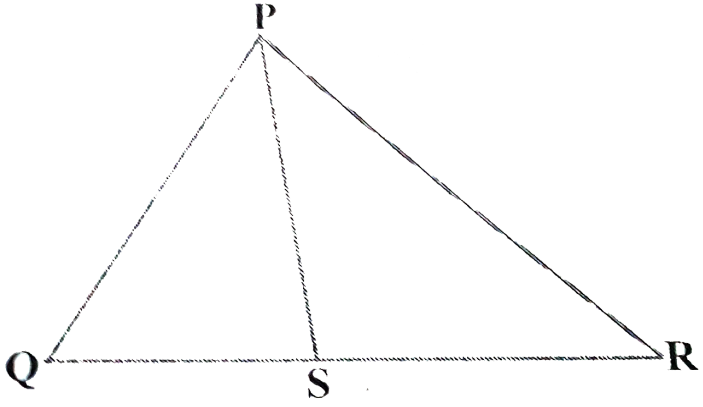
MATHS

NCERT - NCERT MATHEMATICS(ENGLISH)

TRIANGLES

Exercise 6 6

1. In figure PS is the bisector of $\angle QPR$of ΔPQR. Prove that $\frac{QS}{SR} = \frac{PQ}{PR}$.



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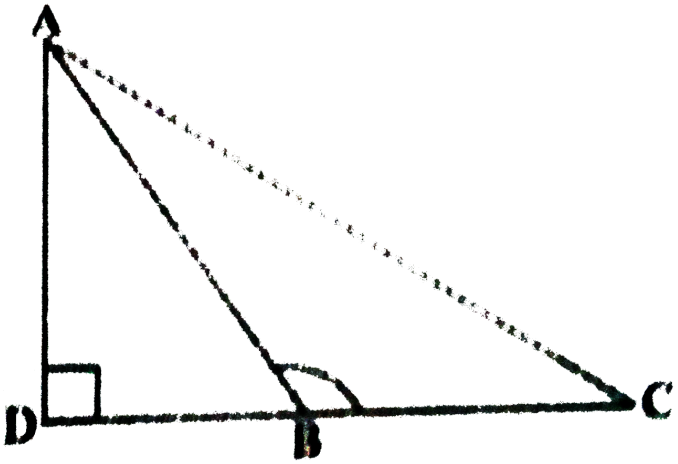
2. In figure, ABC is triangle in which $\angle ABC > 90^\circ$ and $AD \perp CB$produced. Prove that $AC^2 = AB^2 + BC^2 + 2BC.\ BD.$



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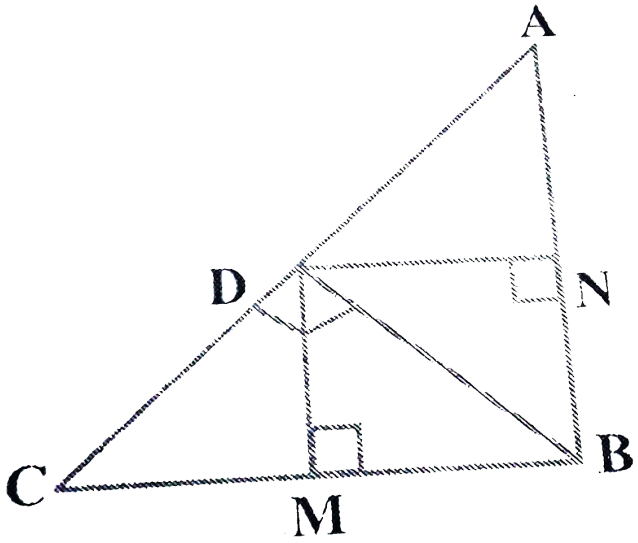
3. In fig., D is a point on hypotenuse AC of ΔABC, $DM \perp BC$ and $DN \perp AB$. Prove that

(i) $DM^2 = DN \cdot MC$

(ii) $DN^2 = DM \cdot AN$



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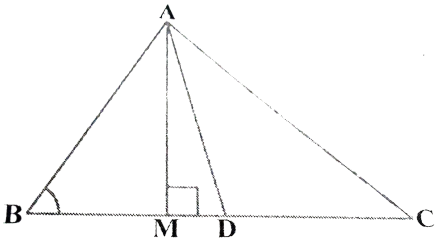
4. In figure, AD is a median of a triangle ABC and $AM \perp BC$.

