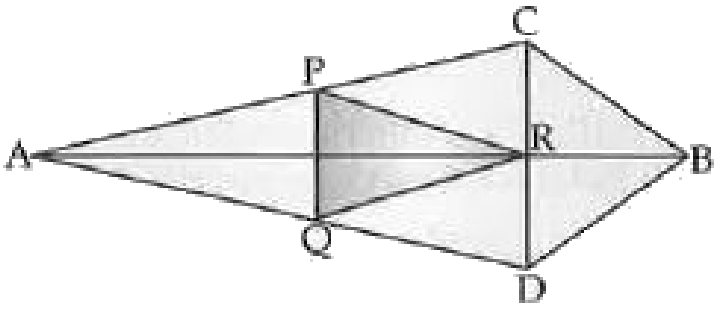
MATHS

BOOKS - ZEN MATHS (KANNADA ENGLISH)

TRIANGLES

Illustrative Examples

1. In the figure, $PR \| \| RC$ and $QR \| \| BD$. Prove that $PQ \| \| CD$.



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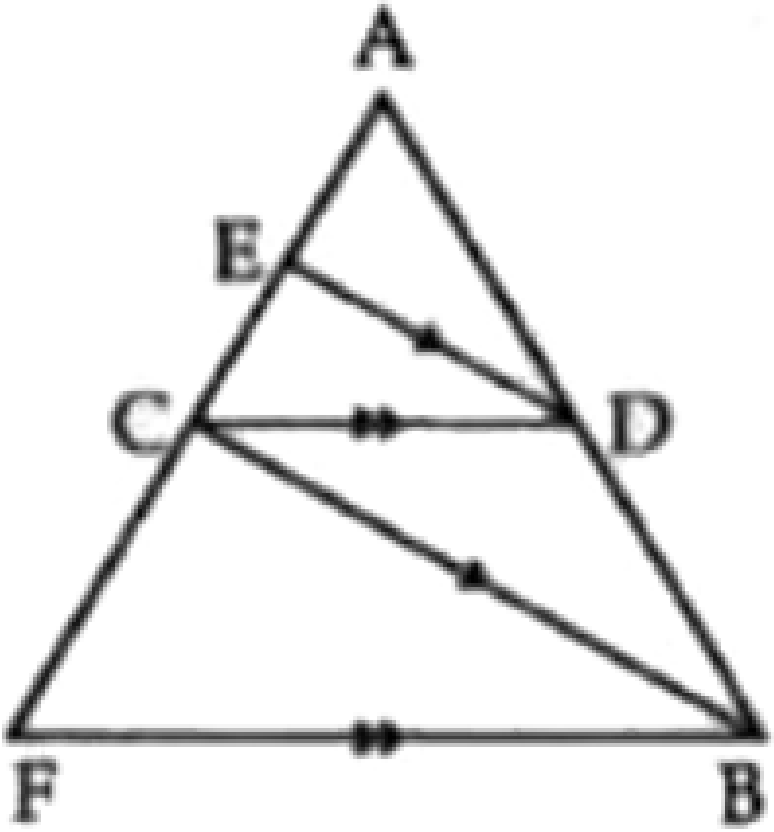
2. In the given figure $DE||BC$ and $CD||BF$ prove that $AC^2 = AE \times AF$.



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3. In the figure, $AB \perp BC$ and $DE \perp AC$. Prove that $\Delta ABC \sim \Delta AED$.

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4. In the given figure P is the midpoint of BC and Q is the midpoint of AP. If BQ when produced meets AC at R, prove that $RA = \frac{1}{3}CA$.

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5. In the given figure, AD = 3 cm, AE = 5 cm, BD = 4 cm, CE = 4 cm, CF = 2 cm, BF = 2.5 cm, then find the pair of parallel lines and hence their lengths.

