MATHS

NCERT - NCERT MATHS (GUJARATI ENGLISH)

SIMILAR TRIANGLES

Example

1. In $\triangle$ABC, DE ||BC and $\dfrac{AD}{DB} = \dfrac{3}{5}$.

AC = 5.6 Find AE.

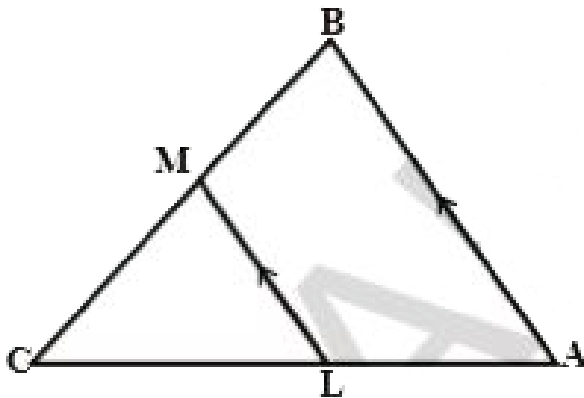▶ **Watch Video Solution**

2. In the given figure LM||AB M

AL = x - 3, AC = 2x, BM = x - 2

and BC = 2x + 3 find the value of x

3. The diagonals of a quadrilateral ABCD intersects each other at the point O such that $\dfrac{AO}{BO} = \dfrac{CO}{DO}$. Show that ABCD is a trapezium.
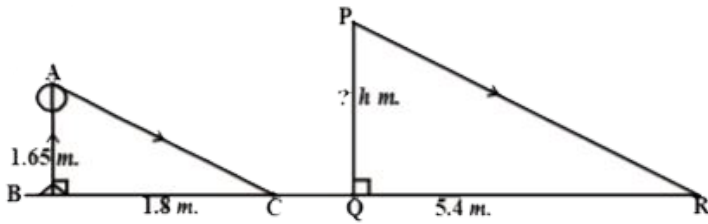
4. ABCD is a trapezium with $AB \mid\mid DC$. E and F are points on non-parallel sides AD and BC respectively such that EF is parallel to AB (see the figure). Show that $\dfrac{AE}{ED} = \dfrac{BF}{FC}$

▶ **Watch Video Solution**

5. A person 1.65m tall casts 1.8m shadow. At the same instance, a lamp post casts a shadow of 5.4 m. Find the height of the

lamppost.

6. A man sees the top of a tower in a mirror which is at a distance of 87.6m from the tower. The mirror is on the ground facing upwards. The man is 0.4m away from the mirror and his height is 1.5m. How tall is the tower?

7. Gopal is worrying that his neighbour can peep into his living room from the top floor of his house. He has decided raise the

height of the fence that is high enough to block the view from his neighbour's top floor window. What should be the height of the fence? The measurements are given in the figure.

▶ View Text Solution

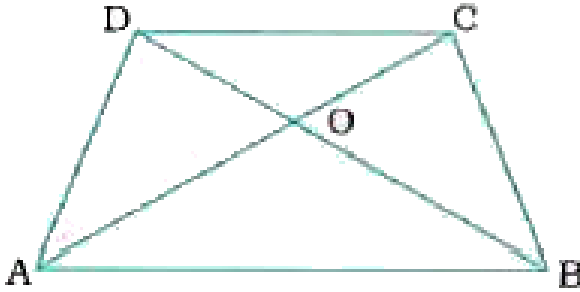**8.** If the areas of two similar triangles are equal, prove that they are congruent.

▶ Watch Video Solution

9. $\triangle ABC \sim \triangle DEF$ and their areas are respectively 64 cm^2 and 121 cm^2. If EF = 15.4 cm., then find BC.

▶ Watch Video Solution

10. Digonals of a trapezium ABCD with $AB||DC$ intersect each other at the point O. If AB= 2 CD, find the ratio of the areas of triangles AOB and COD.
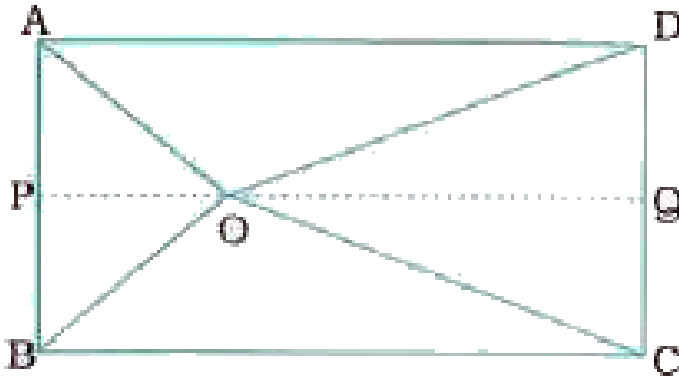
11. A ladder 25m long reaches a window of building 20m above the ground. Determine the distance from the foot of the ladder to the building.

12. BL and CM are medians of a DeltaABC right angled at A. Prove that $4(BL^2 + CM^2) = 5BC^2$.

13. O is any point inside a rectangle ABCD (see the given figure). Prove that $OB^2 + OD^2 = OA^2 + OC^2$.

14. The hypotenuse of a right triangle is 6m more than twice of the shortest side. If the third side is 2 m., less than the

hypotenuse, find the sides of the triangle

[▶] **Watch Video Solution**

15. ABC is a right triangle right angled at C. Let BC = a, CA = b, AB = c and let p be the length of perpendicular from C on AB. Prove that (i) pc = ab (ii) $\dfrac{1}{p^2} = \dfrac{1}{a^2} + \dfrac{1}{b^2}$.