Prove that:

(i) $AC^2 = AD^2 + BC.DM + \left(\frac{BC}{2}\right)^2$

(ii) $AB^2 = AD^2 - BC\dot{D}M + \left(\frac{BC}{2}\right)^2$

(iii) $AC^2 + AB^2 = 2AD^2 + \frac{1}{2}BC^2$



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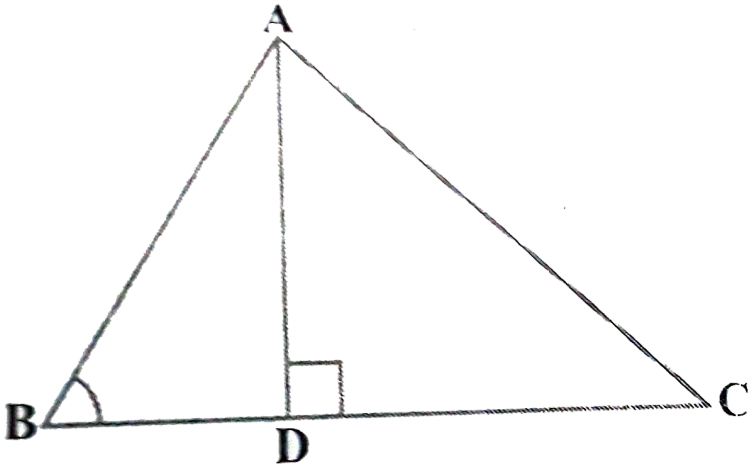
5. In figure, ABC is a triangle in which $\angle ABC = 90^\circ$ and $AD \perp BC$. Prove that $AC^2 = AB^2 + BC^2 - 2BC.\,BD.$



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

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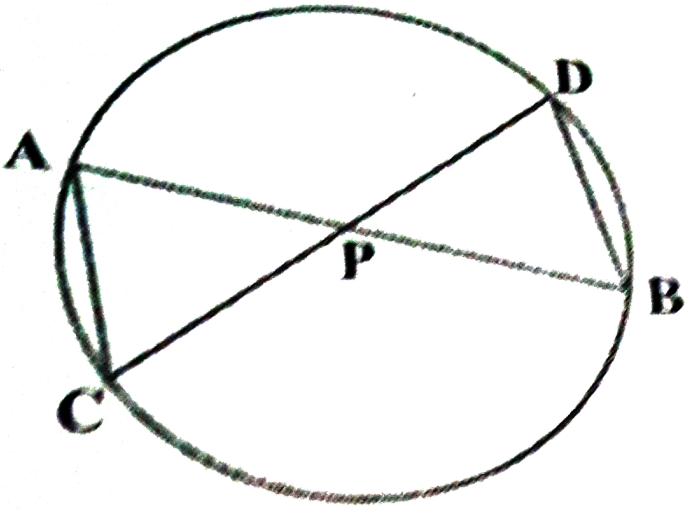
7. In Figure, two chords AB and CD intersect each other at the point P. Prove that:

(i) $\Delta APC \sim \Delta DPB$

(ii) $AP \cdot PB = CP \cdot DP$



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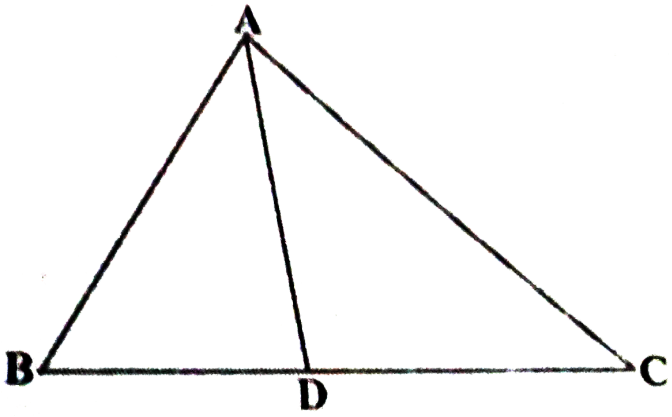
8. In figure D is a point on side BC of a ΔABCsuch that $\frac{BD}{CD} = \frac{AB}{AC}$. Prove that AD is the bisector of $\angle BAC$.