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6. In the ΔABC, altitudes AD and CE intersect each other at point P. Prove that

i] $\Delta APE \sim \Delta CPD$

ii] $AP \times PD = CP \times PE$

iii] $\Delta ADB \sim \Delta CEB$

iv] $AB \times CE = BC \times AD$

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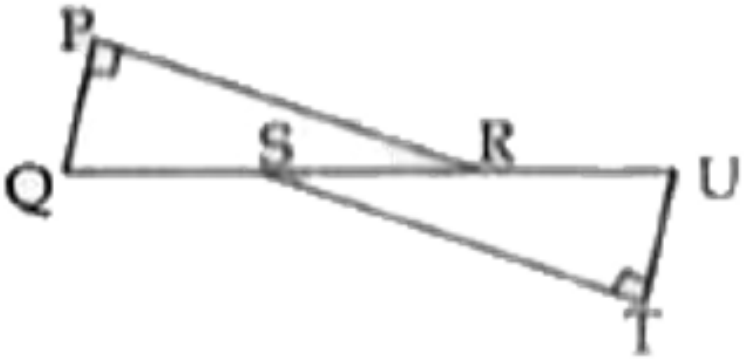
7. In the figure $\lfloor QPR = \lfloor UTS = 90^\circ$ and $PR \mid\mid TS$. Prove that $\Delta PQR \sim \Delta TUS$.



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8. In the figure $\frac{AO}{OC} = \frac{BO}{OD} = \frac{1}{2}$ and AB = 5 cm. Find DC

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9. If the area of two similar triangles is in the ratio 25 : 64, find the

of their corresponding sides.

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10. D, E and F are the mid-points of sides of ΔABC. P, Q, R are the mid-points of sides DEF. This process of marking the mid-points and forming a new triangle is continued. How are the areas of these triangles related?

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11. In areas of two similar triangles ABC and PQR are in the ratio 9 : 16. If BC = 4.5 cm. Find the length of QR.

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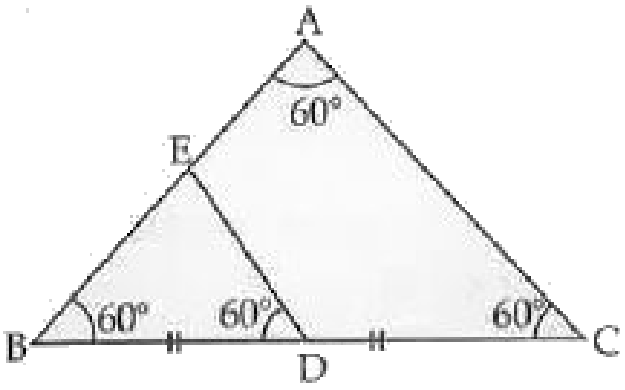
12. ΔABC and ΔBDE are two equilateral triangles and $BD = DC$. Find the ratio between areas of ΔABC and ΔBDE.



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13. AD is altitude of equilateral ΔABC. On AD as base, another equilateral triangle ADE is constructed. Prove that $\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \frac{3}{4}$.

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14. The lengths of diagonals of a rhombus are 24 cm and 32 cm. Calculate the altitide of the rhombus.

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15. The sides AB and AC and the perimeter P_1 of ΔABC are respectively three times the corresponding sides DE and DF and the perimeter P_2 of ΔDEF. Are the two triangles similar? If yes, find $\frac{ar(\Delta ABC)}{ar(\Delta DEF)}$.

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16. In the rectangle WXYZ, XY + YZ = 17 cm and XZ + YW = 26. Calculate the length and breadth of the rectangle.

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17. An insect 8 m away from the foot of a lamp post 6 m tall, crawls towards it. After moving through a distance, its distance from the top of the lamp post is equal to the distance it has moved. How far is the insect away from the foot of the lamp post?

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18. In ΔABC, C is a point on BD such that BC:CD=1:2 and $\triangle$ABC is an equilateral triangle Prove that $AD^2 = 7AC^2$

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19. In $\Delta ABC, CD \perp AB, CA = 2AD, BD = 3AD$. Prove that $\lfloor BCA = 90^\circ$.

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20. In the figure, $AB \perp BC$ and $DE \perp AC$. Prove that $\Delta ABC \sim \Delta AED$.

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21. In the given figure $\lfloor BAC = 90^\circ$.

Prove that :

a] $\Delta AGF \sim \Delta BDG$

b] $\Delta AGF \sim \Delta EFC$

c] $\Delta BDG \sim \Delta EFC$

d] $DE^2 = BD \times EC$

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22. ABC is a right angled triangle. Points D and E trisect BC. Prove that $8AE^2 = 3AC^2 + 5AD^2$.

