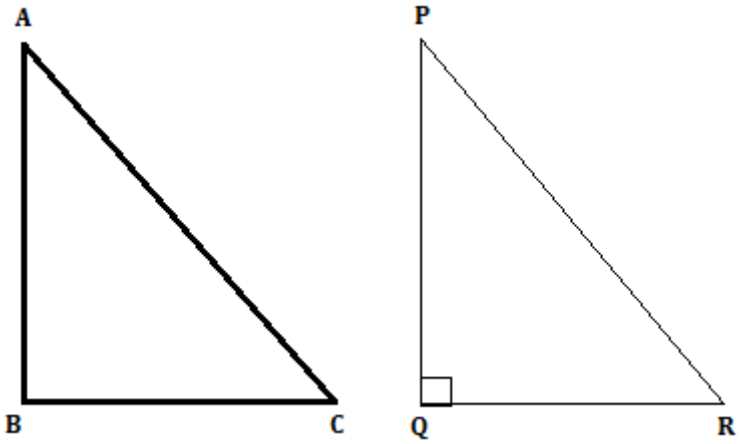
DAY 12

In last section, we have discussed about Pythagoras Theorem and its sums. In this section we shall discuss its converse and related sums.

(CONVERSE OF PYTHAGORAS THEOREM)

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



Given : - In ΔABC, $AB^2 + BC^2 = AC^2$ ……. i)

To prove: $\angle B = 90^0$

Construction :- Construct a right angled ΔPQF at angle Q in which $PQ = AB$ and $QR = BC$

Proof : In right angled ΔPQR, we've

$PR^2 = PQ^2 + QR^2$ (Pythagoras Theorem)

$= AB^2 + BC^2$ (By Construction)

$= AC^2$ (by i))

$\Rightarrow$ $PR = AC$

$\Rightarrow$ $\Delta ABC \cong \Delta PQR$ (SSS Congruence)

$\Rightarrow$ $\angle B = \angle Q = 90^0$ (By Construction)

Hence ΔABC is a right angled triangle.

Now we shall discuss some examples on it.

1. Check which of the following are the sides of a right angled triangle

i) 3cm , 4cm, 5cm **ii) 6cm, 7cm, 8cm** **iii) 20cm, 21cm, 29cm**

Sol :-

i) Here the largest side is 5 cm (Hypotenuse)

Now (largest side)$^2 = 5^2 =$ **25**

and Sum of squares of other two sides $= 3^2 + 4^2 = 9 + 16 =$ **25**

$\Rightarrow$ (largest side)^2 = Sum of squares of other two sides $= 25$

By converse of Pythagoras theorem, Given sides are of right angled triangle.

ii) Here the largest side is 8 cm (Hypotenuse)

Now (largest side)$^2 = 8^2 =$ **64**

and Sum of squares of other two sides $= 6^2 + 7^2 = 36 + 49 =$ **85**

$\Rightarrow$ (largest side)$^2 \neq$ Sum of squares of other two sides

Hence given sides are not of right triangle.

iii) Here the largest side is 29 cm (Hypotenuse)

Now (largest side)$^2 = 29^2 =$ **841**

and Sum of squares of other two sides $= 20^2 + 21^2 = 400 + 441 =$ **841**

$\Rightarrow$ (largest side)^2 = Sum of squares of other two sides = **841**

By converse of Pythagoras theorem, Given sides are of right angled triangle.

2. ABC is an isosceles triangle with AC=BC, If $AB^2 = 2AC^2$, prove that ABC is a right triangle. **[Ex 6.5, Q5]**

Sol:- Given $AB^2 = 2AC^2 = AC^2 + AC^2$

$= AC^2 + BC^2$ {As AC = BC}

$\Rightarrow$By converse of Pythagoras Theorem ΔABC is right angled at C.