Exercise 6.5

Question 1:

PQR is a triangle, right angled at P. If PQ = 10 cm and PR = 24 cm, find QR.

Answer 1:

Given: PQ = 10 cm, PR = 24 cm

Let QR be x cm.

In right angled triangle QPR,

$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$ [By Pythagoras theorem]

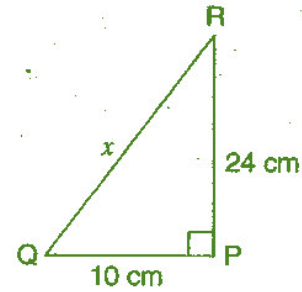
$\Rightarrow \quad (QR)^2 = (PQ)^2 + (PR)^2$

$\Rightarrow \quad x^2 = (10)^2 + (24)^2$

$\Rightarrow \quad x^2 = 100 + 576 = 676$

$\Rightarrow \quad x = \sqrt{676} = 26$ cm

Thus, the length of QR is 26 cm.



Question 2:

ABC is a triangle, right angled at C. If AB = 25 cm and AC = 7 cm, find BC.

Answer 2:

Given: AB = 25 cm, AC = 7 cm

Let BC be x cm.

In right angled triangle ACB,

$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$ [By Pythagoras theorem]

$\Rightarrow \quad (AB)^2 = (AC)^2 + (BC)^2$

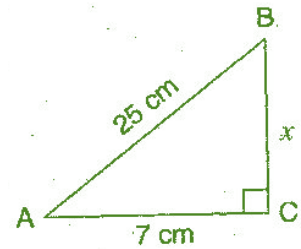
$\Rightarrow \quad (25)^2 = (7)^2 + x^2$

$\Rightarrow \quad 625 = 49 + x^2$

$\Rightarrow \quad x^2 = 625 - 49 = 576$

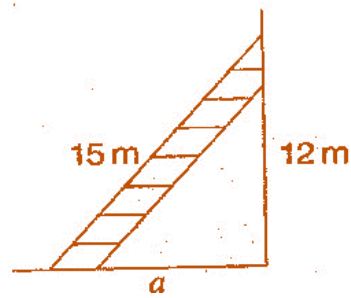
$\Rightarrow \quad x = \sqrt{576} = 24$ cm

Thus, the length of BC is 24 cm.



Question 3:

A 15 m long ladder reached a window 12 m high from the ground on placing it against a wall at a distance a. Find the distance of the foot of the ladder from the wall.



Answer 3:

Let AC be the ladder and A be the window.

Given: AC = 15 m, AB = 12 m, CB = a m

In right angled triangle ACB,

(Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2 [By Pythagoras theorem]

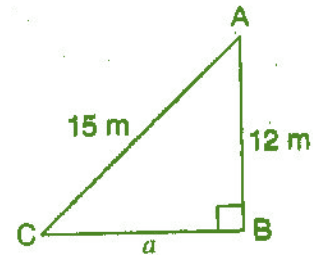
$\Rightarrow$ (AC)^2 = (CB)^2 + (AB)^2

$\Rightarrow$ $(15)^2 = (a)^2 + (12)^2$

$\Rightarrow$ $225 = a^2 + 144$

$\Rightarrow$ $a^2 = 225 - 144 = 81$

$\Rightarrow$ $a = \sqrt{81} = 9$ cm



Thus, the distance of the foot of the ladder from the wall is 9 m.

Question 4:

Which of the following can be the sides of a right triangle?

(i) 2.5 cm, 6.5 cm, 6 cm

(ii) 2 cm, 2 cm, 5 cm

(iii) 1.5 cm, 2 cm, 2.5 cm

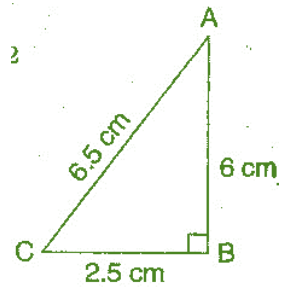
In the case of right angled triangles, identify the right angles.

Answer 4:

Let us consider, the larger side be the hypotenuse and also using Pythagoras theorem,

(Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2

(i) 2.5 cm, 6.5 cm, 6 cm



In ΔABC, $(AC)^2 = (AB)^2 + (BC)^2$

L.H.S. = $(6.5)^2$ = 42.25 cm

R.H.S. = $(6)^2 + (2.5)^2$ = 36 + 6.25 = 42.25 cm

Since, L.H.S. = R.H.S.

Therefore, the given sides are of the right angled triangle.

Right angle lies on the opposite to the greater side 6.5 cm, i.e., at B.

(ii) 2 cm, 2 cm, 5 cm

In the given triangle, $(5)^2 = (2)^2 + (2)^2$

L.H.S. = $(5)^2$ = 25

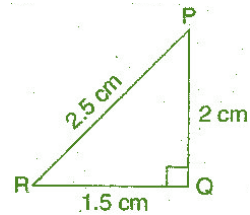
R.H.S. = $(2)^2 + (2)^2$ = 4 + 4 = 8

Since, L.H.S. $\neq$ R.H.S.

Therefore, the given sides are not of the right angled triangle.

(iii) 1.5 cm, 2 cm, 2.5 cm

In ΔPQR, $(PR)^2 = (PQ)^2 + (RQ)^2$



L.H.S. = $(2.5)^2$ = 6.25 cm

R.H.S. = $(1.5)^2 + (2)^2$ = 2.25 + 4 = 6.25 cm

Since, L.H.S. = R.H.S.