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23. In an equilateral triangle ABC, $AD \perp BC$. Prove that $AD^2 = 3BD^2$.

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Textual Exercises Exercise 2 1

1. Fill in the blanks using the correct word given in brackets :

All circles are ..... (congruent , similar)

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2. Fill in the blanks using the correct word given in the brackets:

All squares are _____ [Similar, Congruent]

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3. Fill in the blanks using the correct word given in the brackets:

All _____ triangles are similar. [isosceles, equilateral].

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4. Two polygons of the same number of sides are similar, if

Their corresponding sides are _____

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5. Two polygons of the same number of sides are similar, if

Their corresponding angles are _____ and

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6. Give two different examples of a pair of different radii of different length:

i] Similar figures

ii] Non-similar figures.

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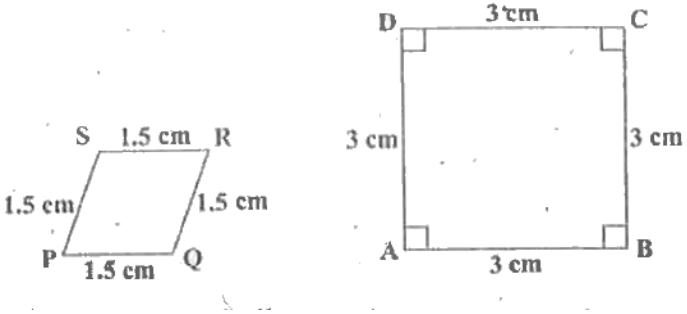
7. State whether the following quadrilaterals are similar or not:



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Textual Exercises Exercise 2 2

1. E and F are points on the sides PQ and PR respectively of a ΔPQR. For 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, 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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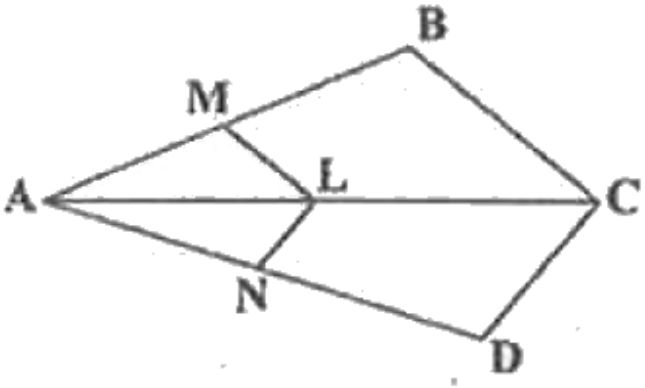
2. In Fig , if $LM||CB$ and $LN||CD$, prove that $\frac{AM}{AB} = \frac{AN}{AD}$



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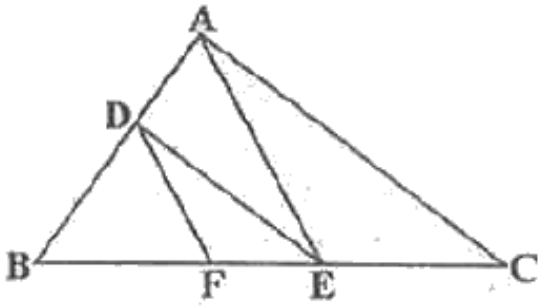
3. In Fig $DE \mid \mid AC$ and AE. Prove that $\frac{BF}{FE} = \frac{BE}{EC}$



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4. In the figure $DE||OQ$ and $DF||OR$. Show that $EF \mid \mid QR$.

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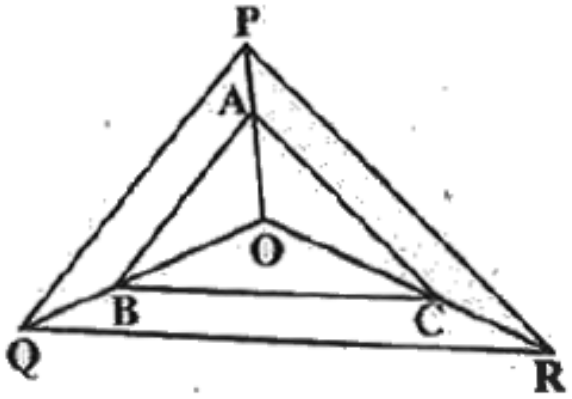
5. In Fig A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR . Show that BC || QR.