[▶] **Watch Video Solution**

Do This Fill In The Blanks

1. All squares are ....

[▶] **Watch Video Solution**

2. All equilateral triangles are ....

3. All isosceles triangles are ....

4. Two polygons with same number of sides are .... if their corresponding angles are equal and corresponding sides are equal.

5. Reduced and Enlarged photographs of an object are ....

6. Rhombus and squares are …………………… to each other.

Do This True False

1. Any two similar figures are congruent.

2. Any two similar figures are congruent.

3. Two polygons are similar if their corresponding angles are equal.

4. Give two different examples of pair of

Similar figures

5. Give two different examples of pair of

Non Similar figures

Do This

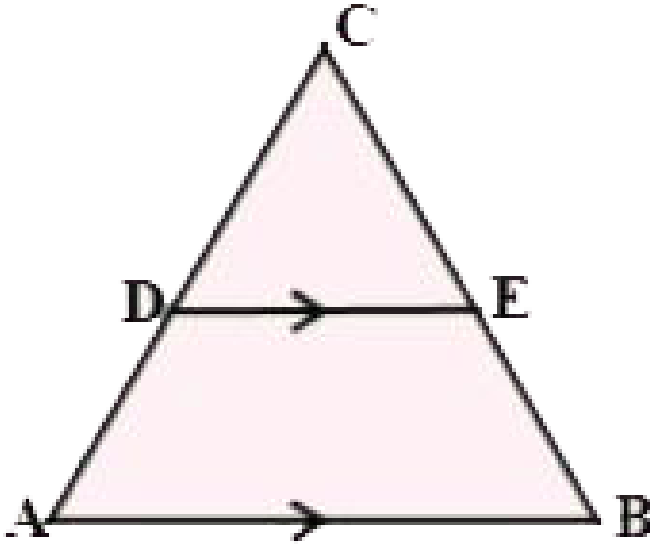**1.** What value(s) of x will make DE || AB, in the given figure ?

AD = 8x + 9 , CD= x + 3 ,

BE = 3x + 4 , CE = x.

2. In △ABC, DE ||BC . AD = x , DB = x - 2 ,

AE = x + 2 and EC = x -1 .

Find the value of x.
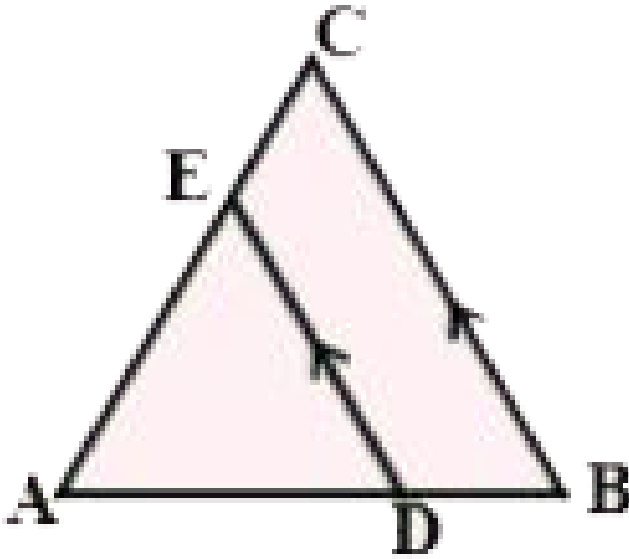
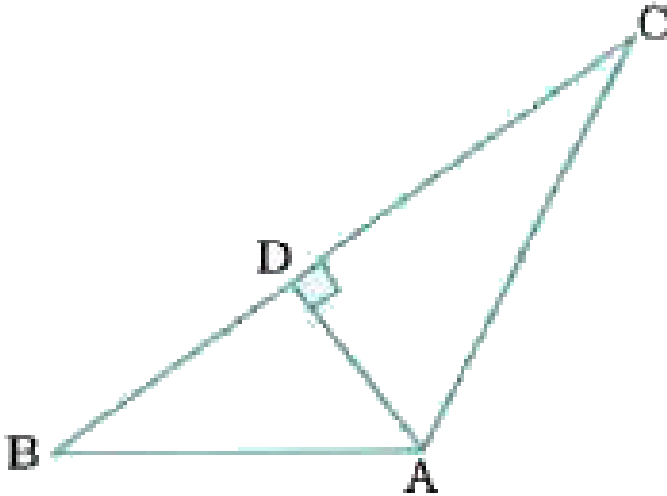**3.** In $\triangle ACB$, $\angle C = 90°$ and CD $\perp$ AB

Prove that $\dfrac{BC^2}{AC^2} = \dfrac{BD}{AD}$.
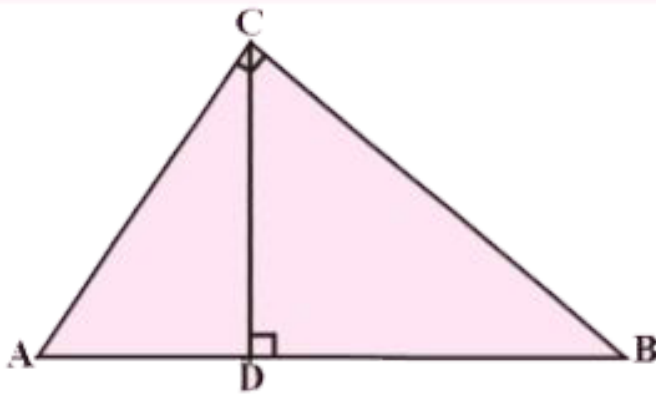
4. A ladder 15m long reaches a window which is 9 m above the ground on one side of a street. Keeping its foot at the same point, the ladder is turned to other side of the street to reach a window 12m high. Find the width of the street.

