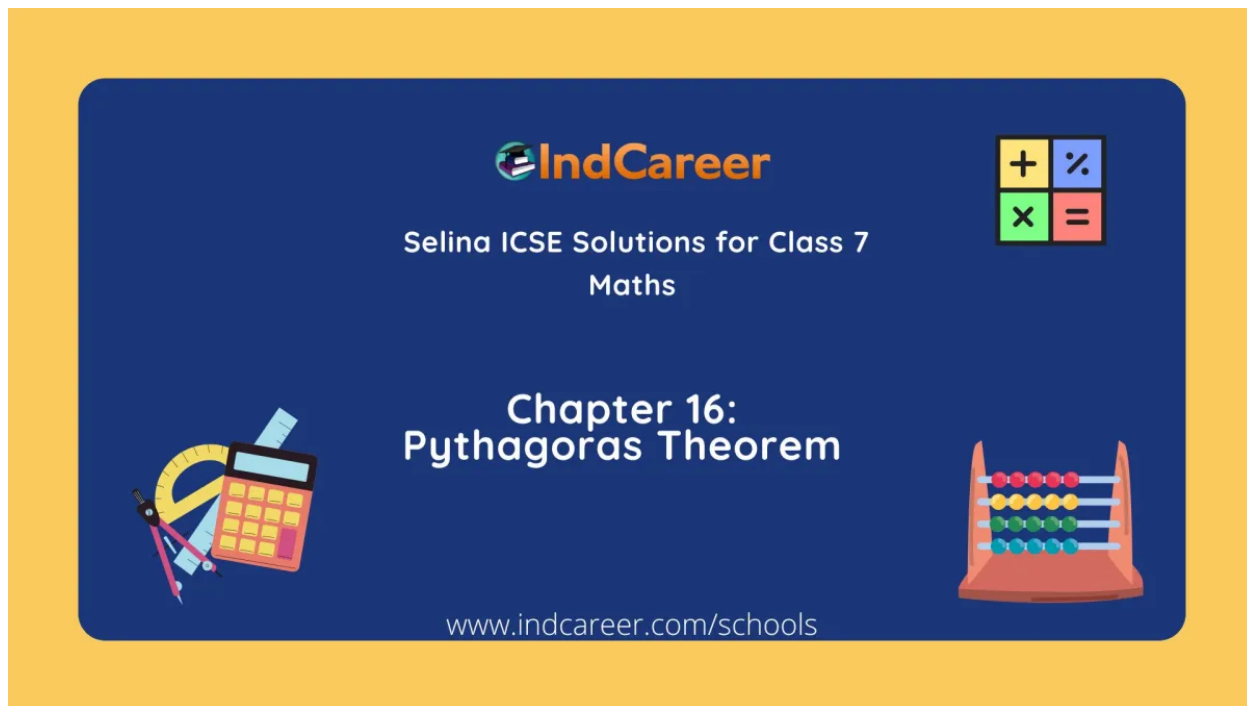


Selina Class 7 ICSE Solutions Mathematics : Chapter 16- Pythagoras Theorem



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Chapter 16- Pythagoras Theorem

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Selina Class 7 ICSE Solutions Mathematics : Chapter 16- Pythagoras Theorem

Selina 7th Maths Chapter 16, Class 7 Maths Chapter 16 solutions

Exercise 16 page: 189

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

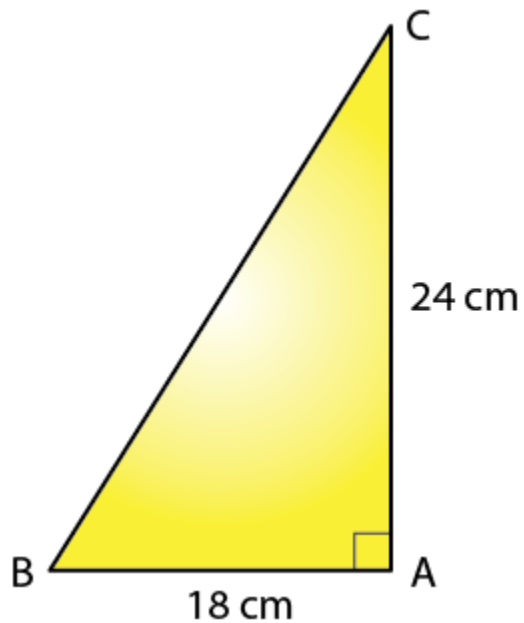
Solution:

It is given that

Triangle ABC is right-angled at vertex A

$AB = 18$ cm and $AC = 24$ cm

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Using Pythagoras Theorem

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

Substituting the values

$$BC^2 = 18^2 + 24^2$$

By further calculation

$$BC^2 = 324 + 576 = 900$$

$$BC = \sqrt{900} = \sqrt{(30 \times 30)}$$

So we get

$$BC = 30 \text{ cm}$$

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

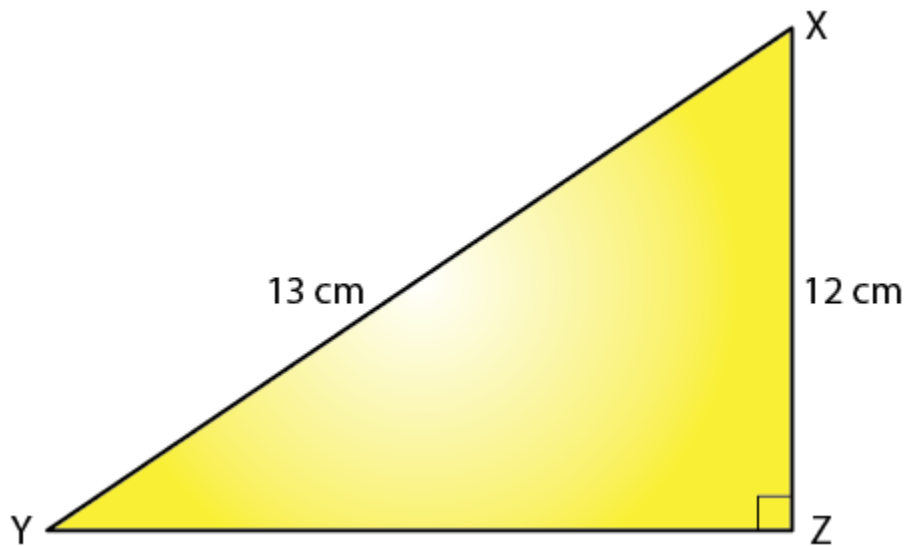
Solution:

It is given that

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Triangle XYZ is right-angled at vertex Z

XY = 13 cm and XZ = 12 cm



Using Pythagoras Theorem

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

Substituting the values

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

By further calculation

$$YZ^2 = 13^2 - 12^2$$

$$YZ^2 = 169 - 144 = 25$$

$$YZ = \sqrt{25} = \sqrt{5 \times 5}$$

So we get

$$YZ = 5 \text{ cm}$$

3. Triangle PQR is right-angled at vertex R. Calculate the length of PR, if:

PQ = 34 cm and QR = 33.6 cm.

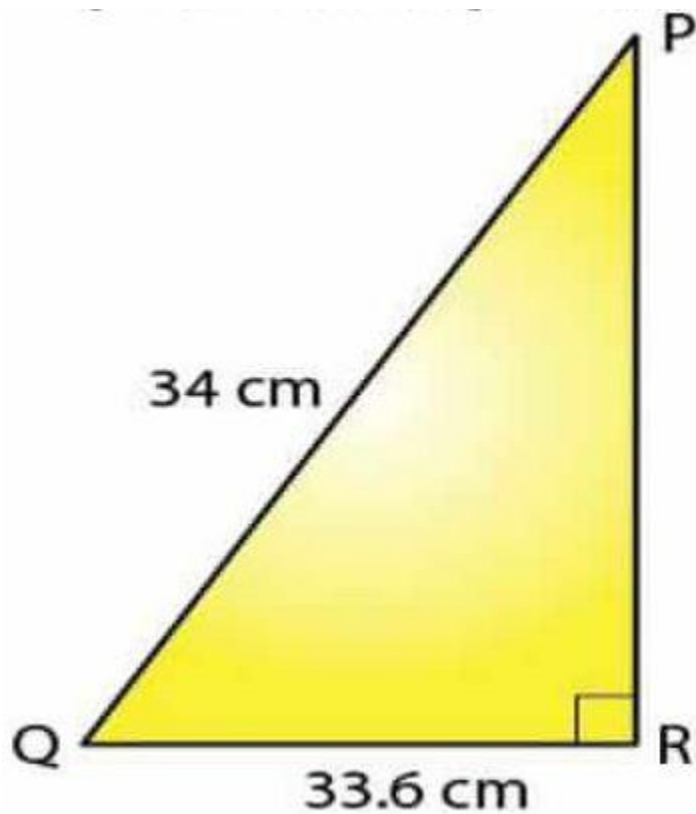
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Solution:

It is given that

Triangle PQR is right-angled at vertex R

PQ = 34 cm and QR = 33.6 cm



Using Pythagoras Theorem

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

Substituting the values

$$34^2 = PR^2 + 33.6^2$$

By further calculation

$$1156 = PR^2 + 1128.96$$

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$$PR^2 = 1156 - 1128.96$$

$$PR = \sqrt{27.04}$$

So we get

$$PR = 5.2 \text{ cm}$$

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 triangle will be right angled if square of the largest side is equal to the sum of the squares of the other two sides.

Here we have 20^2 , 16^2 and 12^2

We can write it as

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

By further calculation

$$400 = 256 + 144$$

So we get

$$400 = 400$$

Hence, the given triangle is right angled.

(ii) 6 m, 9 m and 13 m

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

$$\text{Here } 13^2 = 9^2 + 6^2$$

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By further calculation

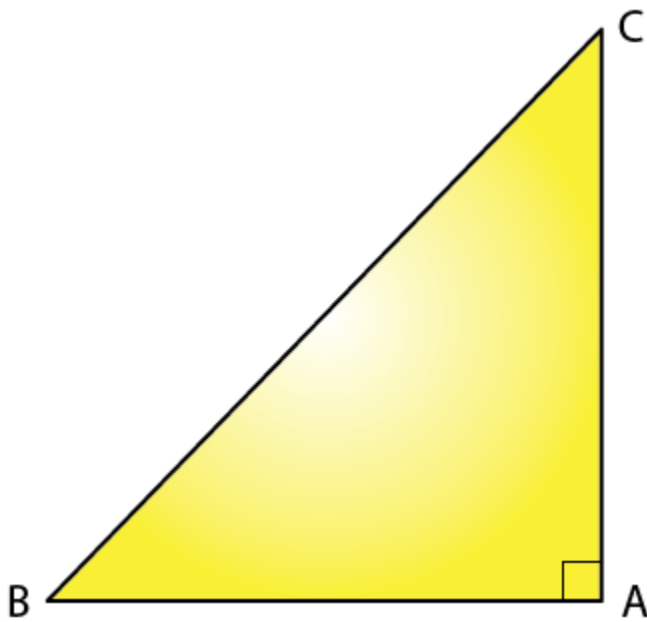
$$169 = 81 + 36$$

So we get

$$169 \neq 117$$

Hence, the given triangle is not right angled.