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6. Prove that a line drawn through the midpoint of one side of a triangle parallel to another side bisects the third side (using BPT).

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7. Prove that the line joining the midpoints of any two sides of a triangle is parallel to the third side.

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8. ABCD is a trapezium in which AB || DC. Its diagonals intersect each other at O.

Show that $\frac{AO}{BO} = \frac{CO}{DO}$

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9. 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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Textual Exercises Exercise 2 3

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

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

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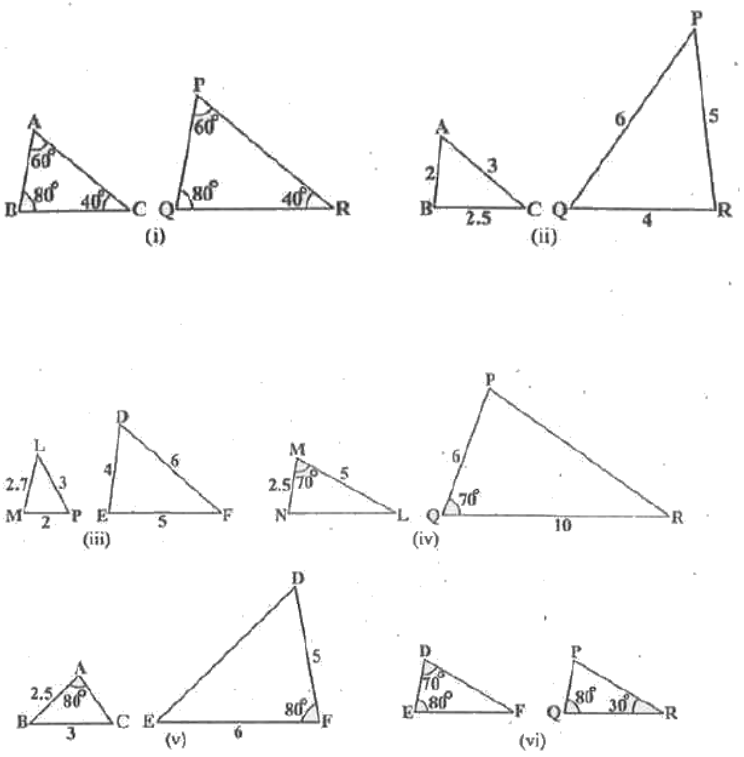
3. State which pairs of triangles in Fig are similar. Write the similarity criterion used by you for answering the question also write the pairs of similar triangles in the symbolic form:



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

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

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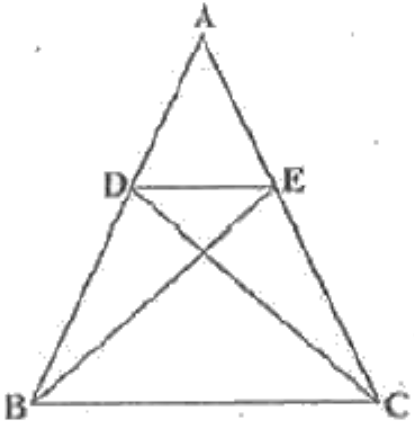
6. In Fig , if $\Delta ABE \angle \Delta ACD$, show that $\Delta ADE \sim \Delta ABC$



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7. In the figure altitudes AD and CE of ΔABC intersect each other at the point P. Show that