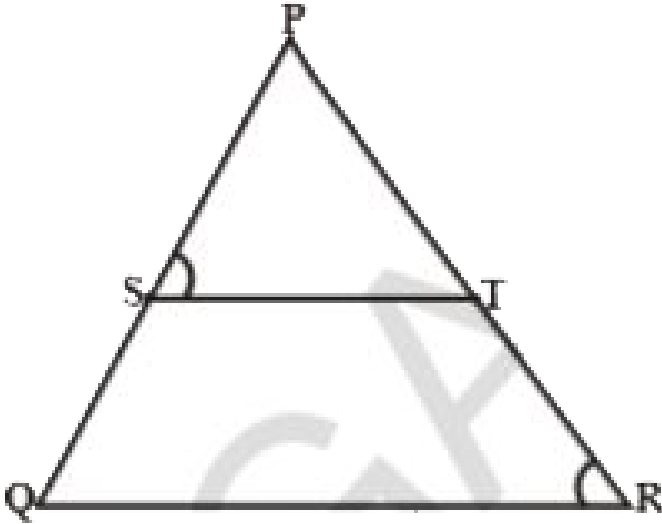**5.** In the given figure, if $AD \perp BC$, prove that $AB^2 + CD^2 = BD^2 + AC^2$

> ▶ **Watch Video Solution**

Exercise 8 1

1. In $\triangle$PQR, ST is a line such that $\dfrac{PS}{SQ} = \dfrac{PT}{TR}$ and also $\angle PST = \triangle PEO$.

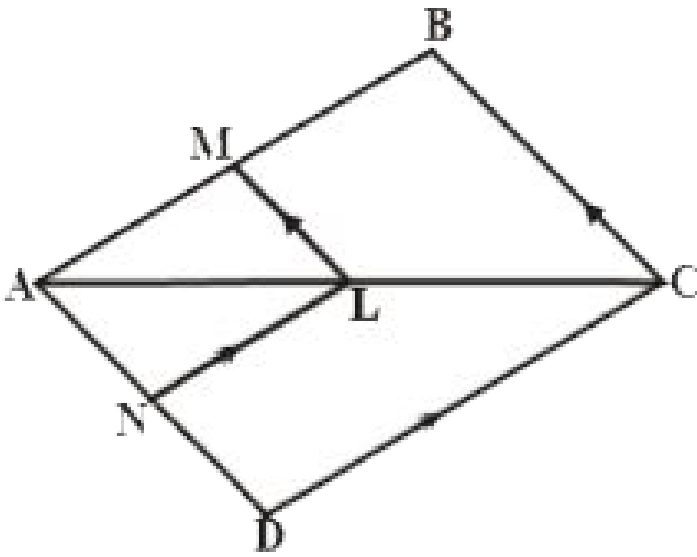Prove that $\triangle PQR$ is an isosceles triangle .