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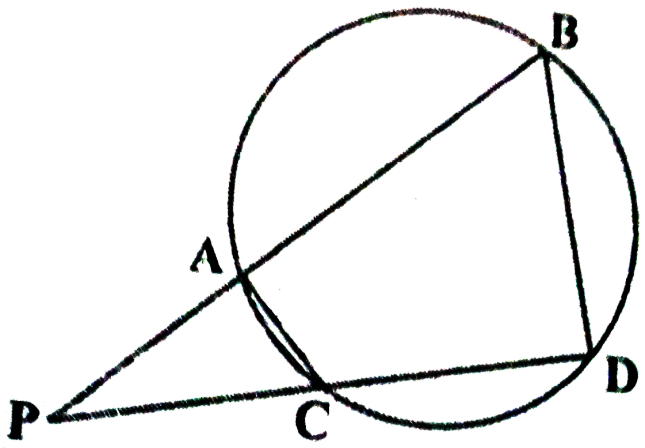
9. In Figure two chords AB and CD of a circle intersect each other at the point P (when produced) outside the circle. Prove that

(i) $\Delta PAC \sim \Delta PDB$

(ii) $PA \cdot PB = PC \cdot PD$



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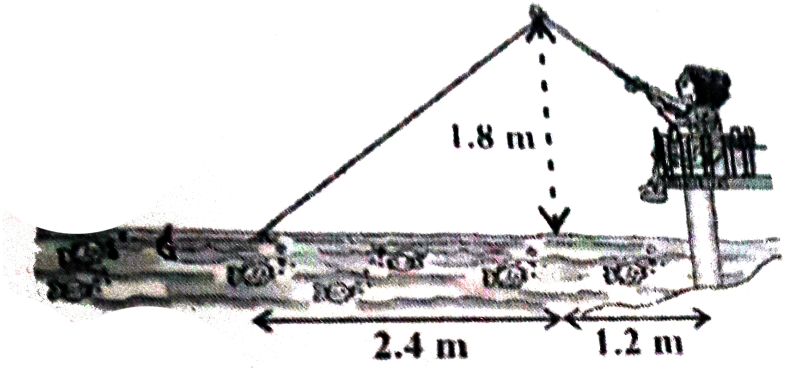
10. Nazima is fly fishing in a stream. The tip of her fishing rod is 1.8 m above the surface of the water and the fly at the end of the string rests on the water 3.6 m away and 2.4 m from a point directly under the tip of the rod. Assuming that her string (from the tip of her rod to the fly) is taut, how much string does she have out? If she pulls in the string at the rate of 5 cm per second,

what will be the horizontal distance of the fly from her after 12 seconds?



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Exercise 6 5

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

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

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3. Tick the correct answer and justify: In ΔABC.AB = $6\sqrt{3}$cm. AC = 12 cm and BC = 6 cm. The angle B is:

(A) 120 (B) 60 (C) 90 (D) 45

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

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5. A guy attached wire to a vertical pole of height 18m is 24 m 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?

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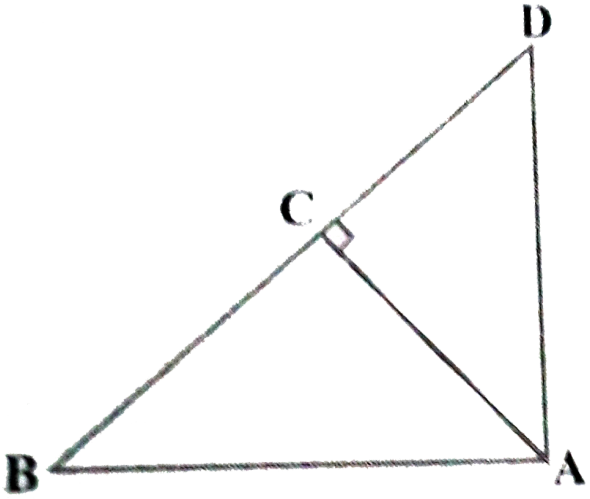
6. In Figure, ABD is a triangle right-angled at A and $AC \perp BD$. Show that

(i)$AB^2 = BC.\,BD$

(ii) $AC^2 = BC.\,DC$

(iii) $AD^2 = BD.CD$



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

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8. ABC is an isosceles right triangle, right-angled at C . Prove that: $AB^2 = 2AC^2$.

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9. Two poles of heights 6 m and 11m 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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10. A ladder 10m long reaches a window 8 m above the ground. Find the distance of the foot of the ladder from base of the wall.

