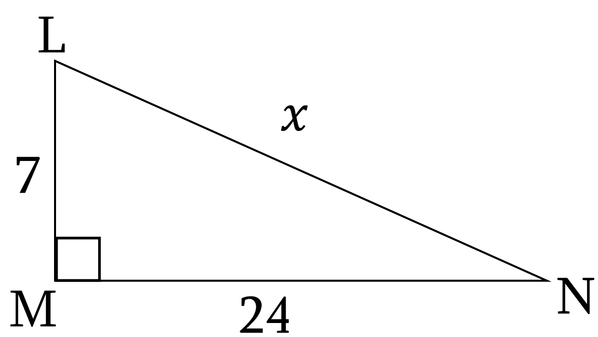
# 13. Pythagoras' Theorem

## Practice Set 48

**1. In the figures below, find the value of '$x$'.**

**(i)**




**Solution: In ΔLMN, by Pythagoras' theorem.**

$$[l(LN)]^2 = [l(LM)]^2 + [l(MN)]^2$$

$$\therefore x^2 = (7)^2 + (24)^2$$

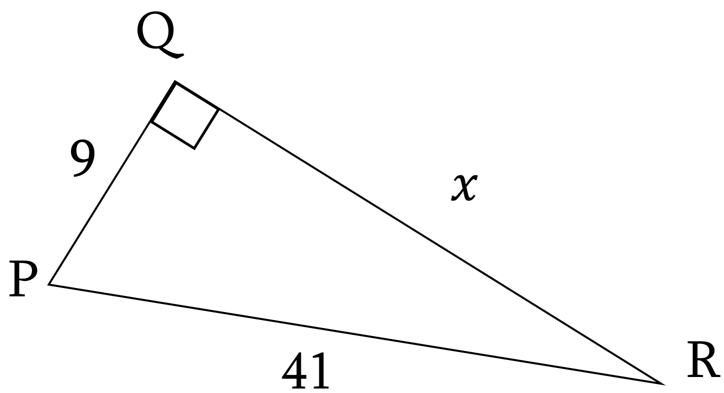
$$= 49 + 576$$

$$= 625$$

$$\therefore x = \sqrt{625} = 25$$

$\therefore$ **The value of $x$ is 25.**

**(ii)**




**Solution: In Δ PQR, by the Pythagoras' theorem:**

$[l(PR)]^2 = [l(PQ)]^2 + [l(QR)]^2$

$\therefore (41)^2 = (9)^2 + (x)^2$

$\therefore (x)^2 = (41)^2 - (9)^2$

$\therefore x^2 = 1681 - 81$

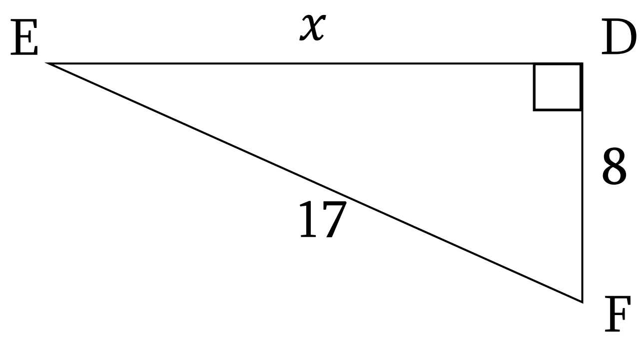
$= 1600$

$\therefore x = \sqrt{1600}$

$\therefore x = 40$

$\therefore$ The value of $x$ is 40.

**(iii)**




**Solution: In $\Delta$ EDF , by the Pythagoras' theorem:**

$$[l(\mathrm{EF})]^2 = [l(\mathrm{DE})]^2 + [l(\mathrm{DF})]^2$$

$$\therefore (17)^2 = (x)^2 + (8)^2$$

$$\therefore x^2 = (17)^2 + (8)^2$$

$$= 289 - 64$$

$$= 225$$

$$\therefore x = \sqrt{225} = 15$$

**$\therefore$ The value of $x$ is 15.**

**2. In the right-angled ΔPQR, ∠P = 90°. If $l$ (PQ) = 24 cm and $l$ (PR) = 10 cm, find the length of seg QR.**

Solution:

In ΔPQR, ∠P = $90^0$

∴ seg QR is the hypotenuse

$l$(PQ) = 24 cm, $l$(PR) = 10 cm

By the Pythagoras' theorem

$[l(QR)]^2 = [l(PQ)]^2 + [l(PR)]^2$

∴ $[l(QR)]^2 = (24)^2 + (10)^2$

∴ $[l(QR)]^2 = 576 + 100$

∴ $[l(QR)]^2 = 676$

∴ $l(QR) = \sqrt{676} = 26$

∴ The length of seg QR is 26 cm.

