ODM EDUCATIONAL GROUP
Changing your Tomorrow

TRIANGLES
PPT-10

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 06
CHAPTER NAME :TRIANGLES

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: **1800 120 2316**
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

. The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Ratio of areas of two similar triangles is equal to:

1.Ratio of the squares of their corresponding sides.

2. Ratio of the squares of their corresponding altitudes.

3. Ratio of the squares of their corresponding medians.

4. Ratio of the squares of their corresponding angle-bisector segments.

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LEARNING OUTCOME

1. Students will be able to know relation between hypotenuse and other two sides of a right angled triangle.

2.Students will be able to prove: In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

3.. Students will be able to solve problems based on Pythagoras theorem and apply in solving real life problems.

Theorem 6.7 : If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse then triangles on both sides of the perpendicular are similar to the whole triangle and to each other

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

https://youtu.be/IV3qw8t4I6I (10.05)

Theorem 6.7; f a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse then triangles on both sides of the perpendicular are similar to the whole triangle and to each other.

Given. A triangle ABC in which

$$\angle BAC = 90° \text{ and } AD \perp BC$$

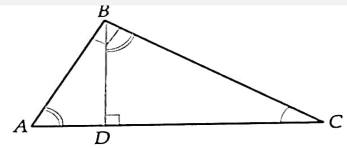

FIGURE 6.147

To Prove.

(*i*) $\Delta ADB \sim \Delta ABC$ (*ii*) $\Delta BDC \sim \Delta ABC$

(*iii*) $\Delta ADB \sim \Delta BDC$

Proof. (*i*) In ΔADB and ΔABC, we have

$\angle ADB = \angle ABC$ [Each $= 90°$]

$\angle A = \angle A$ [Common]

$\therefore$ $\Delta ADB \sim \Delta ABC$ [AA similarity]

(*ii*) In ΔBDC and ΔABC, we have

$\angle BDC = \angle ABC$ [Each $= 90°$]

$\angle C = \angle C$ [Common]

$\therefore$ $\Delta BDC \sim \Delta ABC$ [AA similarity]

(*iii*) In ΔABC, $\angle A + \angle ABC + \angle C = 180°$ ...(1)

In ΔADB, $\angle A + \angle ADB + \angle ABD = 180°$ ...(2)

From (1) and (2), we get

$$\angle A + \angle ABC + \angle C = \angle A + \angle ADB + \angle ABD$$

$\Rightarrow$ $\angle A + 90° + \angle C = \angle A + 90° + \angle ABD$ $\Rightarrow$ $\angle C = \angle ABD$

Now, in ΔADB and ΔBDC, we have

$\angle ABD = \angle C$ [Proved]

$\angle ADB = \angle BDC$ [Each $= 90°$]

$\therefore$ $\Delta ADB \sim \Delta BDC$ [AA similarity]

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Theorem 6.8 : In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides..

Given. A ΔABC is which $\angle ABC = 90°$.

To Prove. $AC^2 = AB^2 + BC^2$.

Construction. Draw $BD \perp AC$.

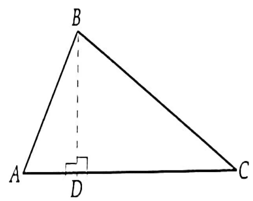

FIGURE 6.148

Proof. In ΔADB and ΔABC, we have

$\angle A = \angle A$ [Common]

$\angle ADB = \angle ABC$ [Each = 90°]

$\therefore$ $\Delta ADB \sim \Delta ABC$ [AA similarity]

$\Rightarrow$ $\frac{AD}{AB} = \frac{AB}{AC}$ [Corresponding sides are proportional]

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

Now, in ΔBDC and ΔABC, we have

$\angle C = \angle C$ [Common]

$\angle BDC = \angle ABC$ [Each = 90°]

$\therefore$ $\Delta BDC \sim \Delta ABC$ [AA similarity]

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

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

On adding (1) and (2), we get

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

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

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

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

REMARK Pythagoras Theorem was earlier stated by an ancient Indian Mathematician *Baudhayan* (about 800 B.C.) in the following form :

The diagonal of a rectangle produces by itself the same area as produced by its both sides (i.e., length and breadth).

For this reason, Pythagoras Theorem is also known as Baudhayan Theorem.

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1.Sides of triangles are given below. Determine which of them are right triangles. In case of a right triangle, write the length of its hypotenuse.

(i) 7 cm, 24 cm, 25 cm

(ii) 50 cm, 80 cm, 100 cm

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(*i*) 7 cm, 24 cm, 25 cm

$(7)^2 + (24)^2 = 49 + 576$

$= 625 = (25)^2 = 25$

$\therefore$ The given sides make a right angled triangle with hypotenuse 25 cm

) 50 cm, 80 cm, 100 cm

$(100)^2 = 10000$

$(80)^2 + (50)^2 = 6400 + 2500 = 8900$

The square of larger side is not equal to the sum of squares of other two sides.

$\therefore$ The given triangle is not a right angled.

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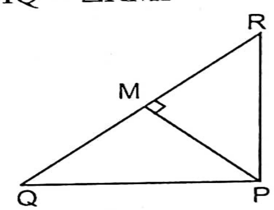
2. PQR is a triangle right angled at P and M is a point on QR such that PM ⊥ QR. Show that PM^2 = QM . MR. .

Sol. In right angled ΔQPR,

$$\angle P = 90°, \; PM \perp QR$$

$\therefore$ $\Delta PMQ \sim \Delta RMP$



[If ⊥ is drawn from the vertex of right angle to the hypotenuse then triangles on both sides of perpendicular are similar to each other, and to whole triangle]

$$\Rightarrow \quad \frac{PM}{RM} = \frac{MQ}{MP}$$

[Corresponding sides of similar triangles]

$$\Rightarrow \quad PM \times MP = RM \times MQ \quad \Rightarrow \quad PM^2 = QM.MR$$

3. ABC is an isosceles triangle right angled at C. Prove that $AB^2 = 2\ AC^2$.

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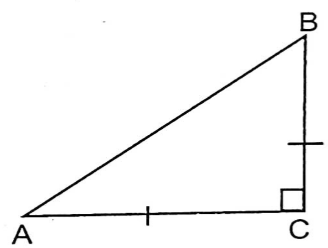
Sol. Given: In ΔABC, $\angle C = 90°$ and $AC = BC$



To Prove: $AB^2 = 2AC^2$

Proof: In ΔABC, $AB^2 = BC^2 + AC^2$

$AB^2 = AC^2 + AC^2$ [Pythagoras theorem]

$= 2AC^2$

4. ABC is an isosceles triangle with AC = BC. If AB^2 = 2 AC^2., prove that ABC is a right triangle.

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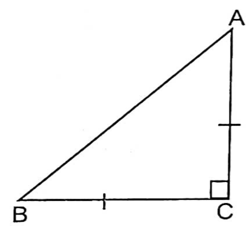
Sol. Given: In ΔABC, AC = BC and $AB^2 = 2\ AC^2$



To Prove: ACB is a right angled triangle

Proof: $AB^2 = 2AC^2$

$AB^2 = AC^2 + AC^2$

$AB^2 = AC^2 + BC^2$ [$\because$ AC = BC]

$\Rightarrow$ $\angle ACB = 90°$

[By converse of Pythagoras theorem]

$\therefore$ ΔABC is right angled triangle

HOME ASSIGNMENT Ex. 6.5 Q. No 1 to Q4

AHA

1. : O is any point inside a rectangle ABCD . Prove that $OB^2 + OD^2 = OA^2 + OC^2$

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THANKING YOU

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