# Pythagoras Theorem

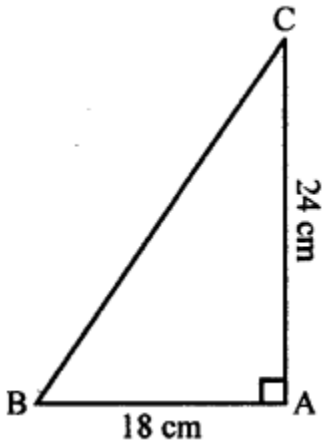
## EXERCISE 16

**Question 1.**

**Triangle ABC is right-angled at vertex A. Calculate the length of BC, if AB = 18 cm and AC = 24 cm.**

**Solution:**

**Given** : ∆ABC right angled at A and AB = 18 cm, AC = 24 cm.




**To find :** Length of BC.

According to Pythagoras Theorem,

$BC^2 = AB^2 + AC^2$

$= 18^2 + 24^2 = 324 + 576 = 900$

$\therefore BC = \sqrt{900} = \sqrt{30x30} = 30$ cm

**Question 2.**

**Triangle XYZ is right-angled at vertex Z. Calculate the length of YZ, if XY = 13 cm and XZ = 12 cm.**

**Solution:**

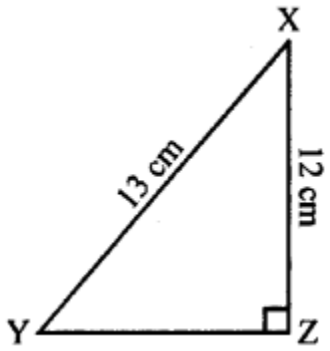
**Given** : ∆XYZ right angled at Z and XY = 13 cm, XZ = 12 cm.

**To find :** Length of YZ.

According to Pythagoras Theorem,

$XY^2 = XZ^2 + YZ^2$

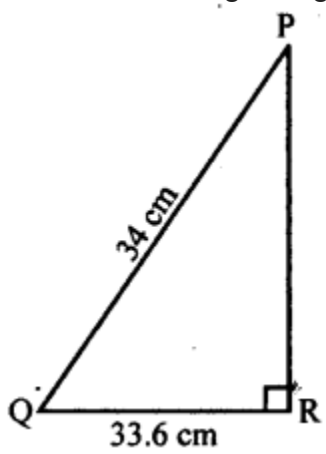
$13^2 = 12^2 + YZ^2$




$169 = 144 + YZ^2$
$169 - 144 = YZ^2$
$25 = YZ^2$
$\therefore YZ = \sqrt{25}$cm $\sqrt{5x5}$ = 5 cm

**Question 3.**
**Triangle PQR is right-angled at vertex R. Calculate the length of PR, if: PQ = 34 cm and QR = 33.6 cm.**

**Solution:**
**Given** : ∆PQR right angled at R and PQ = 34 cm, QR = 33.6 cm.




**To find :** Length of PR.
According to Pythagoras Theorem,
$PR^2 + QR^2 = PQ^2$
$PR^2 + 33.6^2 = 34^2$
$PR^2 + 1128.96 = 1156$
$PR^2 = 1156 - 1128.96$
$\therefore PR = \sqrt{27.04}$ = 5.2 cm

**Question 4.**

**The sides of a certain triangle are given below. Find, which of them is right-triangle**

**(i) 16 cm, 20 cm and 12 cm**

**(ii) 6 m, 9 m and 13 m**

**Solution:**

**(i)** 16 cm, 20 cm and 12 cm

The given triangle will be a right-angled triangle if square of its largest side is equal to the sum of the squares on the other two sides.

i.e., If $(20)^2 = (16)^2 = (12)^2$

$(20)^2 = (16)^2 + (12)^2$

$400 = 256 + 144$

$400 = 400$

So, the given triangle is right angled.

**(ii)** 6 m, 9 m and 13 m

The given triangle will be a right-angled triangle if square of its largest side is equal to the sum of the squares on the other two sides.