1] $\Delta AEP \sim \Delta CDP$

2] $\Delta ABD \sim \Delta CBE$

3] $\Delta AEP \sim \Delta ADB$

4] $\Delta PDC \sim \Delta BEC$

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8. 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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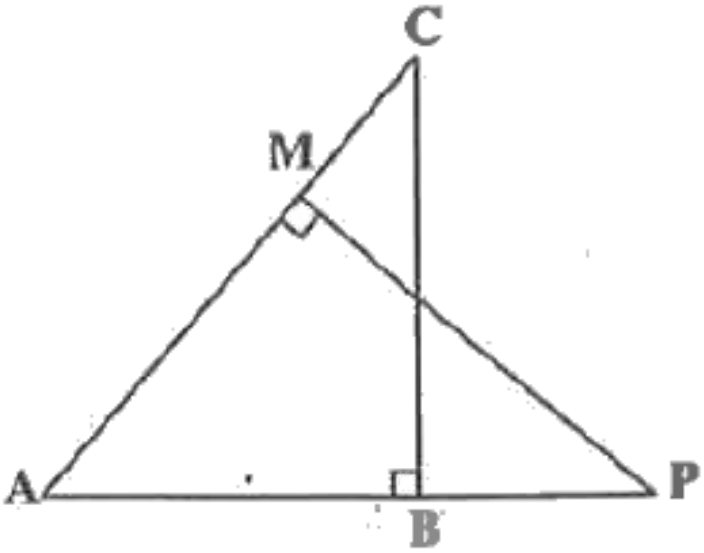
9. In Fig , ABC and AMP are two right triangles, right angled at B and M respectively. Prove that :

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



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10. CD and GH are respectively the bisectors of $\lfloor ACB$ and $\lfloor EGF$ such that D and H lie on sidea AB and FE of ΔABC and ΔEFG respectively. If $\Delta ABC \sim \Delta FEG$, show that.

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

ii] $\Delta CDB \sim \Delta HGE$

iii] $\Delta DCA \sim \Delta HGF$

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11. In the 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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12. 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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13. D is a point on the side BC of a triangle ABC such that $\lfloor ADC = \lfloor BAC$. Show that $CA^2 = CB.CD$.

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

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

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Textual Exercises Exercise 2 4

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

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2. Diagonals of a trapezium ABCD with AB || DC intersect each other at the point O. If AB = 2CD, find the ratio of the areas of triangle AOB and COD.

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3. In the figure ABC and DBC are two triangles on the same base BC. If AD intersects BC at 0, show that $\frac{\text{Area}(\Delta ABC)}{\text{Area}(\Delta DBC)} = \frac{AO}{DO}$.

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

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5. D,Eand F are respectively the mid - points of sides AB, BC and CA of ΔABC . Find the ratio of the areas of ΔDEF and ΔABC.

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

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

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8. ABC and BDF are two equilateral triangles such that D is the mid -point of BC. Ratio of the areas of triangles ABC and BDF is

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: C

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9. 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. $16:81$

Answer: D

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Textual Exercises Exercise 2 5

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.

7cm, 24 cm, 25 cm

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2. 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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3. In the 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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4. ABC is an isosceles triangle right-angled at C. Prove that $AB^2 = 2AC^2$.

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

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

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7. Prove that sum of the squares of the side of a rhombus is equal to the to the sum of the squares of its diagonals.

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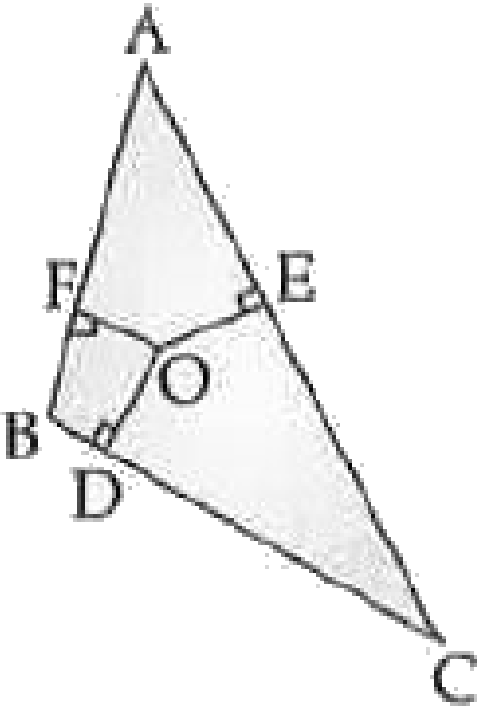
8. In the figure given below, O is point in the interior of a triangle ABC, $OD \perp BC, OE \perp AC$ and $OF \perp AB$. Show that

(i)

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

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



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9. A ladder 10 m 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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10. A guy wire attached to a vertical pole of height 18 m 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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11. An aeroplane leaves an airport and files due north at a speed of 1000 km per hour. At the same time, another aeroplane leaves the same airpot 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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12. Two poles of heights 6 m and 11 m stand on a plane ground. If the distance between the feet of the poles is 12m , find the

distance between their tops .