Therefore, the given sides are of the right angled triangle.

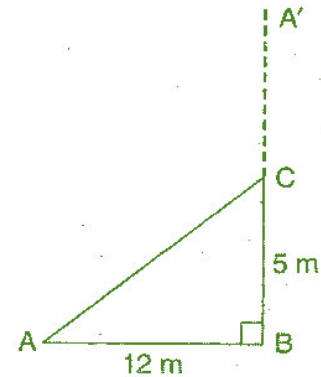
Right angle lies on the opposite to the greater side 2.5 cm, i.e., at Q.

Question 5:

A tree is broken at a height of 5 m from the ground and its top touches the ground at a distance of 12 m from the base of the tree. Find the original height of the tree.

Answer 5:

Let A'CB represents the tree before it broken at the point C and let the top A' touches the ground at A after it broke. Then ΔABC is a right angled triangle, right angled at B.



AB = 12 m and BC = 5 m

Using Pythagoras theorem, In ΔABC

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

$$\Rightarrow \quad (AC)^2 = (12)^2 + (5)^2$$

$$\Rightarrow \quad (AC)^2 = 144 + 25$$

$$\Rightarrow \quad (AC)^2 = 169$$

$$\Rightarrow \quad AC = 13 \text{ m}$$

Hence, the total height of the tree = AC + CB = 13 + 5 = 18 m.

Question 6:

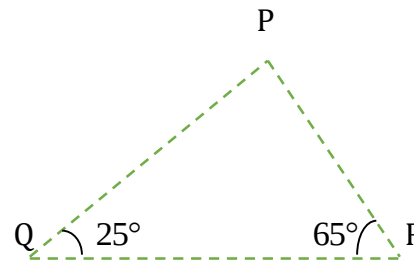
Angles Q and R of a ΔPQR are $25°$ and $65°$.

Write which of the following is true:

(i) $PQ^2 + QR^2 = RP^2$

(ii) $PQ^2 + RP^2 = QR^2$

(iii) $RP^2 + QR^2 = PQ^2$



Answer 6:

In ΔPQR,

$\angle PQR + \angle QRP + \angle RPQ = 180°$ [By Angle sum property of a Δ]

$\Rightarrow \quad 25° + 65° + \angle RPQ = 180°$

$\Rightarrow \quad 90° + \angle RPQ = 180°$

$\Rightarrow \quad \angle RPQ = 180° - 90° = 90°$

Thus, ΔPQR is a right angled triangle, right angled at P.

$\therefore$ (Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2 [By Pythagoras theorem]

$$\Rightarrow \quad (QR)^2 = (PR)^2 + (QP)^2$$

Hence, Option (ii) is correct.

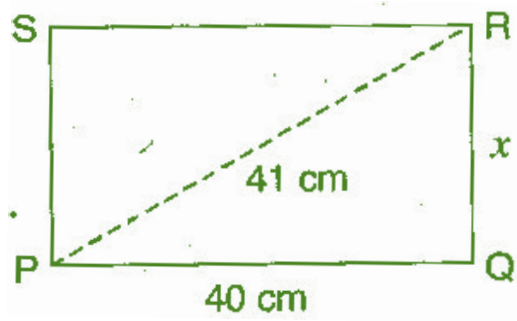
Question 7:

Find the perimeter of the rectangle whose length is 40 cm and a diagonal is 41 cm.

Answer 7:

Given diagonal (PR) = 41 cm, length (PQ) = 40 cm

Let breadth (QR) be x cm.



Now, in right angled triangle PQR,

$(PR)^2 = (RQ)^2 + (PQ)^2$ [By Pythagoras theorem]

$\Rightarrow \quad (41)^2 = x^2 + (40)^2$

$\Rightarrow \quad 1681 = x^2 + 1600$

$\Rightarrow \quad x^2 = 1681 - 1600$

$\Rightarrow \quad x^2 = 81$

$\Rightarrow \quad x = \sqrt{81} = 9$ cm

Therefore the breadth of the rectangle is 9 cm.

Perimeter of rectangle = 2(length + breadth)

= 2 (9 + 49)

= 2 x 49 = 98 cm

Hence, the perimeter of the rectangle is 98 cm.

Question 8:

The diagonals of a rhombus measure 16 cm and 30 cm. Find its perimeter.

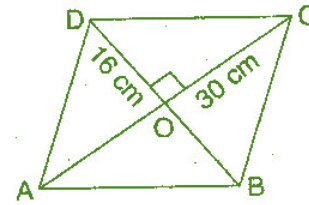
Answer 8:

Given: Diagonals AC = 30 cm and DB = 16 cm.

Since the diagonals of the rhombus bisect at right angle to each other.

Therefore, $OD = \frac{DB}{2} = \frac{16}{2} = 8$ cm

And $OC = \frac{AC}{2} = \frac{30}{2} = 15$ cm



Now, In right angle triangle DOC,

$(DC)^2 = (OD)^2 + (OC)^2$ [By Pythagoras theorem]

$\Rightarrow \quad (DC)^2 = (8)^2 + (15)^2$

$\Rightarrow \quad (DC)^2 = 64 + 225 = 289$

$\Rightarrow \quad DC = \sqrt{289} = 17$ cm

Perimeter of rhombus = 4 x side = 4 x 17 = 68 cm

Thus, the perimeter of rhombus is 68 cm.