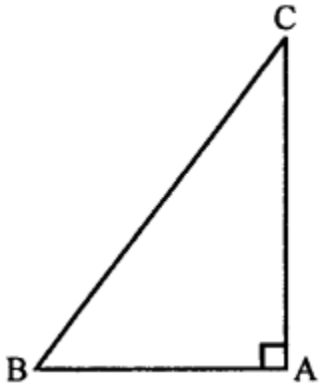
i.e., If $(13)^2 = (9)^2 + (6)^2$

$169 = 81+36$ $169 \neq 117$

So, the given triangle is not right angled.

**Question 5.**

**In the given figure, angle BAC = 90°, AC = 400 m and AB = 300 m. Find the length of BC.**

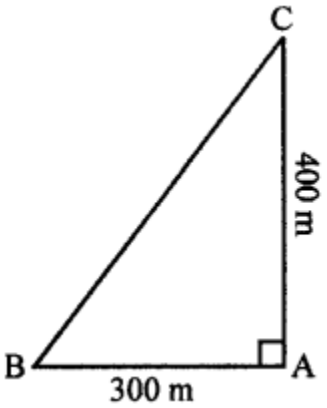



**Solution:**

AC = 400 m

AB = 300 m

BC = ?

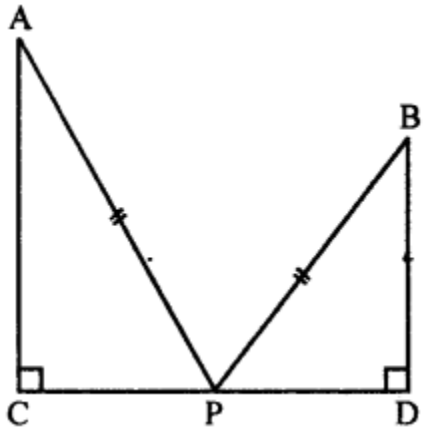



According to Pythagoras Theorem,
$BC^2 = AB^2 + AC^2$
$BC^2 = (300)^2 + (400)^2$
$BC^2 = 90000 + 160000$
$BC^2 = 250000$
$BC = \sqrt{250000} = 500$ m

**Question 6.**

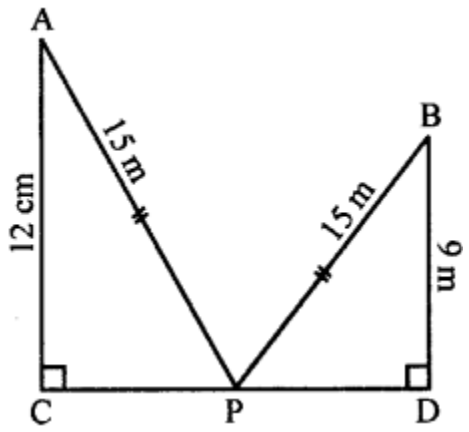
**In the given figure, angle ACP = ∠BDP = 90°, AC = 12 m, BD = 9 m and PA= PB = 15 m. Find:**