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

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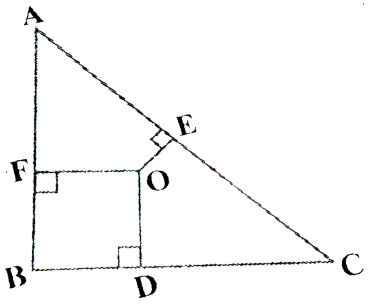
12. In figure, O is a point in the interior of a triangle ABC, $OD \perp BC, OE \perp AC$and $OF \perp AB$. Show that

(i)

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

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



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13. 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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14. An aeroplane leaves an airport and flies due north at a speed of 1000 km per hour. At the same tune, another aeroplane 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 $1\frac{1}{2}$ hours ?

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15. 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) 3 cm, 8 cm, 6 cm

(iii) 50 cm, 80 cm, 100 cm

(iv) 13 cm, 12 cm, 5 cm

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16. ABC is an equilateral triangle of side 2a. Find each of its altitudes.

A. $a\sqrt{3}$

B. $a\sqrt{2}$

C. $2a\sqrt{3}$

D. None

Answer: A

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

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Exercise 6 3

1. E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$.

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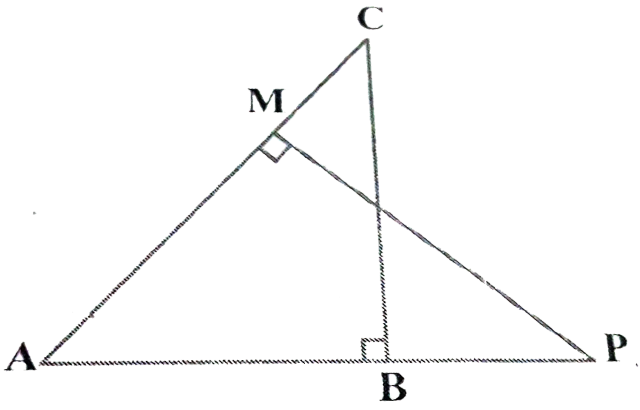
2. In figure ABC and AMP are two right triangles, right angles at B and M respectively. Prove that(i) $\Delta ABC \sim \Delta AMP$ (ii)

$$\frac{CA}{PA} = \frac{BC}{MP}$$



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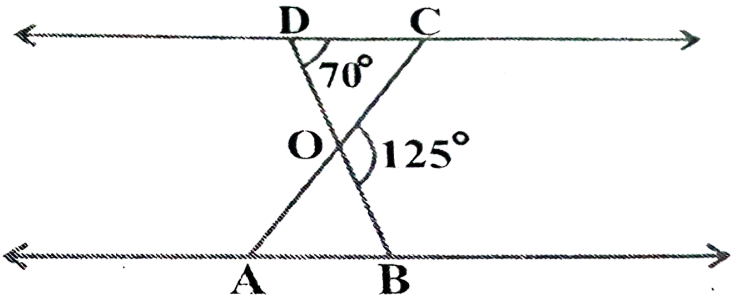
3. In figure, $\Delta ODC \sim \Delta OBA$, $\angle BOC = 125^o$ and $\angle CDO = 70^o$. Find $\angle DOC$, $\angle DCO$ and $\angle OAB$.



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

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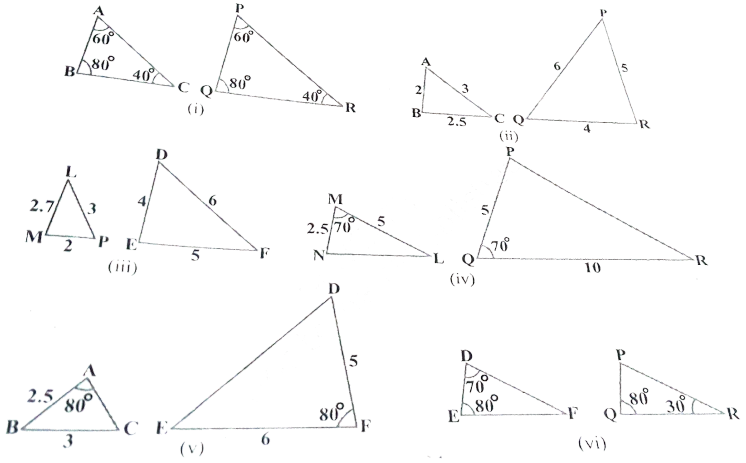
5. State which pairs of triangles in Figure are similar. Write the similarity criterion used by you for answering the question and also write the pairs of similar triangles in the symbolic form:



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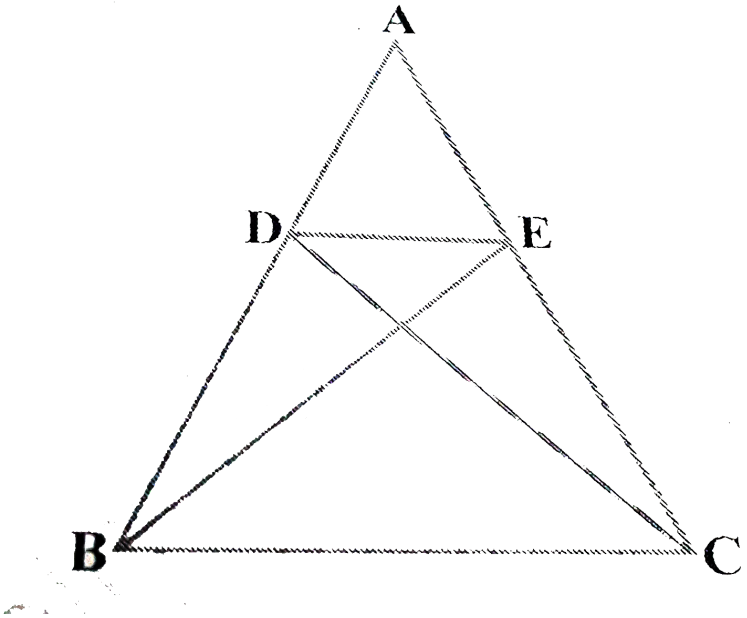
6. In figure, if $\Delta ABE \cong \Delta ACD$, show that $\Delta ADE \sim \Delta ABC$.



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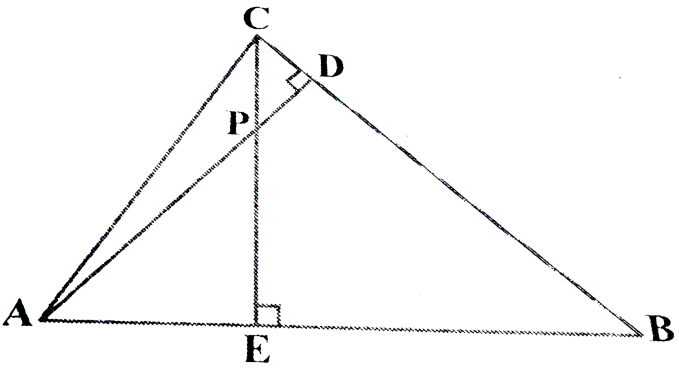
7. In Figure altitudes AD and CE of A B C intersect each other at the point P. Show that:(i) $\Delta AEP \sim \Delta CDP$ (ii) $\Delta ABD \sim \Delta CBE$ (iii)

$\Delta AEP \sim \Delta ADB$(iv) $\Delta PDC \sim \Delta BEC$



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8. In figure $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Show that $\Delta PQS \sim \Delta TQR$

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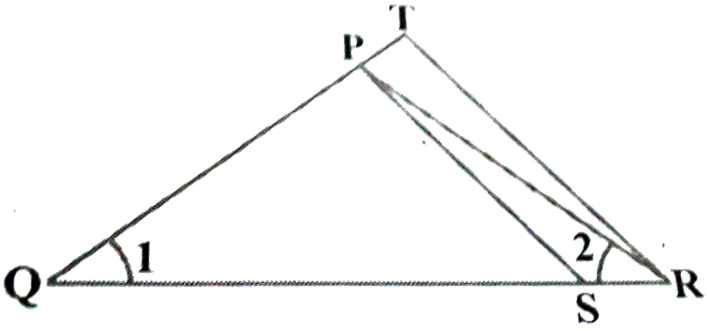

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9. S and T are points on sides PR and QR of ΔPQR such that $\angle P = \angle RTS$. Show that $\Delta RPQ \sim \Delta RTS$.

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10. If AD and PM are medians of triangles ABC and PQR, respectively where $\Delta ABC \sim \Delta PQR$, prove that $\frac{AB}{PQ} = \frac{AD}{PM}$

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11. A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.

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12. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$.