5. In the given figure, angle $BAC = 90^\circ$, $AC = 400$ m and $AB = 300$ m. Find the length of BC .

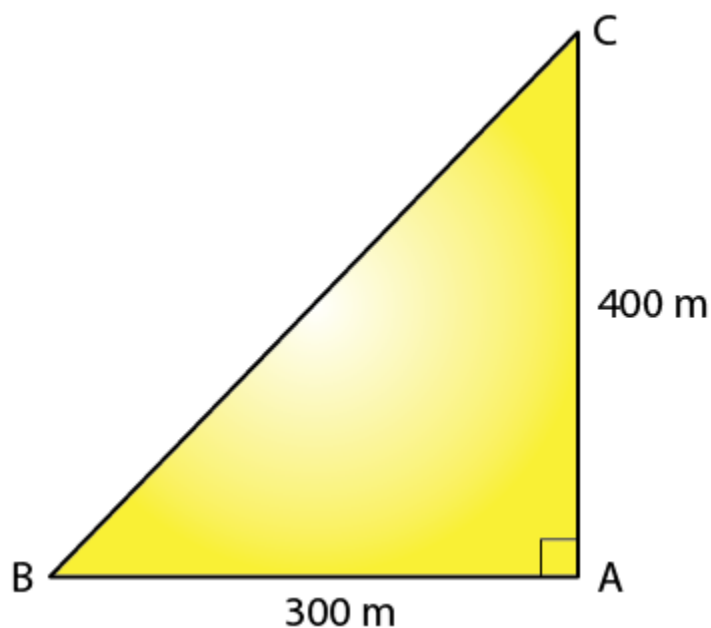


Solution:

It is given that

$BAC = 90^\circ$, $AC = 400$ m and $AB = 300$ m

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Using Pythagoras Theorem

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

Substituting the values

$$BC^2 = 300^2 + 400^2$$

By further calculation

$$BC^2 = 90000 + 160000 = 250000$$

$$BC = \sqrt{250000}$$

So we get

$$BC = 500 \text{ m}$$

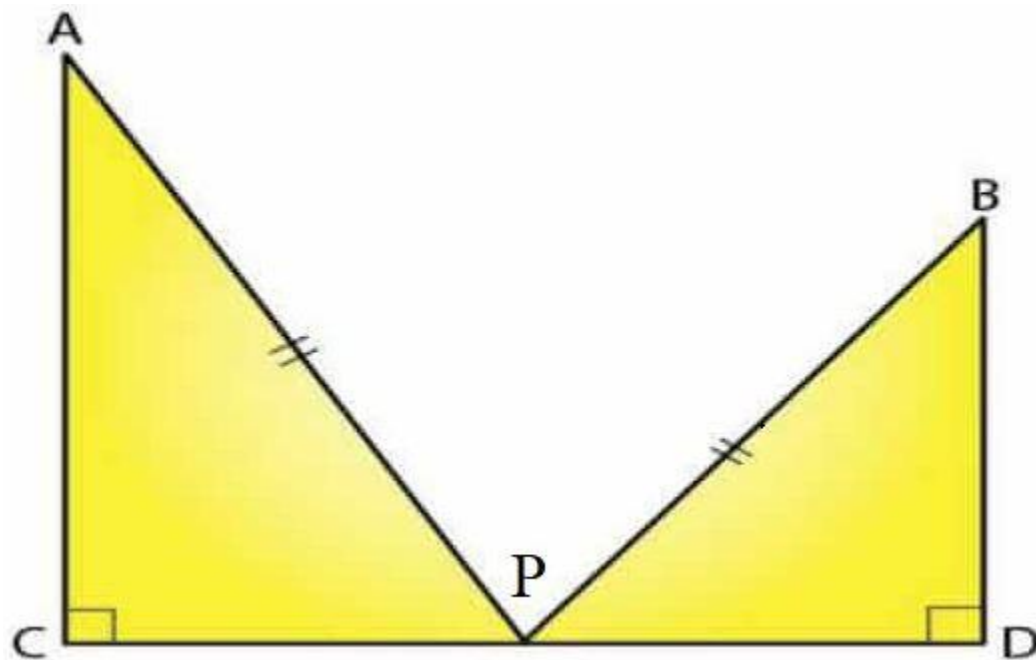
**6. In the given figure, angle ACP = $\angle$ BDP = 90° , AC = 12 m, BD = 9 m and PA= PB = 15 m.
Find:**

(i) CP

(ii) PD

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(iii) CD



Solution:

It is given that

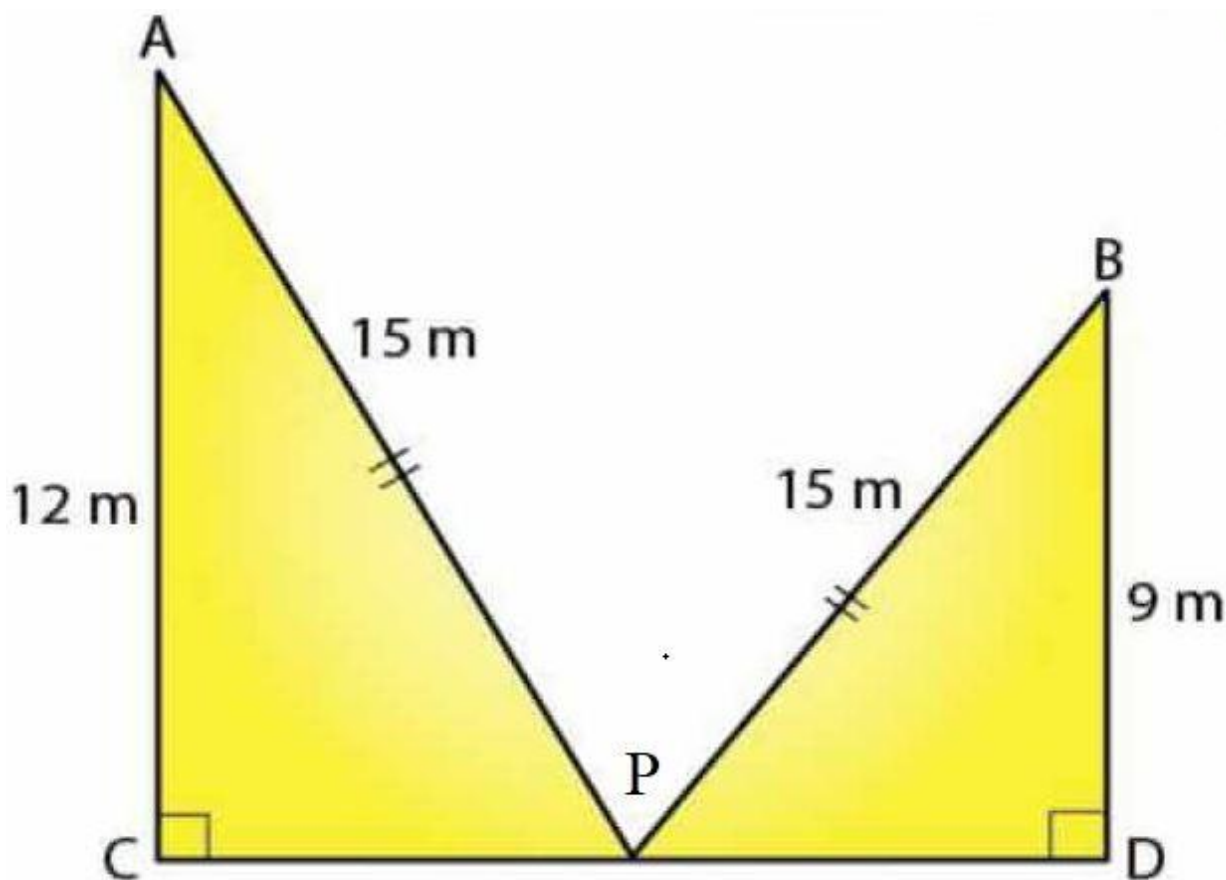
$$\angle ACP = \angle BDP = 90^\circ$$

$$AC = 12 \text{ m}$$

$$BD = 9 \text{ m}$$

$$PA = PB = 15 \text{ m}$$

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(i) In the right angled triangle ACP

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

Substituting the values

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

By further calculation

$$225 = 144 + CP^2$$

$$CP^2 = 225 - 144 = 81$$

So we get

$$CP = \sqrt{81} = 9 \text{ m}$$

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(ii) In the right angled triangle BPD

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

Substituting the values

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

By further calculation

$$225 = 81 + PD^2$$

$$PD^2 = 225 - 81 = 144$$

So we get

$$PD = \sqrt{144} = 12 \text{ m}$$

(iii) We know that

$$CP = 9 \text{ m}$$

$$PD = 12 \text{ m}$$

So we get

$$CD = CP + PD$$

Substituting the values

$$CD = 9 + 12 = 21 \text{ m}$$

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

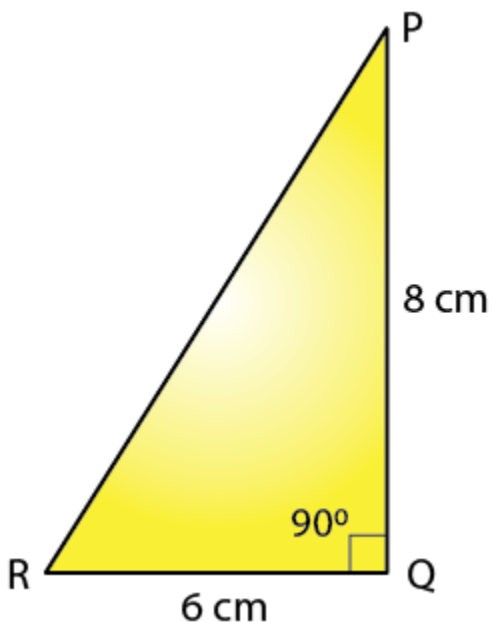
Solution:

(i) It is given that

$$PQ = 8 \text{ cm and } QR = 6 \text{ cm}$$

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$$\angle PQR = 90^\circ$$



Using Pythagoras Theorem

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

Substituting the values

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

By further calculation

$$PR^2 = 64 + 36 = 100$$

$$PR = \sqrt{100}$$

So we get

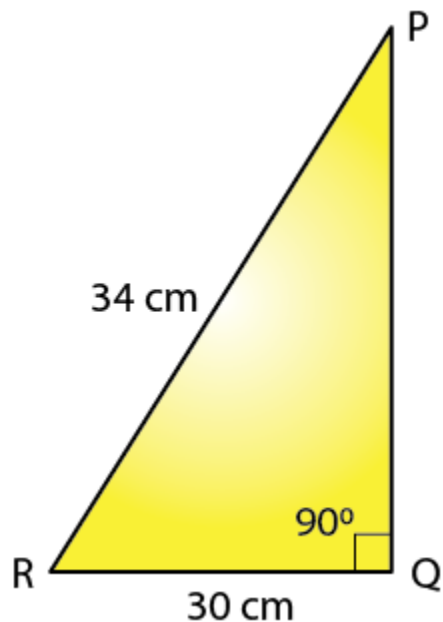
$$PR = 10 \text{ cm}$$

(ii) It is given that

$$PR = 34 \text{ cm and } QR = 30 \text{ cm}$$

$$\angle PQR = 90^\circ$$

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Using Pythagoras Theorem

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

Substituting the values

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

By further calculation

$$1156 = PQ^2 + 900$$

$$PQ^2 = 1156 - 900 = 256$$

$$PQ = \sqrt{256}$$

So we get

$$PQ = 16 \text{ cm}$$

8. Show that the triangle ABC is a right-angled triangle; if:

AB = 9 cm, BC = 40 cm and AC = 41 cm

Solution:

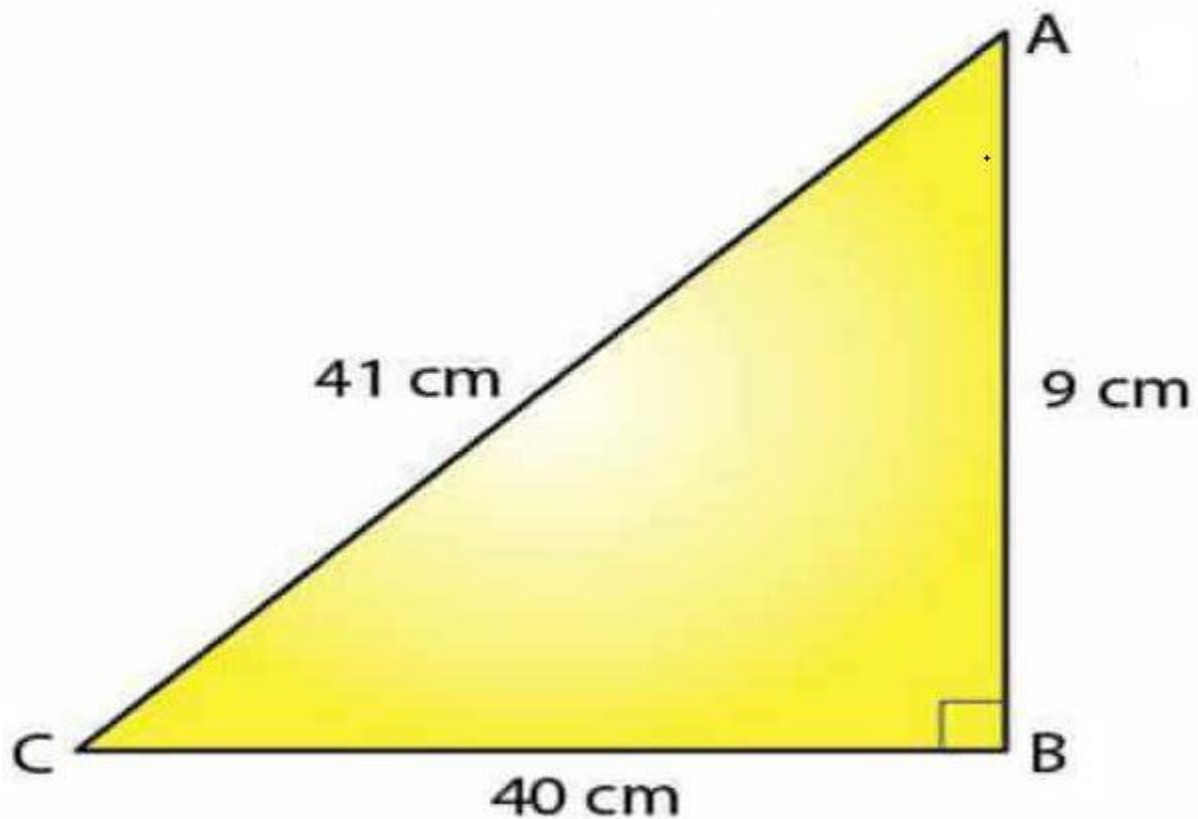
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It is given that