**(i) CP**
**(ii) PD**
**(iii) *CD***




**Solution:**

**Given :** AC = 12 m
BD = 9 m
PA = PB= 15 m




**(i)** In right angle triangle ACP

$(AP)^2 = (AC)^2 + (CP)^2$

$15^2 = 12^2 + CP^2$

$225 = 144 + CP^2$

$225 – 144 = CP^2$

$81 = CP$

$\sqrt{81} = CP$

$\therefore$ CP = 9 m

**(ii)** In right angle triangle BPD

$(PB)^2 = (BD)^2 + (PD)^2$

$(15)^2 = (9)^2 + PD^2$

$225 = 81 + PD^2$

$225\text{-}81 = PD^2$

$144 = PD^2$

$\sqrt{144} = PD$

$\therefore$ PD = 12 m

**(iii)** CP = 9 m

PD = 12 m

$\therefore$ CD = CP + PD

= 9+ 12 = 21 m

## Question 7.

**In triangle PQR, angle Q = 90°, find :**

**(i) PR, if PQ = 8 cm and QR = 6 cm**

**(ii) PQ, if PR = 34 cm and QR = 30 cm**

## Solution:

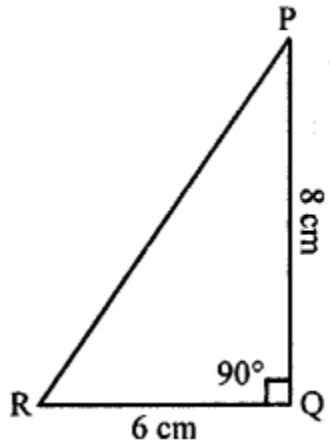
**(i) Given:**

PQ = 8 cm

QR = 6 cm

PR = ?

$\angle PQR = 90°$




According to Pythagoras Theorem,

$(PR)^2 = (PQ)^2 + (QR)^2$

$PR^2 = 8^2 + 6^2$

$PR^2 = 64 + 36$

$PR^2 = 100$

$\therefore PR = \sqrt{100} = 10$ cm

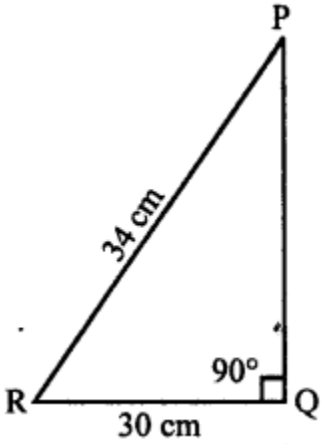
**(ii)** Given :

PR = 34 cm

QR = 30 cm

PQ = ?

$\angle PQR = 90°$




According to Pythagoras Theorem,

$(PR)^2 = (PQ)^2 + (QR)^2$

$(34)^2 = PQ^2 + (30)^2$

$1156 = PQ^2 + 900$

$1156-900 = PQ^2$

$256 = PQ^2$

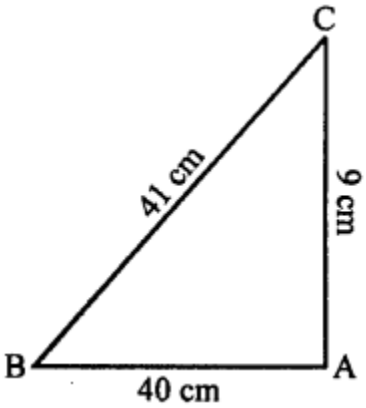
$\therefore PQ = 16$ cm

**Question 8.**

**Show that the triangle ABC is a right-angled triangle; if:**
**AB = 9 cm, BC = 40 cm and AC = 41 cm**

**Solution:**

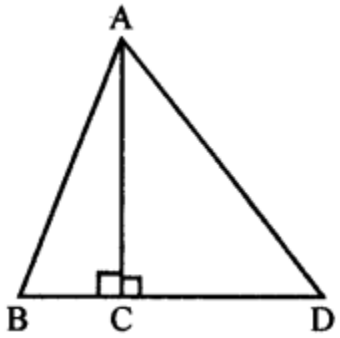
AB = 9 cm
CB = 40 cm
AC = 41 cm




The given triangle will be a right angled triangle if square of its largest side is equal to the sum of the squares on the other two sides.
According to Pythagoras Theorem,
$(AC)^2 = (BC)^2 + (AB)^2$
$(41)^2 = (40)^2 + (9)^2$
1681 = 1600 + 81
1681 = 1681
Hence, it is a right-angled triangle ABC.