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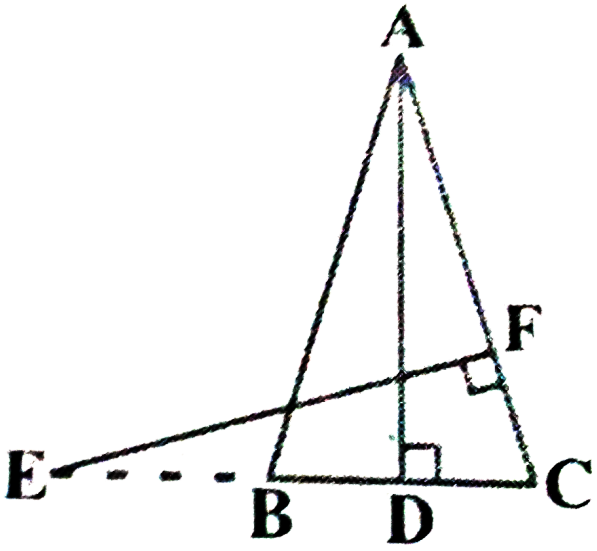
13. In $figure E$ is a point on side CB produced of an isosceles $\triangle ABC$ with $AB = AC$. If $AD \perp BC$ and $EF \perp AC$, prove that $\Delta ABD \sim \Delta ECF$.



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14. 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 ΔABC and ΔEFG respectively. If $\Delta ABC \sim \Delta FEG$, show that:

(i) $\frac{CD}{GH} = \frac{AG}{FG}$

(ii) $\Delta DCB \sim \Delta HGE$

(iii) $\Delta DCA \sim \Delta HGF$

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15. D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$. Show that $CA^2 = CB.CD$.

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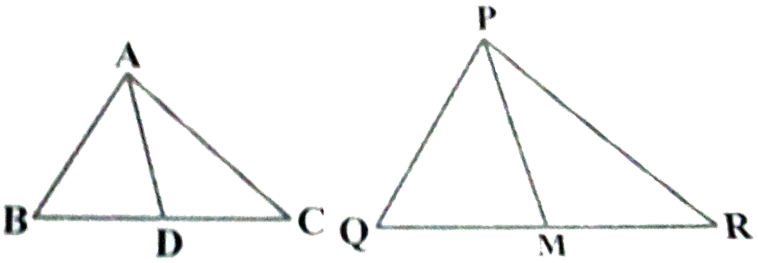
16. Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of ΔPQR. Show that $\Delta ABC \sim \Delta PQR$.



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Exercise 6 2

1. The diagonals of a quadrilateral ABCD intersect each other at the point O such that $\frac{AO}{BO} = \frac{CO}{DO}$. Show that ABCD is a trapezium.

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2. Using Theorem 6.2, prove that the line joining the mid-point of any two sides of a triangle is parallel to the third side. (Recall that you have done it in class IX).

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3. Using Theorem 6.1, prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side. (Recall that you have proved it in Class IX).

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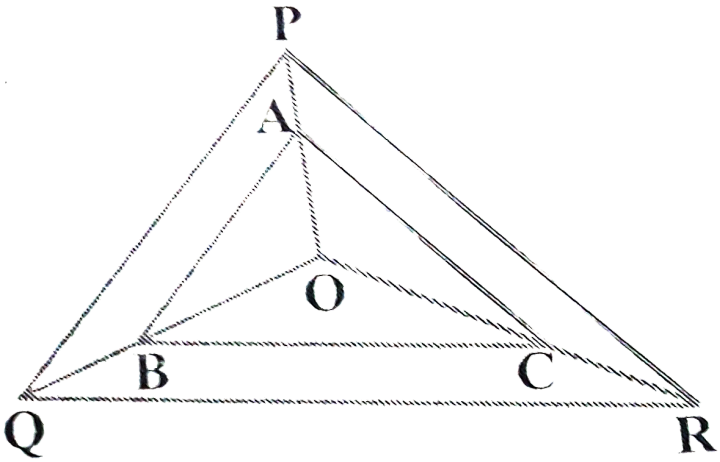
4. In figure A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR. Show that BC || QR.



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5. ABCD is a trapezium in which AB||DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

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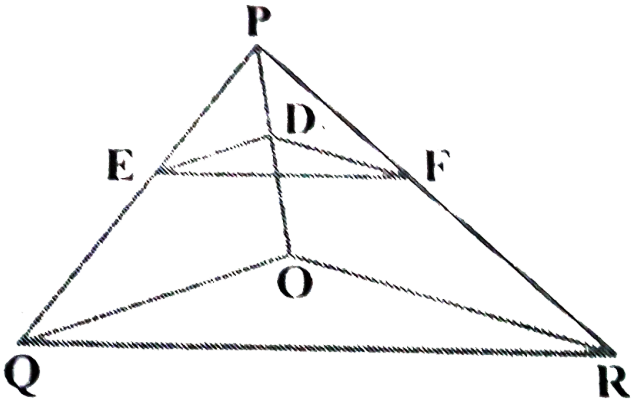
6. In figure DE || OQ and DF || OR. Show that EF||QR.