2. In the given figure, LM || CB and LN || CD Prove that $\dfrac{AM}{AB} = \dfrac{AN}{AD}$

3. In the given figure, DE || AC and DF || AE Prove that $\dfrac{BF}{FE} = \dfrac{BE}{EC}$

.
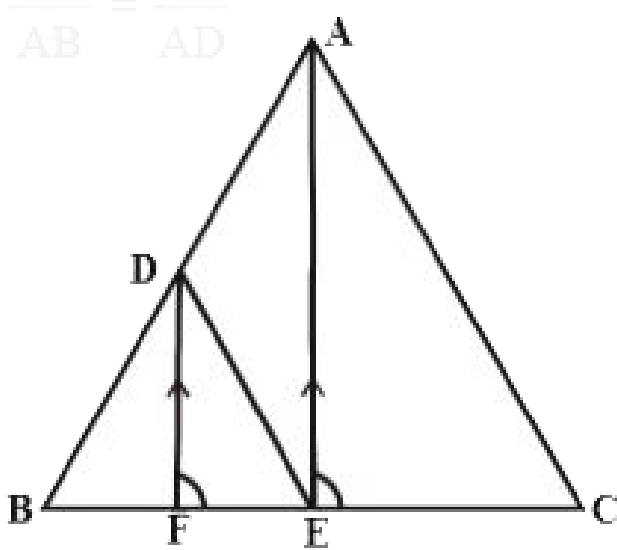
> ▶ Watch Video Solution

4. Prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side (Using basic proportionality theorem).

> ▶ Watch Video Solution

5. Prove that a line joining the midpoints of any two sides of a triangle is parallel to the third side. (Using converse of basic proportionality theorem)
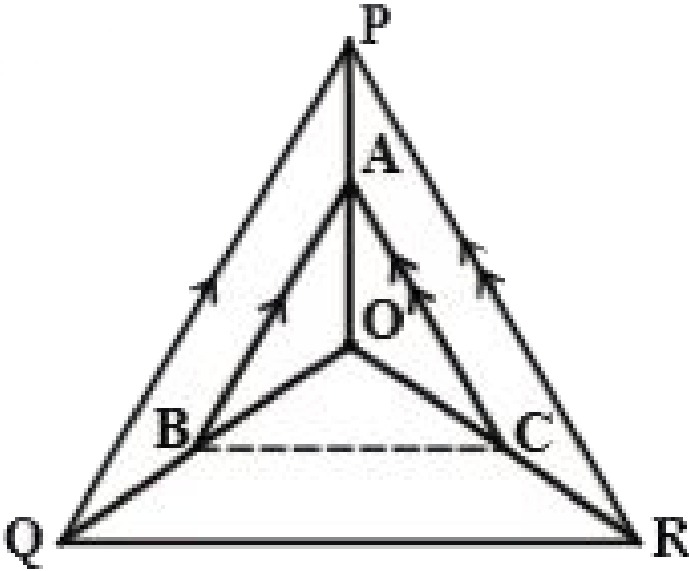
6. In the given figure, DE || OQ and DF || OR. Show that EF || QR.
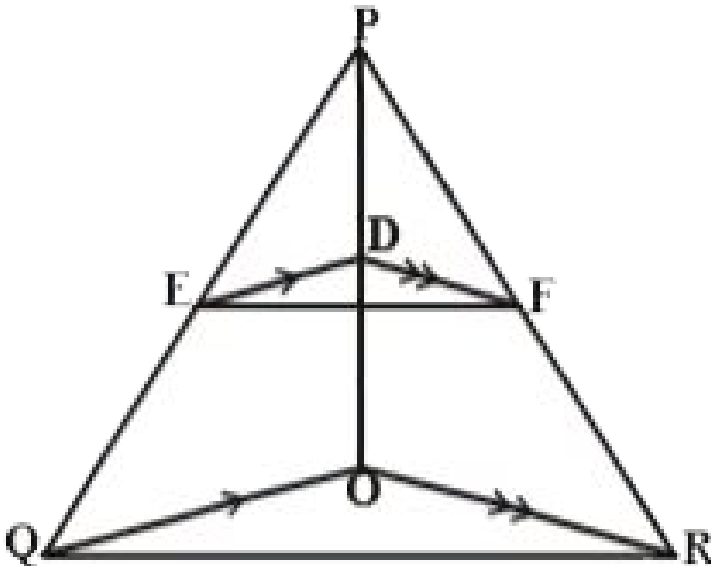
7. In the adjacent figure, A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC||PR. Show that BC || QR.

8. ABCD is a trapezium in which $AB \mid \mid DC$ and its diagonals intersects each other at the point O. Show that $\dfrac{AO}{BO} = \dfrac{CO}{DO}$.

9. Draw a line segment of length 7.2 cm and divide it in the ratio 5 : 3. Measure the two parts.
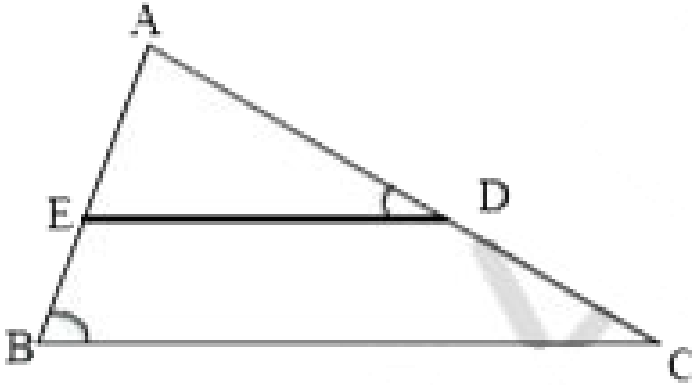
Exercise 8 2

1. In the given figure, $\angle ADE = \angle B$

(i) Show that $\triangle ABC \sim \triangle ADE$

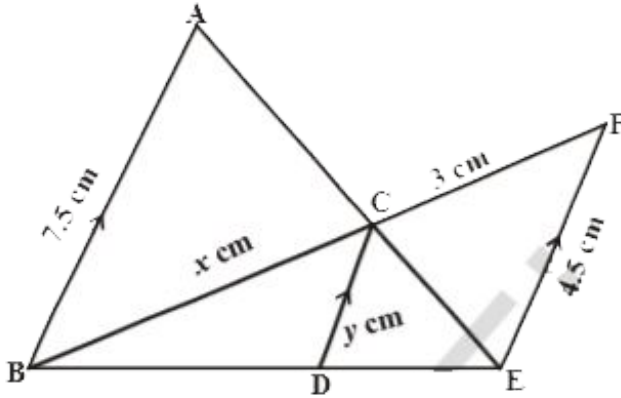(ii) If AD = 3.8 cm, AE = 3.6cm, BE = 2.1 cm and BC = 4.2 cm, find DE.

2. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 12 cm, determine the corresponding side of the second triangle.

3. In the given figure, AB || CD || EF. given that AB=7.5 cm, DC= y cm EF = 4.5 cm and BC = x cm, find the values of x and y.

