CHAPTER 06

Triangles

Pythagoras theorem:

Statement:

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

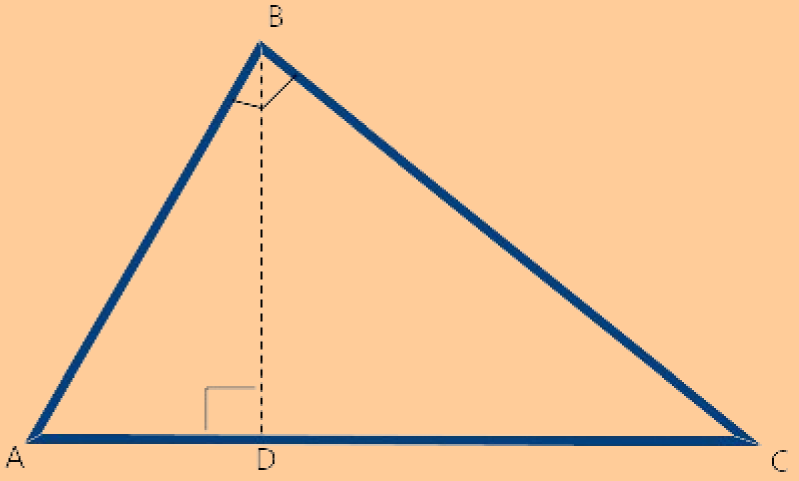
Given:

A right angled triangle ABC in which $\angle B = 90^\circ$.

To prove:

$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

i.e. $AC^2 = AB^2 + BC^2$



Construction:

From B, draw $BD \perp AC$

In triangles, ADB and ABC, we have

$\angle ADB = \angle ABC$ (Each equals 90°)

(And)

$\angle A = \angle A$ (Common)

$\therefore \Delta ADB \sim \Delta ABC$ (By AA similarity criterion)

$\Rightarrow \frac{AD}{AB} = \frac{AB}{AC}$

(In similar triangles, corresponding sides are proportion)

$\Rightarrow AB^2 = AD \times AC$ .... (1)

In triangles, BDC and ABC, we have

$\angle BDC = \angle ABC$ (Each equals 90°)

(And)

$\angle C = \angle C$ (Common)

$\therefore \Delta BDC \sim \Delta ABC$ (By AA similarity criterion)

$\Rightarrow \frac{DC}{BC} = \frac{BC}{AC}$

($\because$ In similar triangles, corresponding sides are proportion)

$\Rightarrow BC^2 = AC \times DC$ ..... (2)

Adding (1) and (2), we get

$AB^2 + BC^2 = (AD \times AC) + (AC \times DC)$

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

$\Rightarrow AB^2 + BC^2 = AC \times AC$

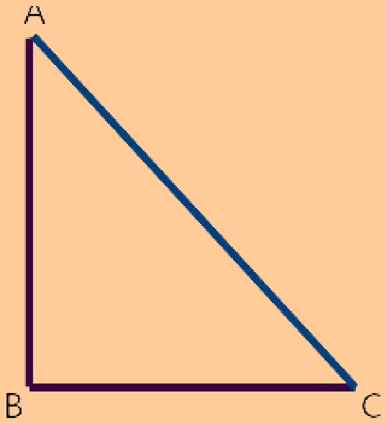
$\Rightarrow AB^2 + BC^2 = AC^2$

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

Converse of Pythagoras theorem:

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.

i.e. A triangle ABC such that $AC^2 = AB^2 + BC^2$


A
B
C