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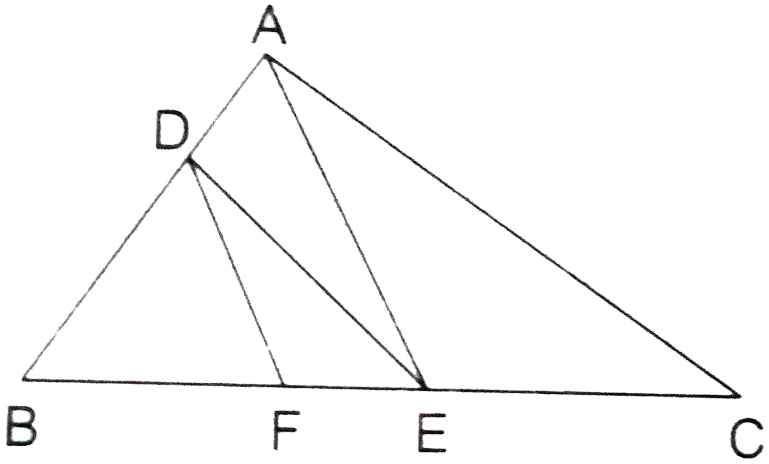
7. In the given figure, $DE||AC$ and $DF||AE$.

Prove that $\frac{BF}{FE} = \frac{BE}{EC}$



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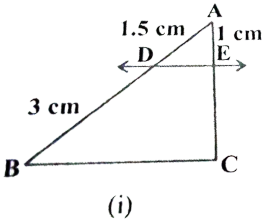
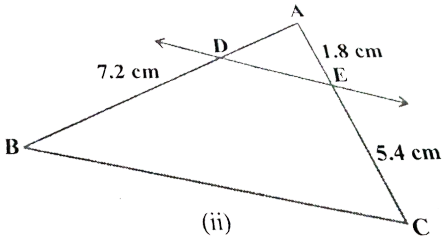
8. In Figure (i) and (ii), DE||BC. Find EC in (i) and AD in (ii).



(i)



(ii)

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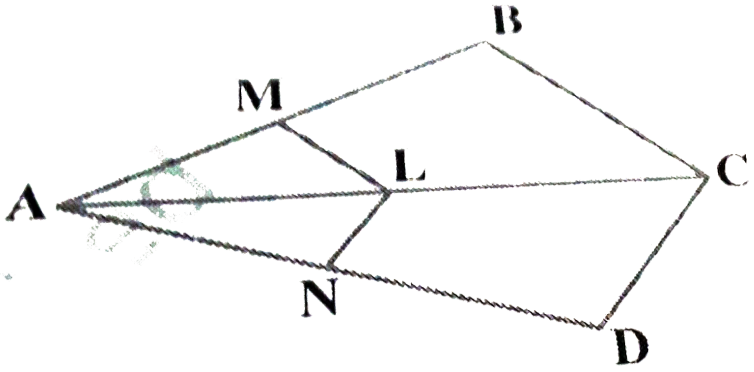
9. In figure, If LM || CB and LN || CD, prove that $\frac{AM}{AB} = \frac{AN}{AD}$.



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10. E and F are points on the sides PQ and PR respectively of ΔPQR. For each of the following cases, state whether EF || QR:

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

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

(iii) PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 cm and PF = 0.36 cm

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Solved Examples

1. In figure $\angle ACB = 90^\circ$ and $CD \perp AB$. Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$.

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2. A ladder is placed against a wall such that its foot is at a distance of 2.5 m from the wall and its top reaches a window 6 m above the ground. Find the length of the ladder.

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3. In fig., if $AD \perp BC$, prove that $AB^2 + CD^2 = BD^2 + AC^2$.

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

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

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6. In Figure $\frac{PS}{SQ} = \frac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles triangle.

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7. ABCD is a trapezium with AB || DC. E and F are points on non-parallel sides AD and BC respectively such that EF is parallel to AB. Show that $\frac{AE}{ED} = \frac{BF}{FC}$.

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8. A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

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9. In Figure the line segment XY is parallel to side AC of ΔABC and it divides the triangle into two parts of equal areas. Find the ratio $\frac{AX}{AB}$.

