ODM EDUCATIONAL GROUP
Changing your Tomorrow

TRIANGLES
PPT-12

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 06
CHAPTER NAME :TRIANGLES

CHANGING YOUR TOMORROW

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PREVIOUS KNOWLEDGE TEST

1 . 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

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

3.Converse of Pythagoras Theorem 6.9 : 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 the first side is a right angle.

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

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LEARNING OUTCOME

1.Students will be able to solve problems based on Pythagoras Theorem.

2. Students will be able to solve problems based on Converse Pythagoras Theorem.

1.In an equilateral triangle, prove that three times the square of one side is equal to four times the square of one of its altitudes.

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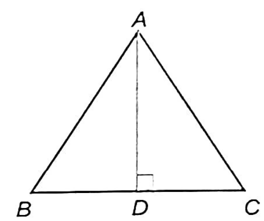
Solution. *Given.* A ΔABC in which $AB = BC = CA$ and $AD \perp BC$.

To Prove. $3AB^2 = 4AD^2$



Proof. In ΔADB and ΔADC, we have

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

$AB = AC$ [Given]

$AD = AD$ [Common]

$\therefore$ $\Delta ADB \cong \Delta ADC$ [RHS Congruency]

$\Rightarrow$ $BC = CD = \frac{1}{2} BC$

Now, in ΔADB, $\angle ADB = 90°$

$\therefore$ $AB^2 = AD^2 + BD^2$ [By Pythagoras Theorem]

$$= AD^2 + \left(\frac{1}{2} BC\right)^2 = AD^2 + \frac{1}{4} BC^2$$

$$= AD^2 + \frac{1}{4} AB^2 \quad [\because BC = AB]$$

$\Rightarrow$ $\frac{3}{4} AB^2 = AD^2$

Hence, $3AB^2 = 4AD^2$

2.Two poles of heights 6 m and 11 m stand on a plane ground. If the distance between the feet of the poles is 12 m, find the distance between their tops.

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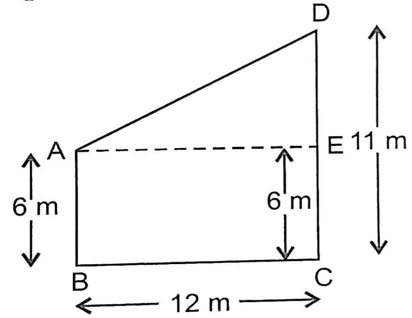
Length of poles is 6 m and 11 m.



$$DE = DC - EC = 11\text{ m} - 6\text{ m} = 5\text{ m}$$

In ΔDAE, $AD^2 = AE^2 + DE^2 \qquad [\because AE = BC]$

$$= (12)^2 + (5)^2 = 144 + 25 = 169$$

$$AD = \sqrt{169} = 13\text{ m}$$

3. An airplane leaves an airport and flies due north at a speed of 1000 km per hour. At the same time, another airplane leaves the same airport and flies due west at a speed of 1200 km per hour. How far apart will be the two planes after 3/2 hours?

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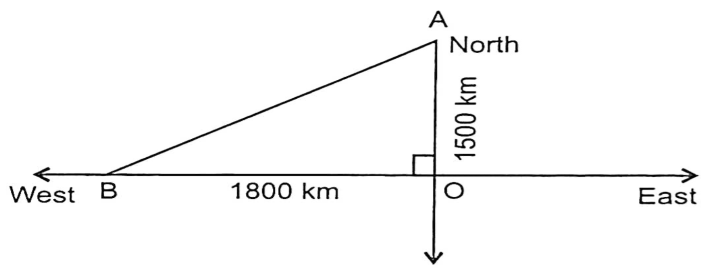
3. An airplane leaves an airport and flies due north at a speed of 1000 km per hour. At the same time, another airplane leaves the same airport and flies due west at a speed of 1200 km per hour. How far apart will be the two planes after 3/2 hours?

Sol. Distance = Speed × Time = $1000 \times \frac{3}{2} = 1500$ km



Distance travelled by the aeroplane due west in $1\frac{1}{2}$ hours

$$= 1200 \times \frac{3}{2} = 1800 \text{ km}$$

In ΔAOB, $AB^2 = AO^2 + OB^2 = (1500)^2 + (1800)^2$

$$= 2250000 + 3240000 = 5490000$$

$$AB = \sqrt{5490000} = \sqrt{9 \times 61 \times 100 \times 100}$$

$$= 300\sqrt{61} \text{ km}$$

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4. The perpendicular from A on side BC of a Δ ABC intersects BC at D such that DB = 3 CD . Prove that $2AB^2$ = 2 AC^2 + BC^2 .

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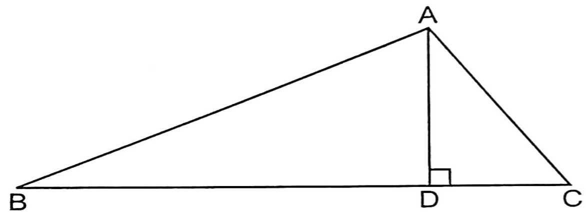


Sol. In ΔADB,

$$AB^2 = AD^2 + BD^2 = AD^2 + (BC - DC)^2$$

$$= AD^2 + BC^2 + DC^2 - 2BC.DC$$

$$= (AD^2 + DC^2) + BC^2 - 2BC.\ DC$$

$$= AC^2 + BC^2 - 2BC.\frac{1}{4}BC$$

$$AB^2 = AC^2 + BC^2 - \frac{1}{2}BC^2 \qquad \left\{\begin{array}{c} BD = 3CD \\ 4CD = BC \\ CD = \frac{1}{4}BC \end{array}\right\}$$

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

$$= 2AC^2 + BC^2$$

5. D and E are points on the sides CA and CB respectively of a triangle ABC right angled at C. Prove that AE^2 + BD^2 = AB^2 + DE^2.

5. D and E are points on the sides CA and CB respectively of a triangle ABC right angled at C. Prove that $AE^2 + BD^2 = AB^2 + DE^2$.

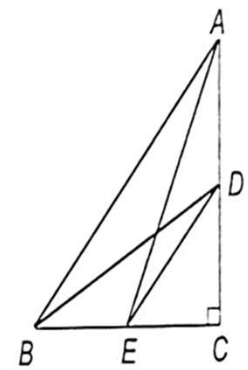
Solution. We apply Pythagoras Theorem to different right triangles.

In right ΔACE, $AE^2 = AC^2 + EC^2$ ...(i)

In right ΔDCB, $BD^2 = CD^2 + BC^2$ ...(ii)

In right ΔACB, $AB^2 = AC^2 + BC^2$ ...(iii)

In right ΔDCE, $DE^2 = CD^2 + EC^2$ ...(iv)



On adding (i) and (ii), we get

$$AE^2 + BD^2 = (AC^2 + EC^2) + (CD^2 + BC^2)$$

$$= (AC^2 + BC^2) + (CD^2 + EC^2)$$

Hence, $AE^2 + BD^2 = AB^2 + DE^2$ [Using (iii) and (iv)]

HOME ASSIGNMENT Ex. 6.5 Q. No 11 to Q17

AHA

1. Prove that the sum of the squares of the diagonals of parallelogram is equal to the sum of the squares of its sides

THANKING YOU

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