**3. In the right-angled $\Delta$LMN, $\angle$M = 90°. If $l$(LM) = 12 cm and $l$ (LN) = 20 cm, find the length of seg MN.**

**Solution :**

$\Delta$PQR, $\angle M = 90^0$

$\therefore$ seg LN is the hypotenuse.

By the Pythagoras' theorem

$$[l(\mathrm{LN})]^2 = [l(\mathrm{LM})]^2 + [l(\mathrm{MN})]^2$$

$$\therefore (20)^2 = (12)^2 + [l(\mathrm{MN})]^2$$

$$\therefore [l(\mathrm{MN})]^2 = (20)^2 - (12)^2$$

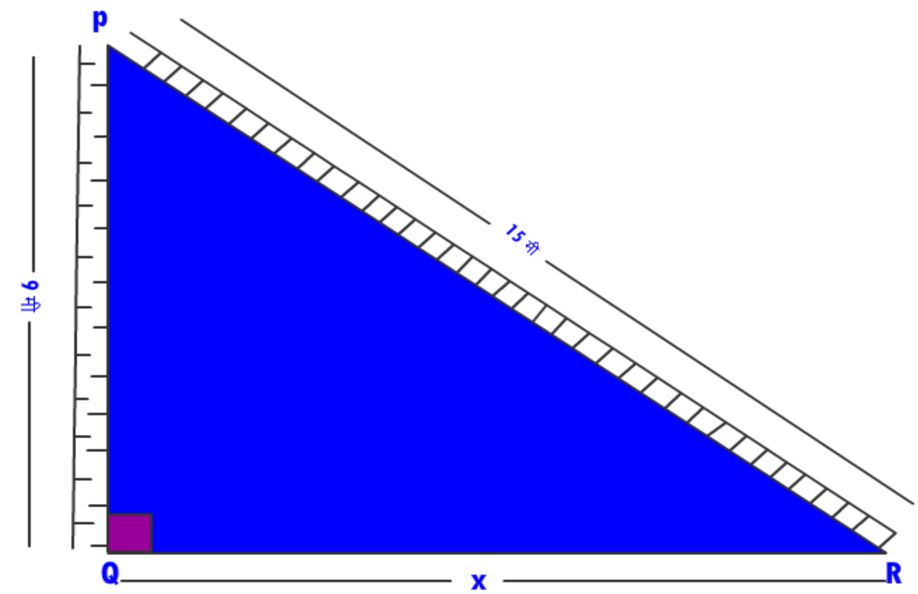
$$= 400 - 144$$

$$= 256$$

$$\therefore [l(\mathrm{MN})] = \sqrt{256} = 16$$

$\therefore$ The length of seg MN is 16 cm.

4. The top of a ladder of length 15 m reaches a window 9 m above the ground. What is the distance between the base of the wall and that of the ladder ?




Solution: Suppose PQ be the wall and PR, the ladder.

P is the window.

$l(\mathrm{PQ}) = 9\mathrm{m}$, $l(\mathrm{PR}) = 15$ m and $l(\mathrm{QR}) = x$ m

In Δ PQR,

By Pythagoras' theorem,

$[l(\mathrm{PR})]^2 = [l(\mathrm{PQ})]^2 + [l(\mathrm{QR})]^2$

$\therefore (15)^2 = (9)^2 + (x)^2$

$\therefore x^2 = (15)^2 - (9)^2$

$= 225 - 81$

$= 144$

$\therefore\ x = \sqrt{144} = 12$

$\therefore\ l(QR) = 12$ m

$\therefore$ The distance between the foot of the ladder and the base of the wall is 12 m.