$$AB = 9 \text{ cm}$$

$$BC = 40 \text{ cm}$$

$$AC = 41 \text{ cm}$$



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

Using Pythagoras Theorem

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

Substituting the values

$$41^2 = 40^2 + 9^2$$

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By further calculation

$$1681 = 1600 + 81$$

So we get

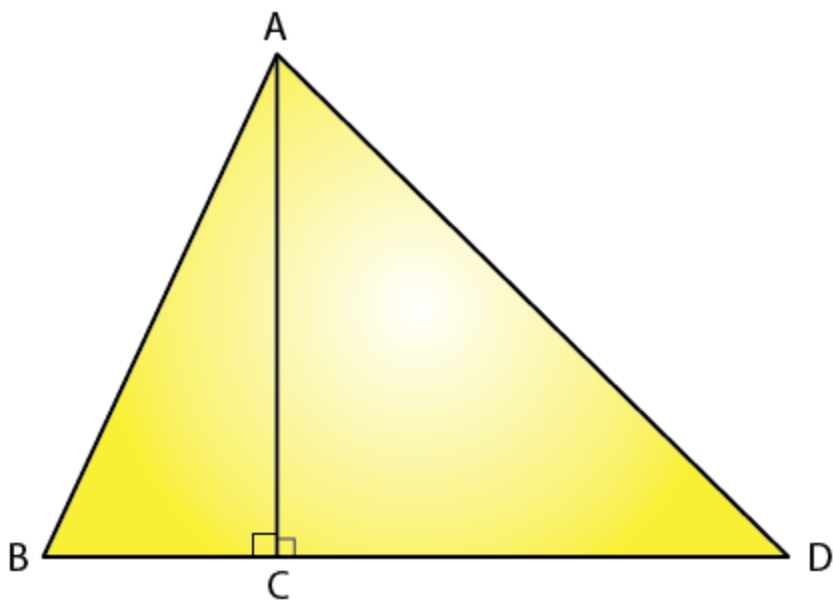
$$1681 = 1681$$

Therefore, ABC is a right-angled triangle.

9. In the given figure, angle $ACB = 90^\circ = \text{angle } ACD$. If $AB = 10$ cm, $BC = 6$ cm and $AD = 17$ cm, find:

(i) AC

(ii) CD



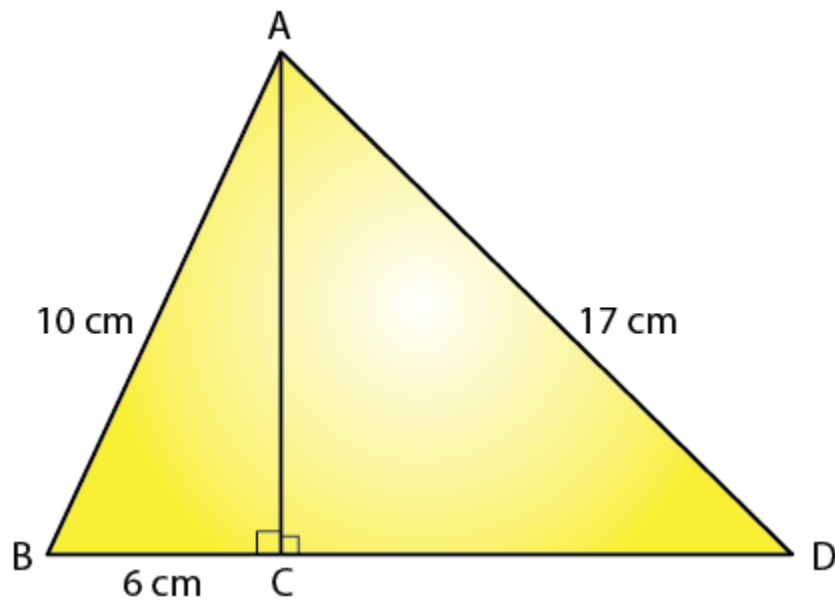
Solution:

It is given that

$$\text{angle } ACB = 90^\circ = \text{angle } ACD$$

$$AB = 10 \text{ cm, } BC = 6 \text{ cm and } AD = 17 \text{ cm}$$

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(i) In the right angled triangle ABC

BC = 6 cm and AB = 10cm

Using Pythagoras Theorem

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

Substituting the values

$$10^2 = AC^2 + 6^2$$

By further calculation

$$100 = AC^2 + 36$$

$$AC^2 = 100 - 36 = 64$$

$$AC = \sqrt{64} = \sqrt{(8 \times 8)}$$

So we get

$$AC = 8 \text{ cm}$$

(ii) In the right angled triangle ACD

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AD = 17 cm and AC = 8cm

Using Pythagoras Theorem

$$AD^2 = AC^2 + CD^2$$

Substituting the values

$$17^2 = 8^2 + CD^2$$

By further calculation

$$289 = 64 + CD^2$$

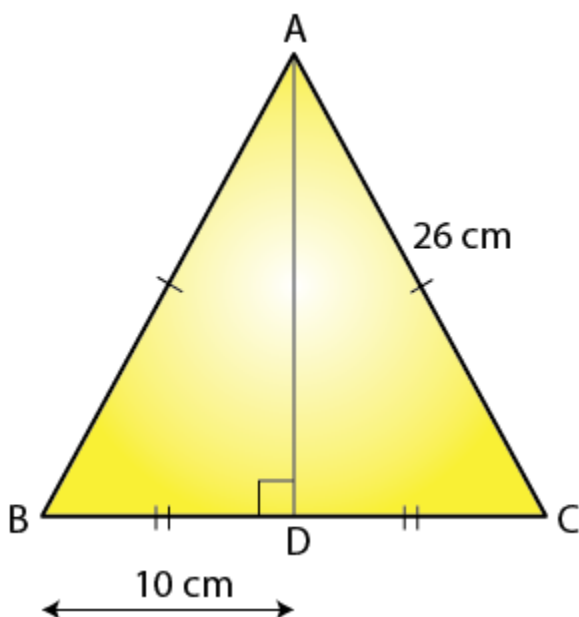
$$CD^2 = 289 - 64 = 225$$

$$CD = \sqrt{225} = \sqrt{(15 \times 15)}$$

So we get

$$CD = 15 \text{ cm}$$

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.