4. A girl of height 90 cm is walking away from the base of a lamp post at a speed of 1.2 m/sec. If the lamp post is 3.6m above the ground, find the length of her shadow after 4 seconds.
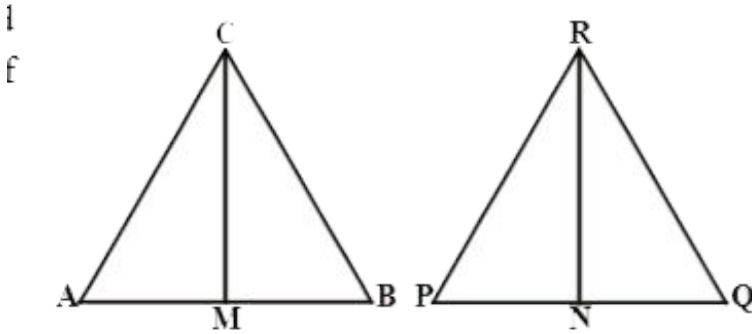
5. Given that $\triangle ABC \sim \triangle PQR$, CM and RN are respectively the medians of $\triangle ABC$ and $\triangle PQR$. Prove that

(i) $\triangle AMC \sim \triangle PNR$

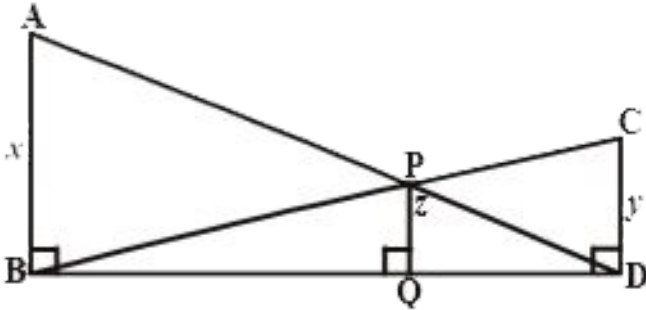(ii) $\dfrac{CM}{RN} = \dfrac{AB}{PQ}$

(iii) $\triangle CMB \sim \triangle RNQ$

6. Diagonals AC and BD of a trapezium ABCD with AB ∥ DC intersect each other at the point 'O'. Using the criterion of similarity for two triangles, show that $\dfrac{OA}{OC} = \dfrac{OB}{OD}$.

7. AB, CD, PQ are perpendicular to BD. If AB = x, CD = y and PQ = z

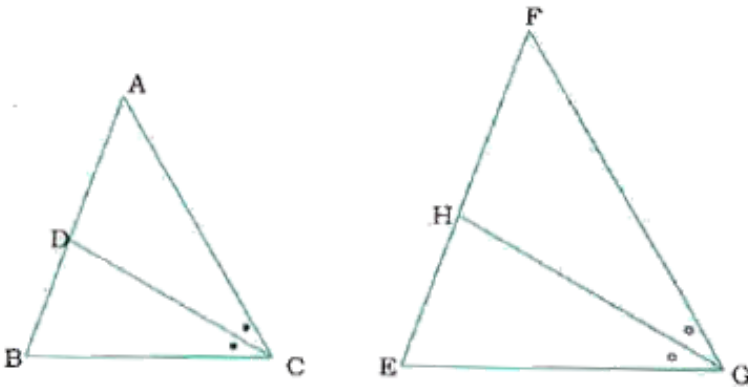prove that $\dfrac{1}{x} + \dfrac{1}{y} = \dfrac{1}{z}$

> ▶ Watch Video Solution

8. A flag pole 4m tall casts a 6 m shadow. At the same time, a nearby building casts a shadow of 24m. How tall is the building ?

> ▶ Watch Video Solution

9. CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie on sides AB and FE of $\triangle ABC$ and $\triangle EFG$ respectively. If $\triangle ABC \sim \triangle FEG$, show that :

$$\frac{CD}{GH} = \frac{AC}{FG}$$

▶ Watch Video Solution

10. AX and DY are altitudes of two similar triangles $\triangle ABC$ and $\triangle DEF$. Prove that AX : DY = AB : DE.

▶ Watch Video Solution

11. Construct a triangle similar to the given $\triangle ABC$, with its sides equal to $\dfrac{5}{3}$ of the corresponding sides of the triangle ABC.

▶ **Watch Video Solution**

12. Construct a triangle of sides 4 cm, 5 cm and 6 cm and then a triangle similar to it whose sides are $\dfrac{2}{3}$ of the corresponding sides of the first triangle.

▶ **Watch Video Solution**

13. Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then another triangle whose sides are $1\dfrac{1}{2}$ thimes the corresponding sides of the isosceles triangle.
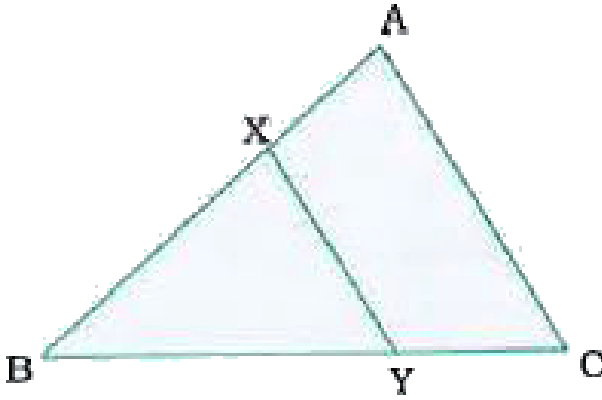
▶ Watch Video Solution

Exercise 8 3

1. D, E, F are mid points of sides BC, CA, AB of $\triangle ABC$. Find the ratio of areas of $\triangle DEF$ and $\triangle ABC$.