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

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

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

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16. In an equilateral triangle prove that three times the square of one side is four times the square of its altitude.

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17. Tick the correct answer and justify : In ΔABC, $AB = 6\sqrt{3}cm$, $AC = 12cm$ and $BC = 6cm$

The angle B is :

A. 120°

B. 60°

C. 90°

D. 45°

Answer: C

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Zee Additional Questions Multiple Choice Questions

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

A. $AB^2 = 2AC^2$

B. $BC^2 = 2AB^2$

C. $AC^2 = 2AB^2$

D. $AB^2 = 4AC^2$

Answer: A

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2. If ΔABC is similar to ΔDEF such that $\lfloor D = 47^\circ$ and $\lfloor B = 83^\circ, \lfloor F$ is

A. 80°

B. 60°

C. 40°

D. 50°

Answer: D

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3. In $\Delta ABC, DE \| BC$. AD = (7x - 4) cm, AE = (5x - 2) cm, DB = (3x + 4) cm, and EC = 3x cm. The value of x is

A. 4

B. 3

C. 5

D. 2.5

Answer: A

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4. The lengths of the diagonals of a rhombus are 16 cm and 12 cm.

Then the length of the side of the rhombus is

A. 9 cm

B. 10 cm

C. 8 cm

D. 20 cm

Answer: B

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5. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then

A. $\Delta PQR \sim \Delta CAB$

B. $\Delta PQR \sim \Delta ABC$

C. $\Delta CBA \sim \Delta PQR$

D. $\Delta BCA \sim \Delta PQR$

Answer: A

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6. If in two triangles DEF and PQR, $\angle D = \angle Q$, and $\angle R = \angle E$ which of the following is not true?

A. $\frac{EF}{PR} = \frac{DF}{PQ}$

B. $\frac{DE}{PQ} = \frac{EF}{RP}$

C. $\frac{DE}{QR} = \frac{DF}{PQ}$

D. $\frac{EF}{RP} = \frac{DE}{QR}$

Answer: B

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7. The altitude of an equilateral triangle having the length of its side 12 cm is

A. 12 cm

B. $6\sqrt{2}$ cm

C. 6 cm

D. $6\sqrt{3}$cm

Answer: D

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8. $\Delta ABC \sim \Delta PQR.$ If $\lfloor A = 40^\circ, \lfloor C = 60^\circ, AB = 5cm, AC = 8cm$ and $PQ = 7.5cm$

, the correct statement among the following is

A. $PR = 12cm, \lfloor R = 60^\circ$

B. $QR = 12cm, \lfloor R = 80^\circ$

C. $PQ = 12cm, \lfloor R = 80^\circ$

D. $QR = 12cm, \lfloor P = 40^\circ$

Answer: C

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9. In $\Delta DEF, \lfloor D = 90^\circ,$ and $DL \perp EF,$ then $\frac{EL}{LF}$ is

A. $\left(\frac{DE}{DF}\right)^2$

B. $\frac{DE}{DF}$

C. $\left(\frac{DE}{DL}\right)^2$

D. $\frac{DE}{DL}$

Answer: B

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10. $\Delta ABC \sim \Delta DEF$. If AB = 4 cm, AC = 3.5 cm, BC = 3 cm, and EF = 6 cm, the perimeter of ΔDEF is

A. 21 cm

B. 14 cm

C. 10.5 cm

D. 18 cm

Answer: A

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11. In the figure, if $\Delta POQ \sim \Delta SOR$ and $PQ : RS = 1 : 2$, then OP : OS is

A. $1 : 2$

B. $2 : 1$

C. $3 : 1$

D. $1 : 3$

Answer: A

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Zee Additional Questions Very Short Answer Questions

1. In ΔABC, D and E are points on AB and AC respectively, such that $DE \mid\mid BC$. If $\frac{AD}{DB} = \frac{4}{13}$ and AC = 20.4 cm, find AE.

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2. In ΔABC, D and E are points on AB and AC respectively, such that DE || BC. If AD = 4, AE = 8, DB = x - 4, and EC = 3x - 19, find x.

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3. Given $\Delta ABC \sim \Delta PQR$. If $\frac{AB}{PQ} = \frac{1}{3}$, find $\frac{\text{Area } \Delta ABC}{\text{Area } \Delta PQR}$.

