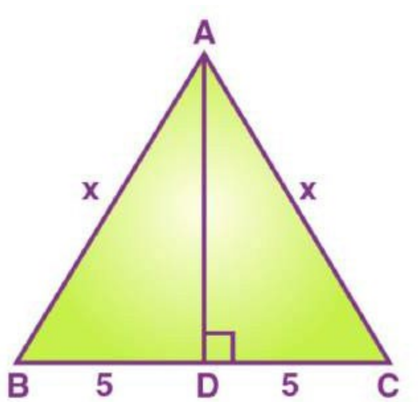
X = 1 7/12 cm

Therefore, the length of OC will be 19/12 cm

7. In triangle ABC, AB = AC = x, BC = 10 cm and the area of the triangle is 60 cm^2. Find x.

Solution:

Here, the diagram will be,



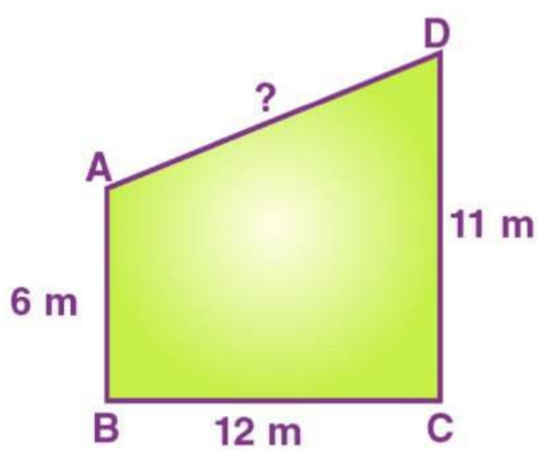
We have Pythagoras theorem which states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.
Since, ABC is an isosceles triangle, therefore perpendicular from vertex will cut the base in two equal segments.
First, we consider the triangle ABD and applying Pythagoras theorem we get,
$AB^2 = AD^2 + BD^2$
$AD^2 = x^2 – 5^2$
$AD^2 = x^2 – 25$
$AD = \sqrt{(x^2 – 25)}$.......... (1)
Now,
Area = 60
½ (10) AD = 60
½ (10) $[\sqrt{(x^2 – 25)}] = 60$
x = 13
Therefore x = 13 cm

8. If the sides of triangle are in the ratio 1 :2: 1, show that is a right-angled triangle.

Solution:
Let, the sides of the triangle be, $x^2 + x^2 = 2x^2 = (\sqrt{2}x)^2$.............. (1)
Here, in (i) it is shown that, square of one side of the given triangle is equal to the addition of square of other two sides. This is nothing but Pythagoras theorem which states that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the remaining two sides.
Therefore, the given triangle is right angled triangle.

9. Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m; find the distance between their tips.

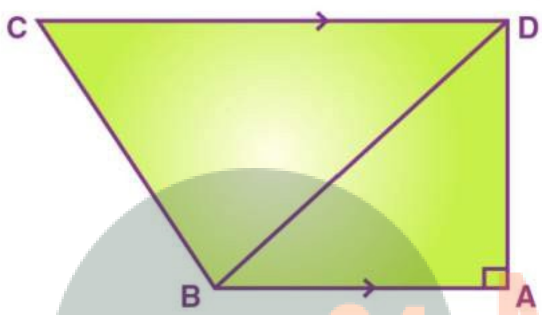
Solution:
The diagram of the given problem is given below,



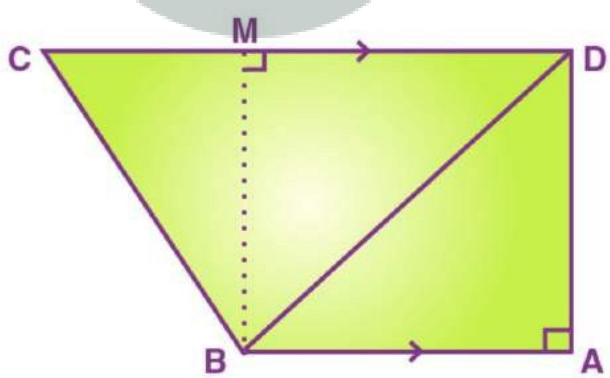
We have Pythagoras theorem which states that in a right-angled triangle, the square on the

hypotenuse is equal to the sum of the squares on the remaining two sides.
Here 11 – 6 = 5m
Base = 12 m
Applying Pythagoras theorem, we get
$h^2 = 5^2 + 12^2$
$= 25 + 144$
$= 169$
$h = 13$
therefore, the distance between the tips will be 13m

10. In the given figure, AB//CD, AB = 7 cm, BD = 25 cm and CD = 17 cm; find the length of side BC.



Take M be the point on CD such that AB = DM.
So, DM = 7cm and MC = 10 cm
Join points B and M to form the line segment BM.
So BM || AD also BM = AD.



In triangle BAD
$BD^2 = AD^2 + BA^2$
$25^2 = AD^2 + 7^2$
$AD^2 = 576$
$AD = 24$
In triangle CMB
$CB^2 = CM^2 + MB^2$
$CB^2 = 10^2 + 24^2$

$CB^2 = 676$

$CB = 26$ cm