**Question 9.**

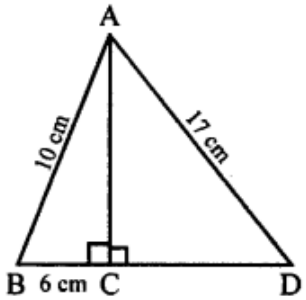
**In the given figure, angle ACB = 90° = angle ACD. If AB = 10 m, BC = 6 cm and AD = 17 cm, find :**
**(i) AC**
**(ii) CD**




**Solution:**

**Given:**

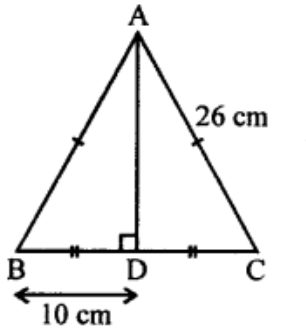
∆ABD
∠ACB = ∠ACD = 90°
and AB = 10 cm, BC = 6 cm and AD = 17 cm




**To find:**
(i) Length of AC
(ii) Length of CD
**Proof:**
(i) In right-angled triangle ABC
BC = 6 cm, AB = 110 cm
According to Pythagoras Theorem,
$AB^2 = AC^2 + BC^2$
$(10)^2 = (AC)^2 + (6)^2$
$100 = (AC)^2 + 36$
$AC^2 = 100-36 = 64$ cm
$AC^2 = 64$ cm
∴ AC = $\sqrt{8x8}$ = 8 cm
(ii) In right-angle triangle ACD
AD = 17 cm, AC = 8 cm
According to Pythagoras Theorem,
$(AD)^2 = (AC)^2 + (CD)^2$
$(17)^2 = (8)^2 + (CD)^2$
$289 – 64 = CD^2$
$225 = CD^2$
CD =$\sqrt{15x15}$ = 15 cm

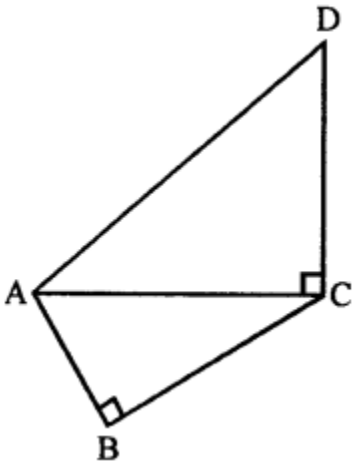
## Question 10.

**In the given figure, angle ADB = 90°, AC = AB = 26 cm and BD = DC. If the length of AD = 24 cm; find the length of BC.**



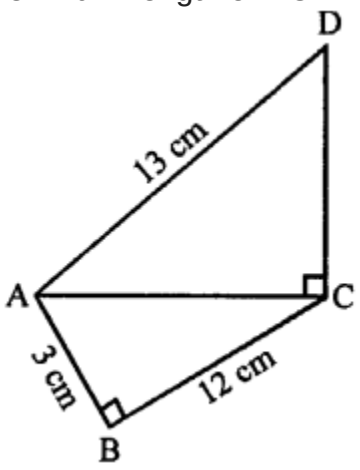
**Solution:**
**Given**:
$\Delta ABC$
$\angle ADB = 90°$ and $AC = AB = 26$ cm
$AD = 24$ cm
**To find :** Length of BC In right angled $\Delta ADC$
$AB = 26$ cm, $AD = 24$ cm
According to Pythagoras Theorem,
$(AC)^2 = (AD)^2 + (DC)^2$
$(26)^2 = (24)^2 + (DC)^2$
$676 = 576 + (DC)^2$
$\Rightarrow (DC)^2 = 100$
$\Rightarrow DC = \sqrt{100} = 10$ cm
$\therefore$ Length of BC = BD + DC
= 10 + 10 = 20 cm

**Question 11.**
**In the given figure, AD = 13 cm, BC = 12 cm, AB = 3 cm and angle ACD = angle ABC = 90°. Find the length of DC.**




**Solution:**
**Given :**
$\Delta ACD = \angle ABC = 90°$
and $AD = 13$ cm, $BC = 12$ cm, $AB = 3$ cm

**To find :** Length of DC.




**(i)**In right angled ∆ABC
AB = 3 cm, BC = 12 cm
According to Pythagoras Theorem,
$(AC)^2 = (AB)^2 + (BC)^2$
$(AC)^2 = (3)^2 + (12)^2$
$(AC) = \sqrt{9 + 144} = \sqrt{153}$ cm