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Solution:

It is given that

$$\text{angle ADB} = 90^\circ$$

$$AC = AB = 26 \text{ cm}$$

$$BD = DC$$

Using Pythagoras Theorem

$$AC^2 = AD^2 + DC^2$$

Substituting the values

$$26^2 = 24^2 + DC^2$$

By further calculation

$$676 = 576 + DC^2$$

$$DC^2 = 676 - 576 = 100$$

$$DC = \sqrt{100}$$

So we get

$$DC = 10 \text{ cm}$$

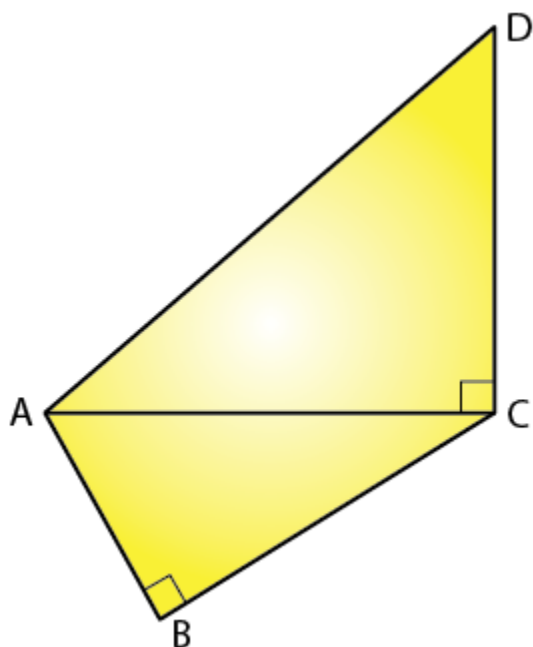
Here the length of $BC = BD + DC$

Substituting the values

$$\text{Length of } BC = 10 + 10 = 20 \text{ cm}$$

11. In the given figure, $AD = 13 \text{ cm}$, $BC = 12 \text{ cm}$, $AB = 3 \text{ cm}$ and $\text{angle ACD} = \text{angle ABC} = 90^\circ$. Find the length of DC .

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**Solution:**

It is given that

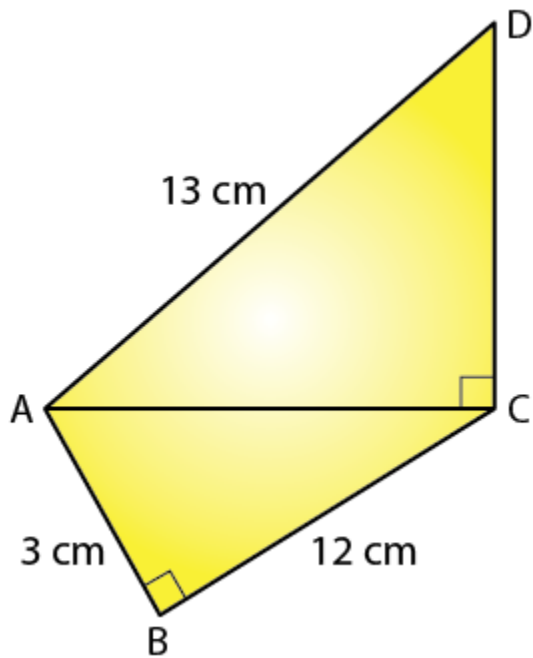
$$AD = 13 \text{ cm}$$

$$BC = 12 \text{ cm}$$

$$AB = 3 \text{ cm}$$

$$\text{angle } ACD = \text{angle } ABC = 90^\circ$$

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(i) In a right angled triangle ABC

AB = 3 cm and BC = 12 cm

Using Pythagoras Theorem

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

Substituting the values

$$AC^2 = 3^2 + 12^2$$

By further calculation

$$AC^2 = 9 + 144 = 153$$

So we get

$$AC = \sqrt{153} \text{ cm}$$

(ii) In a right angled triangle ACD

AD = 13 cm and AC = $\sqrt{153}$ cm

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Using Pythagoras Theorem

$$DC^2 = AD^2 - AC^2$$

Substituting the values

$$DC^2 = 13^2 + \sqrt{153^2}$$

By further calculation

$$DC^2 = 169 - 153 = 16$$

So we get

$$DC = \sqrt{16} = 4 \text{ cm}$$

Hence, the length of DC is 4 cm.

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

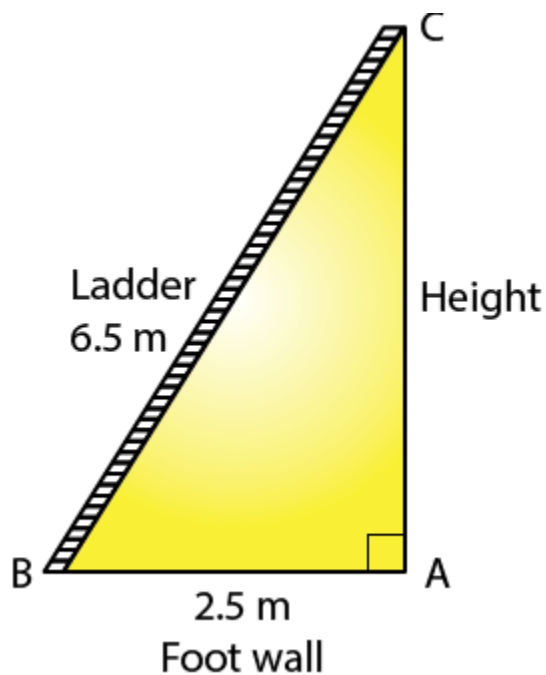
Solution:

It is given that

Length of ladder = 6.5 m

Length of foot of the wall = 2.5m

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Using Pythagoras Theorem

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

Substituting the values

$$6.5^2 = 2.5^2 + AC^2$$

By further calculation

$$AC^2 = 42.25 - 6.25 = 36$$

So we get

$$AC = \sqrt{36} = 6 \text{ m}$$

Hence, the ladder reaches upto 6 m.