▶ Watch Video Solution

2. In the given figure, the line segment XY is parallel to side AC of $\triangle ABC$ and it divides the Deltainto two parts of equal areas. Find

the ratio $\dfrac{AX}{AB}$.

3. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding medians.

4. $\triangle ABC \sim \triangle DEF$. BC = 3cm, EF = 4cm and area of $\triangle ABC = 54cm^2$. Determine the area of $\triangle DEF$.

5. ABC is a triangle and PQ is a straight line meeting AB in P and AC in Q. If AP = 1 cm, BP = 3cm, AQ = 1.5 cm and CQ = 4.5 cm, prove that area of $\triangle APQ = \dfrac{1}{16}$ (area of $\triangle ABC$).

6. The areas of two similar triangles are $81 cm^2$ and $49 cm^2$ respectively. If the altitude of the bigger triangle is 4.5 cm. Find the corresponding altitude of the smaller triangle.
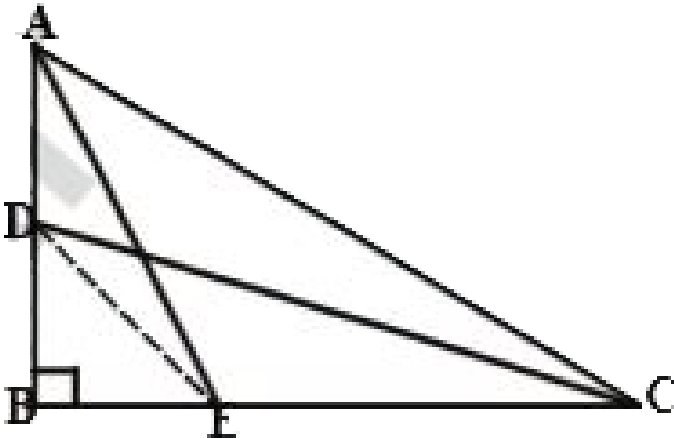
Exercise 8 4

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

2. ABC is a right triangle right angled at B. Let D and E be any points on AB and BC respectively. Prove that $AE^2 + CD^2 = AC^2 + DE^2$.
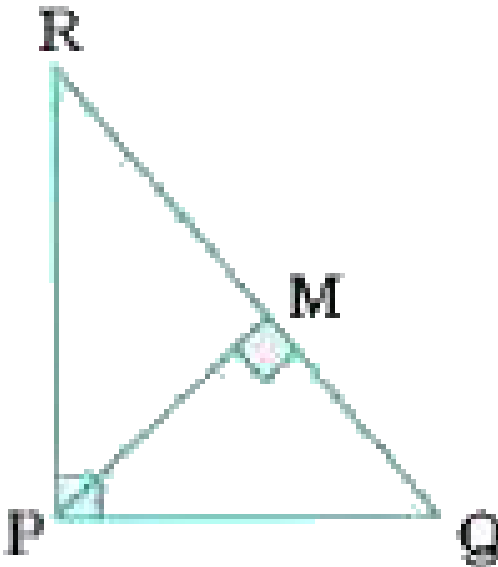
3. Prove that three times the square of any side of an equilateral triangle is equal to four times the square of the altitude.

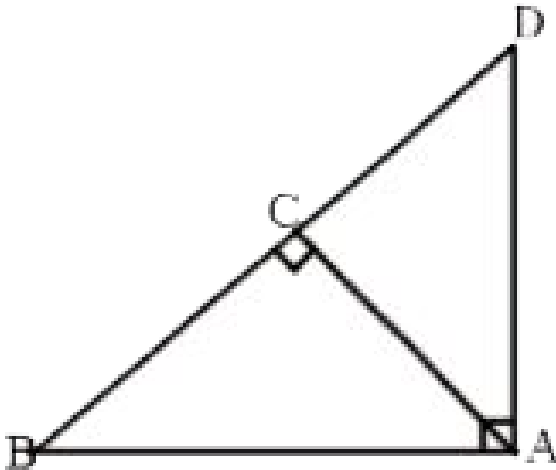**4.** PQR is a Deltaright angled at P and M is a point on QR such that $PM \perp QR.$ Show that $PM^2 = QM \cdot MR.$

5. ABD is a triangle right angled at A and AC $\perp$ BD Show that

(i) AB^2 = BC .BD.

(ii) AC^2 = BC.DC

(iii) AD^2 = BD .CD.

> ▶ Watch Video Solution

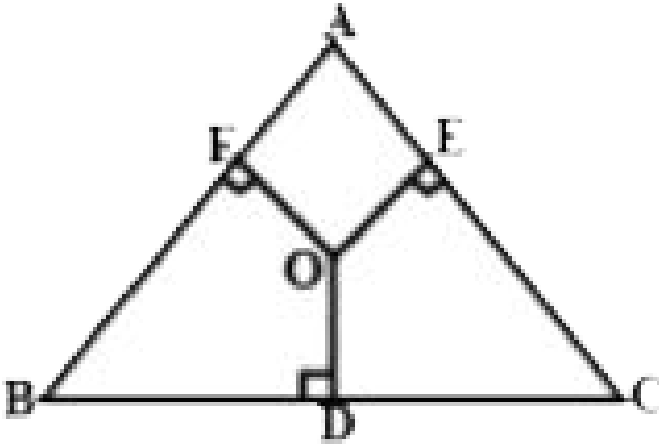**6.** ABC is an isosceles triangle right angled at C. Prove that $AB^2 = 2AC^2$.