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4. Find the perimeter of the square whose diagonal is $5\sqrt{2}$ cm.

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5. $\Delta ABC \sim \Delta DEF$. If area $(\Delta ABC) = 2.89m^2$, area $(\Delta DEF) = 2.25m^2$, and AB = 1.5 m, find DE.

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6. If $\Delta ABC \sim \Delta PQR$, AB = 7 cm, PQ = 12.5 cm, and the perimeter of $\Delta ABC = 70cm$, find the perimeter of ΔPQR.

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7. A vertical stick 1 m long casts a shadow 80 cm long. At the same time a tower casts a shadow 30 m long. Determine the height of the tower.

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8. In an isosceles triangle ABC, if AB = AC = 25 cm and altitude from A on BC is 24 cm, find BC.

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9. Find the length of the chord of a circle of radius 8 cm which subtends a right angle at the centre.

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10. State and prove Basic proportionality theorem

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Zee Additional Questions Short Answer Type 1 Questions

1. Legs of a right triangle are of lengths 16 cm and 8 cm. Find the length of the side of the largest square that can be inscribed in the triangle.

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2. In the figure $\lfloor D = \lfloor E$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that BAC is an isosceles triangle.

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3. Diagonals of trapezium PQRS intersect each other at the point O, PQ||RS, and PQ = 3RS. Find the ratio of the areas of triangles POQ and ROS.

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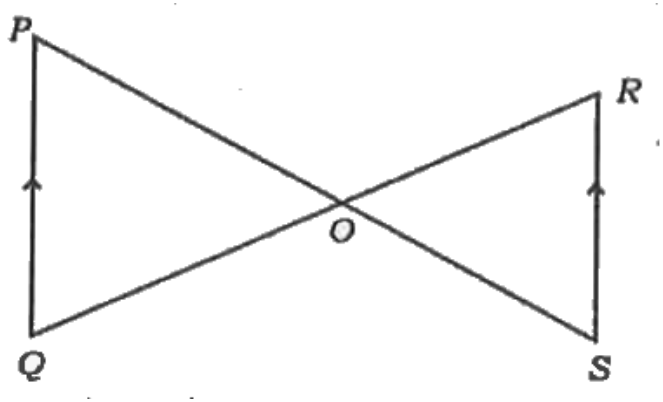
4. In the given figure PQ || RS , prove that $\Delta POQ \sim \Delta SOR$.



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5. In the triangle PQR, is a point on PR such that $QN \perp PR$. If PN. NR = QN^2, prove that $\lfloor PQR = 90^\circ$.

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6. If in a $\Delta PQR, XY \mid\mid QR, PX = 22x, XQ = 3x, PY = x,$ and YR = 9x, find the value of x.

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7. In a rectangle ABCD, E is the mid point of AB. If AB = 16 cm and AD = 6 m, find ED.

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8. In the given figure, $\lfloor ACB = 90^\circ$ and $CD \perp AB$. Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$.

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9. In an isosceles ΔABC, $AB = AC$ and $BD \perp AC$. Prove that $BD^2 - CD^2 = 2CD.\ AD.$

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10. In a quadrilateral ABCD, $\lfloor B = 90^\circ$. If $AD^2 = AB^2 + BC^2 + CD^2$, prove that $\lfloor ACD = 90^\circ$.

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11. P and Q are the points on sides AB and AC respectively of ΔABC. If AP = 3 cm, PB = 6 cm, AQ = 5 cm and QC = 10 cm, show that BC = 3 PQ.