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.

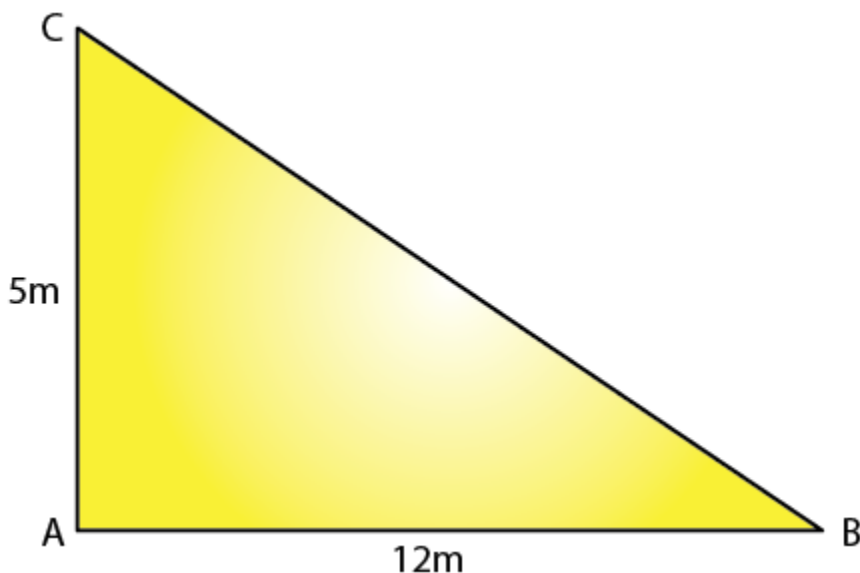
Solution:

It is given that

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Direction of north AC = 5 m

Direction of east AB = 12 m



Using Pythagoras Theorem

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

Substituting the values

$$BC^2 = 5^2 + 12^2$$

By further calculation

$$BC^2 = 25 + 144 = 169$$

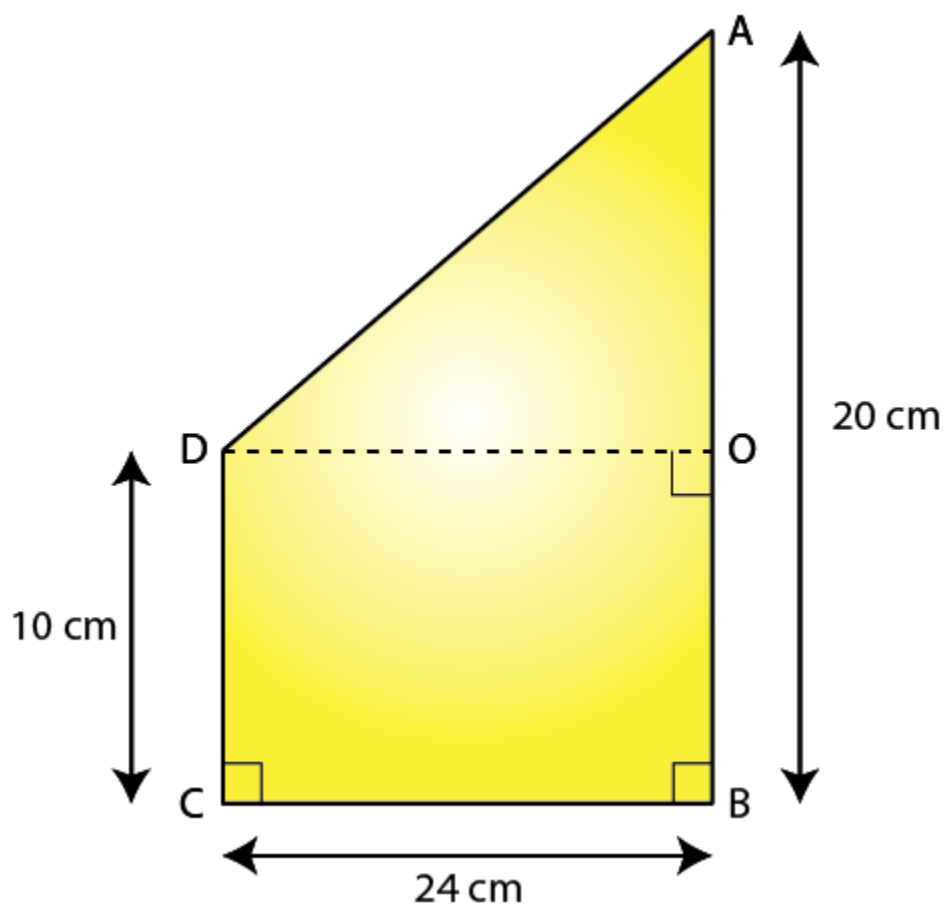
$$BC = \sqrt{169} = \sqrt{(13 \times 13)}$$

So we get

$$BC = 13 \text{ m}$$

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

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**Solution:**

It is given that

$$AB = 20 \text{ cm}$$

$$AO = AB/2 = 20/2 = 10 \text{ cm}$$

$$BC = OD = 24 \text{ cm}$$

Using Pythagoras Theorem

$$AD^2 = AO^2 + OD^2$$

Substituting the values

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

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By further calculation

$$AD^2 = 100 + 576 = 676$$

$$AD = \sqrt{676} = \sqrt{(26 \times 26)}$$

So we get

$$AD = 26 \text{ cm}$$



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