General instructions for Students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy.

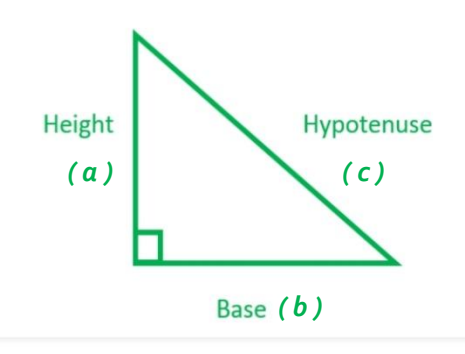
CLASS – IX

MATHEMATICS

12. *Pythagoras Theorem (Part – I)*

Pythagoras Theorem

Statement: In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.



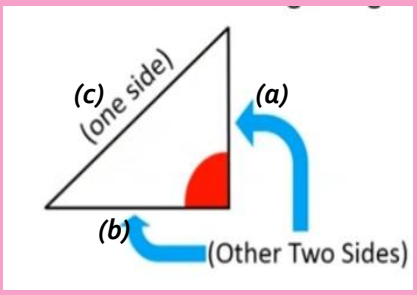
$(Hypotenuse)^2 = (Height)^2 + (Base)^2$

If a triangle is a right Δ*, then* $c^2 = a^2 + b^2$

Converse of Pythagoras Theorem

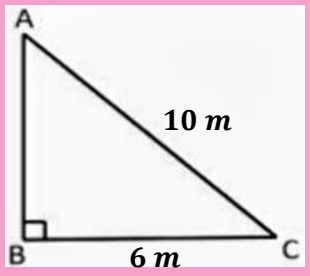
Statement: In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle.

If $c^2 = a^2 + b^2$, *then the triangle is a right* Δ



EXERCISE – 12

2. ***Foot of a 10 m long ladder leaning against a vertical well is 6 m away from the base of the wall. Find the height of the point on the wall where the top of the ladder reaches.***



Solution : $AC^2 = AB^2 + BC^2$ [*By Pythagoras Theorem*]

$\Rightarrow 10^2 = AB^2 + 6^2$

$\Rightarrow 100 = AB^2 + 36$

$\Rightarrow AB^2 = 100 - 36 = 64 \Rightarrow AB = 8\ m$ *Ans.*

6. *If the sides of a triangle are in the ratio* $3 : 4 : 5$, *prove that it is a right – angled triangle.*

Solution : *Let* $a = 3x$, $b = 4x$ *and* $c = 5x$

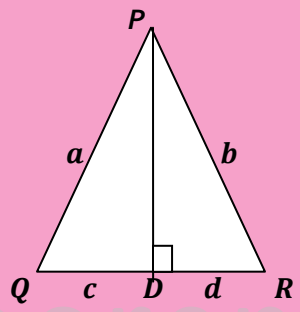
$$(5x)^2 = (3x)^2 + (4x)^2$$

$$\Rightarrow \quad 25x^2 = 9x^2 + 16x^2$$

$$\Rightarrow \quad 25x^2 = 25x^2 \quad [\text{By Converse of Pythagoras Theorem}]$$

Thus, the triangle is right angled. Proved.

11. *In* ΔPQR, $PD \perp QR$, *such that D lies on QR. If* $PQ = a$, $PR = b$, $QD = c$ *and* $DR = d$, *prove that* $(a + b)(a - b) = (c + d)(c - d)$.



Solution : *In* ΔPDQ, $\angle PDQ = 90°$

$$PD^2 = PQ^2 - QD^2 \quad [\text{By Pythagoras Theorem}]$$

$$= a^2 - c^2 \ldots\ldots\ldots\ldots\ldots (i)$$

In ΔPDR, $\angle PDR = 90°$

$$PD^2 = PR^2 - RD^2 \quad [\text{By Pythagoras Theorem}]$$

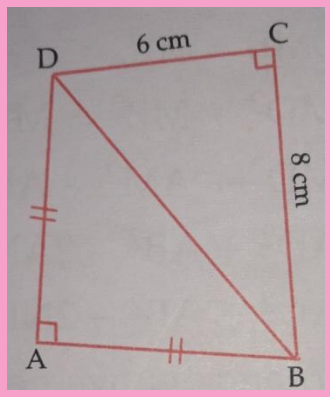
$$= b^2 - d^2 \ldots\ldots\ldots\ldots\ldots (ii)$$

From (i)*and* (ii), $\quad a^2 - c^2 = b^2 - d^2$

$$\Rightarrow \quad a^2 - b^2 = c^2 - d^2$$

$$\Rightarrow \quad (a + b)(a - b) = (c + d)(c - d) \quad \textit{Proved.}$$

14. (b) *In the figure,* $ABCD$ *is a quadrilateral in which* $AB = AD$, $\angle A = 90° = \angle C$, $BC = 8$ *cm and* $CD = 6$ *cm . Find AB and calculate area of* ΔABD



Solution : *In* ΔBCD, $\angle BCD = 90°$

$$BD^2 = BC^2 + CD^2 \quad [\text{By Pythagoras Theorem}]$$

$$\Rightarrow \quad BD^2 = 8^2 + 6^2 = 64 + 36 = 100 \ldots\ldots\ldots\ldots (i)$$

In ΔABD, $\angle BAD = 90°$

$$BD^2 = AB^2 + AD^2 \quad [\text{By Pythagoras Theorem}]$$

$\Rightarrow \quad BD^2 = AB^2 + AB^2 \quad [\ Given\ AB = AD\ ]$

$\Rightarrow \quad BD^2 = 2 * AB^2$

$\Rightarrow \quad 100 = 2 * AB^2 \qquad [\ using\ (i)\ ]$

$\Rightarrow \quad AB^2 = 50$

$\Rightarrow \quad AB = 5\sqrt{2}\ cm = AD \ldots\ldots\ldots\ldots (ii)$

$Now, \quad Area\ of\ \Delta ABD = \frac{1}{2}\ (AB)\ (AD)$

$= \frac{1}{2}\ \left(5\sqrt{2}\right)\ \left(5\sqrt{2}\right) \quad [\ using\ (ii)\ ]$

$= 25\ \ cm^2\ \ Ans.$

HOMEWORK

EXERCISE – 12

QUESTION NUMBERS : $3,\ 5,\ 7,\ 9,\ 12,\ 14\ (a),\ and\ 15\ (a)$