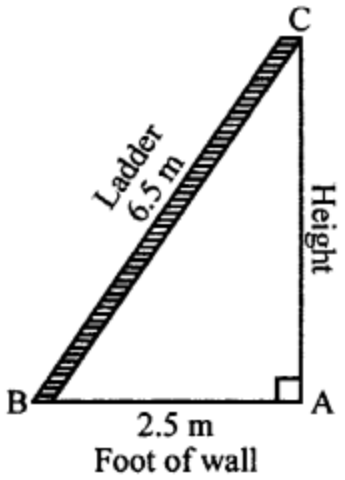
**(ii)** In right angled triangle ACD
AD = 13 cm, AC = $\sqrt{153}$
According to Pythagoras Theorem,
$DC^2 = AB^2 - AC^2$
$DC^2 = 169 - 153$
$DC = \sqrt{16} = 4$ cm
∴ Length of DC is 4 cm

## Question 12.

**A ladder, 6.5 m long, rests against a vertical wall. Ifthe foot of the ladcler is 2.5 m from the foot of the wall, find upto how much height does the ladder reach?**

## Solution:

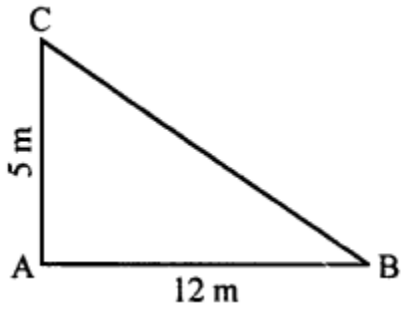
**Given :**
Length of ladder = 6.5 m
Length of foot of the wall = 2.5 m
**To find :** Height AC According to Pythagoras Theorem,
$(BC)^2 = (AB)^2 + (AC)^2$




$(6.5)^2 = (2.5)^2 + (AC)^2$
$42.25 = 6.25 + AC^2$
$AC^2 = 42.25 – 6.25 = 36$ m
$AC = \sqrt{6x6}$ = 6 m
∴ Height of wall = 6 m

**Question 13.**
**A boy first goes 5 m due north and then 12 m due east. Find the distance between the initial and the final position of the boy.**

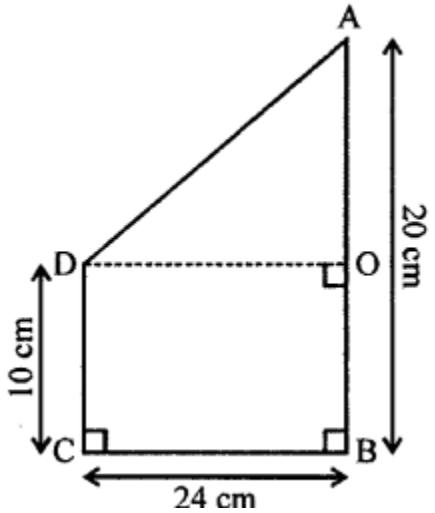
**Solution:**
**Given :** Direction of north = 5 m i.e. AC Direction of east = 12 m i.e. AB




**To find:** BC
According to Pythagoras Theorem,
In right angled AABC
$(BC)^2 = (AC)^2 + (AB)^2$
$(BC)^2 = (5)^2 + (12)^2$
$(BC)^2 = 25 + 144$
$(BC)^2 = 25 + 144$
$(BC)^2 = 169$
∴ BC = $\sqrt{169}$ = $\sqrt{13x13}$ = 13 m

**Question 14.**

**Use the information given in the figure to find the length AD.**




**Solution:**

**Given :**

AB = 20 cm

$\therefore AO = \frac{AB}{2} = \frac{20}{2} = 10cm$

BC = OD = 24 cm

**To find :** Length of AD

In right angled triangle

AOD $(AD)^2 = (AO)^2 + (OD)^2$

$(AD)^2 = (10)^2 + (24)^2$

$(AD)^2 = 100 + 576$

$(AD)^2 = 676$

$\therefore AD = \sqrt{26x26}$

AD = 26 cm