> ▶ Watch Video Solution

7. 'O' is any point in the interior of a triangle ABC. If $OD \perp BC, OE \perp$ AC and OF $\perp$ AB, show that

(i)
$$OA^2 + OB^2 + OC^2 - OD^2 - OE^2 - OF^2 = AF^2 + BD^2 + CE^2$$

(ii) $AF^2 + BD^2 + CE^2 = AE^2 + CD^2 + BE^2$.

8. A wire attached to a vertical pole of height 18m is 24m long and has a stake attached to the other end. How far from the base of the pole should the stake be driven so that the wire will be taut?

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

10. In an equilateral triangle ABC, D is a point on side BC such that $BD = \dfrac{1}{3}BC.$ Prove that $9AD^2 = 7AB^2.$

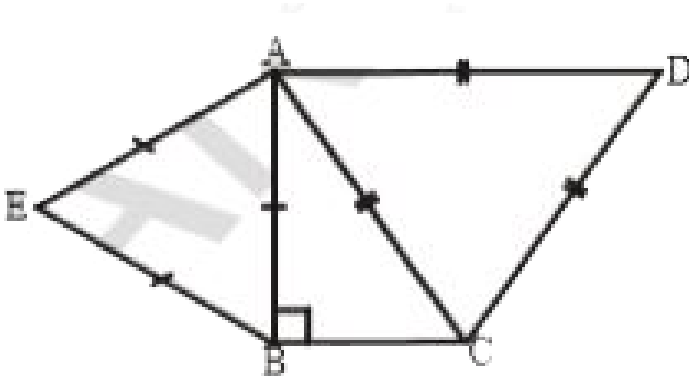**11.** In the given figure, ABC is a triangle right angled at B. D and E are ponts on BC trisect it.

Prove that $8AE^2 = 3AC^2 + 5AD^2$.
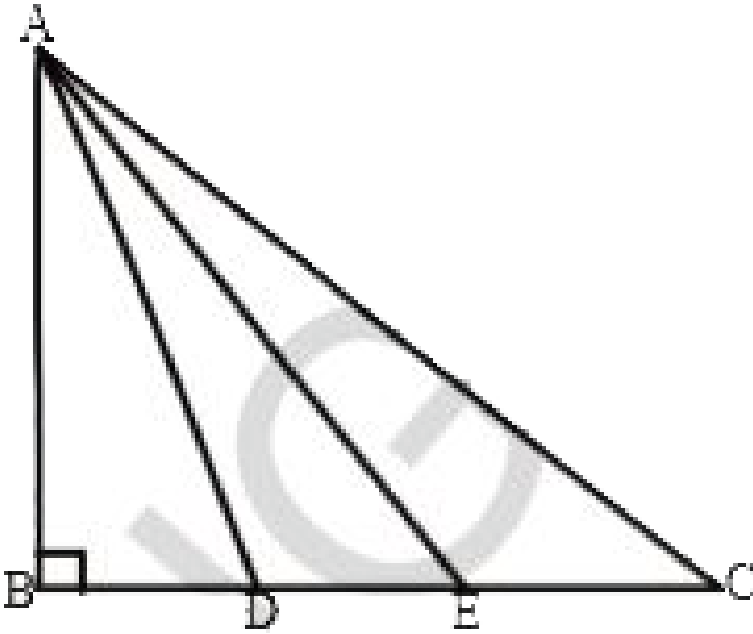
12. ABC is an isosceles triangle right angled at B. Similar triangles ACD and ABE are constructed on sides AC and AB. Find the ratio

between the areas of $\triangle ABE$ and $\triangle ACD$

13. Equilateral triangles are drawn on the three sides of a right angled triangle. Show that the area of the triangle on the hypotenuse is equal to the sum of the areas of triangles on the other two sides.

14. Prove that the area of the equilateral triangle described on the side of a square is half the area of the equilateral triangles described on its diagonal.
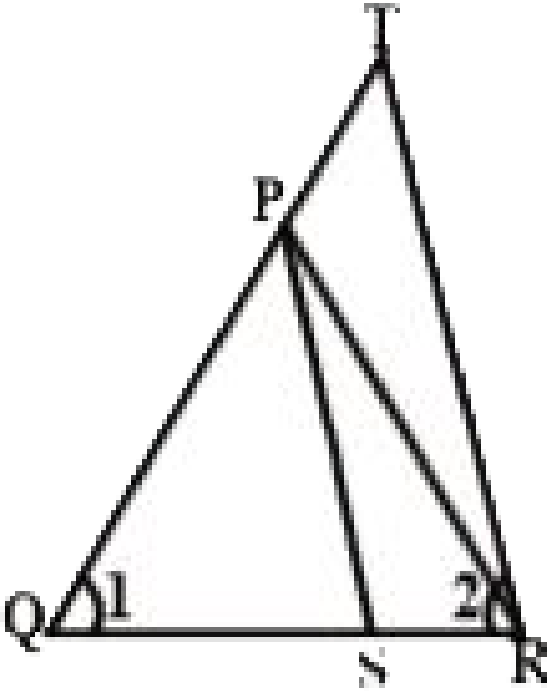
▶ Watch Video Solution