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10. In figure Cm and RN are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, prove that: (i) $\Delta AMC \sim \Delta PNR$ (ii) $\frac{CM}{RN} = \frac{AB}{PQ}$ (ii) $\Delta CMB \sim \Delta RNQ$

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11. Observe and then find $\angle P$.

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12. If a line intersects sides AB and AC of a ΔABC at D and E respectively and is parallel to BC, prove that $\frac{AD}{AB} = \frac{AE}{AC}$

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13. In figure, if PQ||RS, prove that $\Delta POQ\Delta SOR$.

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14. In Fig. 4.126, $\frac{OA}{OC} = \frac{OD}{OB}$. Prove that $\angle A = \angle C$ and $\angle B = \angle D$.(FIGURE)

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Exercise 6 4

1. Tick the correct answer and justify: Sides of two similar triangles are in the ratio 4 : 9. Areas of these triangles are in the ratio

(A) 2:3 (B) 4:9 (C) 81:16 (D) 16:81

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2. Tick the correct answer and justify:ABC and BDE are two equilateral triangles such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is

(A) 2:1 (B) 1:2 (C) 4:1 (D) 1:4

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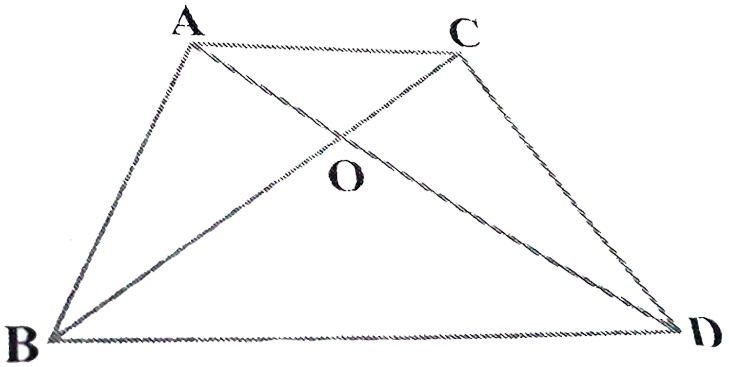
3. In figure ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that $\frac{ar(ABC)}{ar(DBC)} = \frac{AO}{DO}$.



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4. Diagonals 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.

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5. Let $\Delta ABC \sim \Delta DEF$ and then areas be, respectively, $64cm^2$ and $121cm^2$. If EF = 15.4 cm. find BC.

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6. Prove that the area of an equilateral triangle described on one side of a square is equal to half the area of the equilateral triangle described on one of its diagonals.

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

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

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9. prove that The areas of the two similar triangles are in the ratio of the square of the corresponding medians.

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Exercise 6 1

1. Fill in the blanks using the correct word given in bracket: (i) All circles are_____(congruent, similar)

(ii) All squares are____. (similar, congruent)

(iii) All_____triangles are similar, (isosceles, equilateral)

(iv) Two polygons of the same number of sides are similar, if

(a) their- corresponding angles are__and

(b) their- corresponding sides are__(equal, proportional)

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2. Give two different examples of pair of

(i) similar figures.

(ii) non-similar figures.

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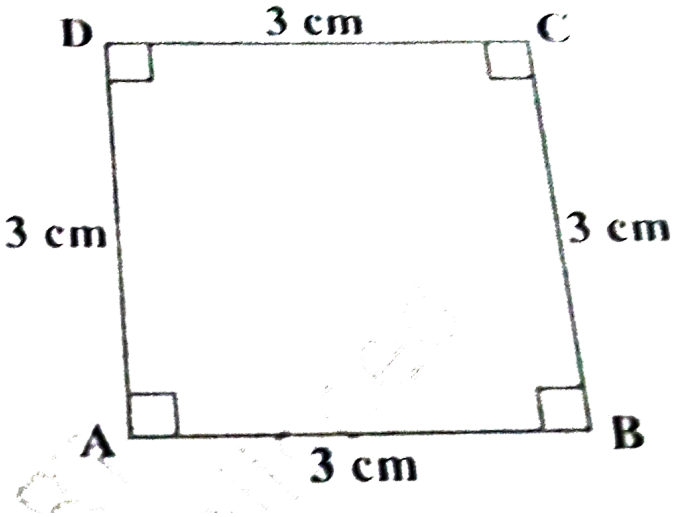
3. State whether the following quadrilaterals are similar or not:



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