## Practice Set 49

**1. Find the Pythagorean triplets from among the following sets of numbers.**

**(i) 3, 4, 5**

**Solution:**

3, 4, 5

$(3)^2 = 9$, $(4)^2 = 16$, $(5)^2 = 25$

$\therefore\ 9 + 16 = 25$

$\therefore\ (3)^2 + (4)^2 = (5)^2$

$\therefore$ 3, 4, 5 is a Pythagorean triplet.

**(ii) 2, 4, 5**

**Solution:**

2, 4, 5

$(2)^2 = 4, \ (4)^2 = 16, \ (5)^2 = 25$

$\therefore 4 + 16 = 20 \neq 25$

$\therefore (2)^2 + (4)^2 \neq (5)^2$

$\therefore$ 2, 4, 5 is not a Pythagorean triplet.

**(iii) 4, 5, 6**

**Solution:**

4, 5, 6

$(4)^2 = 16, (5)^2 = 25, (6)^2 = 36$

$\therefore 16 + 25 = 41 \neq 36$

$\therefore (4)^2 + (5)^2 \neq (6)^2$

Ans. 4,5,6 is not a Pythagorean triplet.

**(iv) 2, 6, 7**

**Solution:**

2,6,7

$(2)^2 = 4$, $(6)^2 = 36$, $(7)^2 = 49$

$\therefore\ 4 + 36 = 40 \neq 49$

$\therefore (2)^2 + (6)^2 \neq (7)^2$

$\therefore$ 2, 6, 7 is not a Pythagorean triplet.

**(v) 9, 40, 41**

**Solution:**

9, 40, 41

$(9)^2 = 81$, $(40)^2 = 1600$, $(41)^2 = 1681$

$\therefore\ 81 + 1600 = 1681$

$\therefore (9)^2 + (40)^2 = (41)^2$

$\therefore$ 9, 40, 41 is a Pythagorean triplet.

**(iv) 4, 7, 8**

**Solution:**

**4, 7, 8**

$(4)^2 = 16$, $(7)^2 = 49$, $(8)^2 = 64$

$\therefore 16 + 49 = 65 \neq 64$

$\therefore (4)^2 + (7)^2 \neq (8)^2$

$\therefore$ 4, 7, 8 is not a Pythagorean triplet.

**2. The sides of some triangles are given below. Find out which ones are right-angled triangles?**

**(i) 8,15,17**

**Solution:**

**8, 15, 17**

$(8)^2 = 64$, $(15)^2 = 225$, $(17)^2 = 289$

$64 + 225 = 289$

$\therefore (8)^2 + (15)^2 = (17)^2$

$\therefore$ It is a right-angled triangle.

**(ii) 11,12,15**

**Solution:**

11,12,15

$(11)^2 = 121$, $(12)^2 = 144$, $(15)^2 = 225$

$121 + 144 = 265 \neq 225$

$\therefore (11)^2 + (12)^2 \neq (15)^2$

$\therefore$ It is not a right-angled triangle.

**(iii) 11, 60, 61**

**Solution:**

11, 60, 61

$(11)^2 = 121$, $(60)^2 = 3600$, $(61)^2 = 3721$

$121 + 3600 = 3721$

$\therefore (11)^2 + (60)^2 = (61)^2$

$\therefore$ It is a right-angled triangle.

**(iv) 1.5, 1.6, 1.7**

**Solution:**

1.5, 1.6, 1.7

$(1.5)^2 = 2.25$, $(1.6)^2 = 2.56$, $(1.7)^2 = 2.89$

$2.25 + 2.56 = 4.81 \neq 2.89$

$\therefore (1.5)^2 + (1.6)^2 \neq (1.7)^2$

$\therefore$ It is not a right-angled triangle.

**(v) 40, 20, 30**

**Solution:**

40, 20, 30

$(40)^2 = 1600$, $(20)^2 = 400$, $(30)^2 = 900$

$900 + 400 = 1300 \neq 1600$

$\therefore (30)^2 + (20)^2 \neq (40)^2$

$\therefore$ It is not a right-angled triangle.

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