Optional Exercise

1. In the given figure,

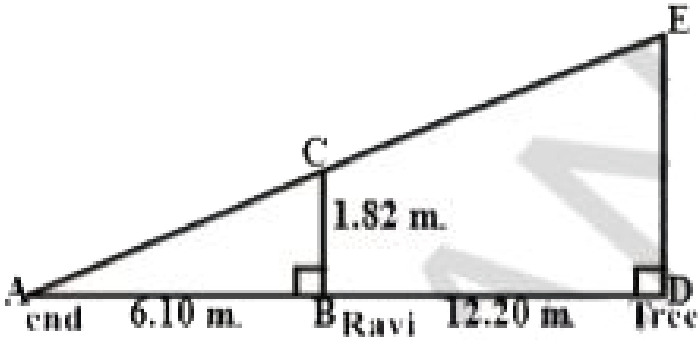$$\frac{QT}{PR} = \frac{QR}{QS} \text{ and } \angle 1 = \angle 2$$

Prove that $\triangle PQS \sim \triangle TQR$.

2. Ravi is 1.82m tall. He wants to find the height of a tree in his backyard. From the tree's base he walked 12.20 m. along the tree's shadow to a position where the end of his shadow exactly overlaps the end of the tree's shadow. He is now 6.10m from the

end of the shadow. How tall is the tree ?

3. The diagonal AC of a parallelogram ABCD intersects DP at the point Q, where 'P' is any point on side AB. Prove that $CQ \times PQ = QA \times QD$.

4. $\triangle ABC$ and $\triangle AMP$ are two right triangles right angled at B and M respectively.

Prove that (i) $\triangle ABC \sim \triangle AMP$ and (ii) $\dfrac{CA}{PA} = \dfrac{BC}{MP}$.
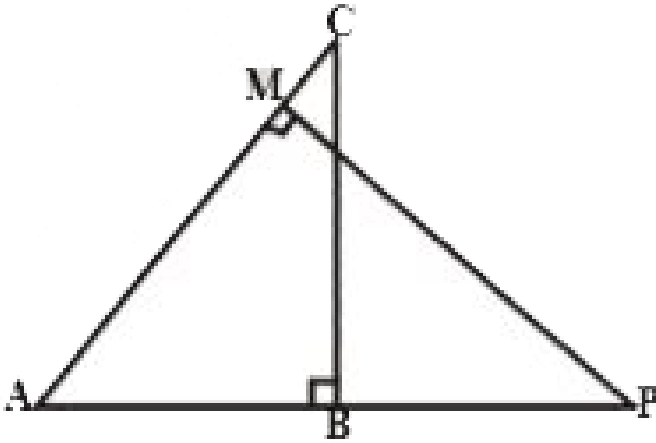
5. An aeroplane leaves an airport and flies due north at a speed of 1000 kmph. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 kmph. How far apart will the two planes be after $1\dfrac{1}{2}$ hour ?

6. In a right triangle ABC right angled at C, P and Q are points on sides AC and CB respectively which divide these sides in the ratio of 2 : 1.

Prove that (i) $9AQ^2 = 9AC^2 + 4BC^2$

(ii) $9BP^2 = 9BC^2 + 4AC^2$

(iii) $9(AQ^2 + BP^2) = 13AB^2$

▶ **Watch Video Solution**

Try This

1. In triangle $\triangle PQR$, E and F are points on the sides PQ and PR respectively. State whether EF ||QR or not?

(i) PE = 3.9 cm EQ = 3 cm PF = 3.6 cm and FR = 2.4 cm

▶ **Watch Video Solution**

2. In triangle ΔPQR, E and F are points on the sides PQ and PR respectively. State whether EF ||QR or not?

(ii) PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm.

3. In triangle ΔPQR, E and F are points on the sides PQ and PR respectively. State whether EF ||QR or not?

(iii) PQ = 1.28 cm PR = 2.56 cm PE = 1.8 cm and PF = 3.6 cm

4. In the following figures DE || BC.

(i) Find EC (ii) Find AD

(i) Find EC
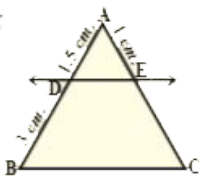
(ii) Find AD

5. Are triangles formed in each figure similar? If so, name the criterion of similarity. Write the similarity relation in symbolic form.
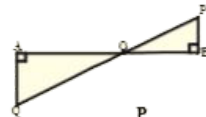
the similarity relation in symbolic form.
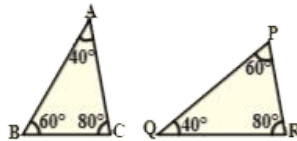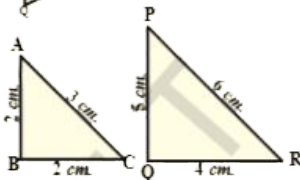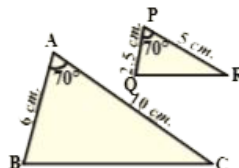
(i)
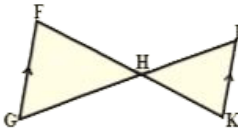
(ii)

(iii)

(iv)

(v)

(vi)

(vii)
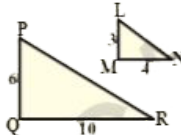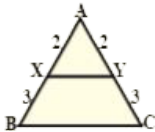
(viii)

If pairs of the triangles are similar and then find the value of x

6. If pairs of the triangles are similar and then find the value of x.