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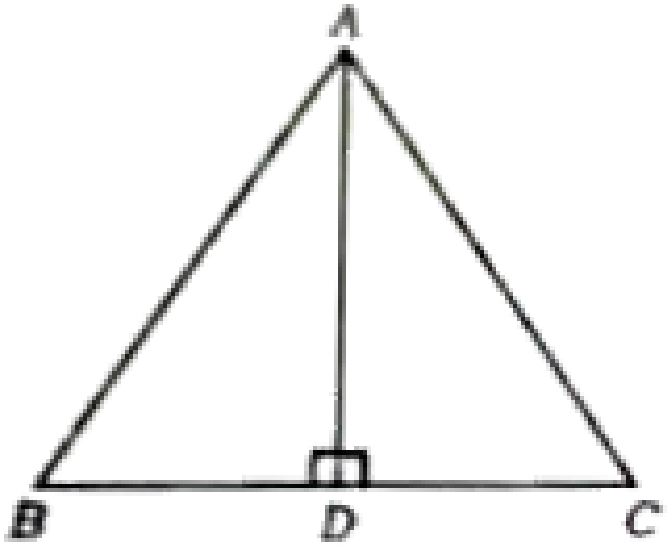
12. In Δ ABC , AD $\perp$ BC and $AD^2 = BD \times CD$. Prove that $AB^2 + AC^2 = (BD + CD)^2$



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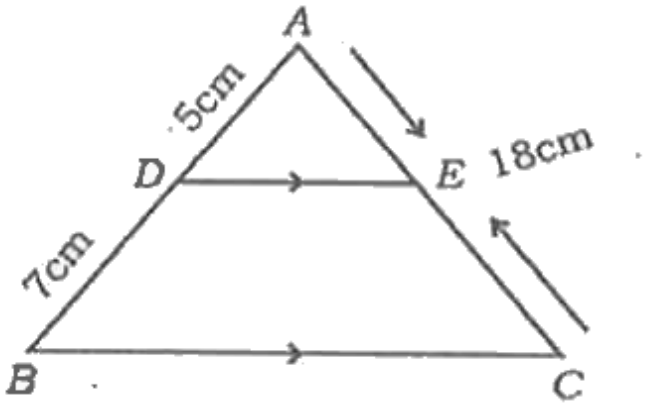
13. In Δ ABC , DE $||$ BC . If AD= 5 cm , BD = 7 cm and AC = 18 cm , find the length of AE.



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14. $\Delta ABC \sim \Delta DEF$ and their areas are $64cm^2$ and $100cm^2$ respectively. If $EF = 12cm$ then find the measure of BC.

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15. The diagonal BD of parallelogram ABCD intersect AE at F as shown in the figure. If E is any point on BC, then prove that $DF \times EF = FB = FA$.

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Zee Additional Questions Short Answer Type 2 Questions

1. Prove that if the area of similar triangles are equal, they are congruent.

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2. In the figure, ABC is a right-angled triangle, right-angled at C. D is a midpoint of BC. Prove that $AB^2 = 4AD^2 - 3AC^2$.

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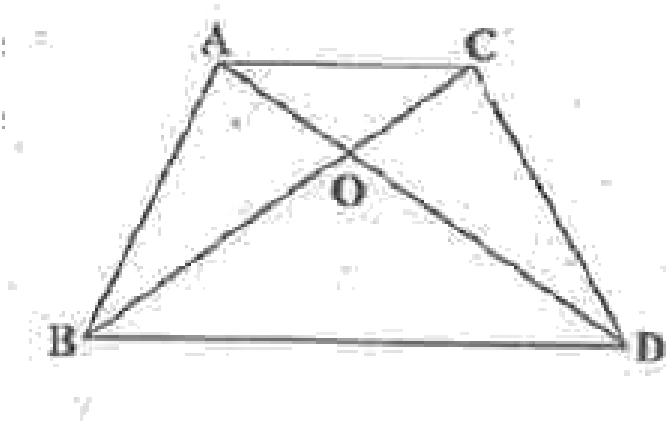
3. In Fig , ABC and DBC are two triangles on the same base BC. If AD intersects BC,at O , show that $\frac{ar(ABC)}{ar(DBC)} = \frac{AO}{DO}$



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4. In the given figure, DE || BC and AD : DB = 5 : 4. Find $ar(\Delta DEF) : ar(\Delta CFB)$.

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5. In the given figure, PA, QB, and RC each is perpendicular to AC such that PA = x, RC = y, QB = z, AB = a, and BC = b. Prove that $\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$.

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6. A girl of height 100 cm is walking away from the base of a lamp post at a speed of 1.9 m/s. If the lamp post is 5 m above the ground, find the length of her shadow after 4 seconds.

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7. In a right-angled ΔABC right-angled at C, P and Q are the midpoints of BC and AC. Prove that $AP^2+BQ^2=5PQ^2$.

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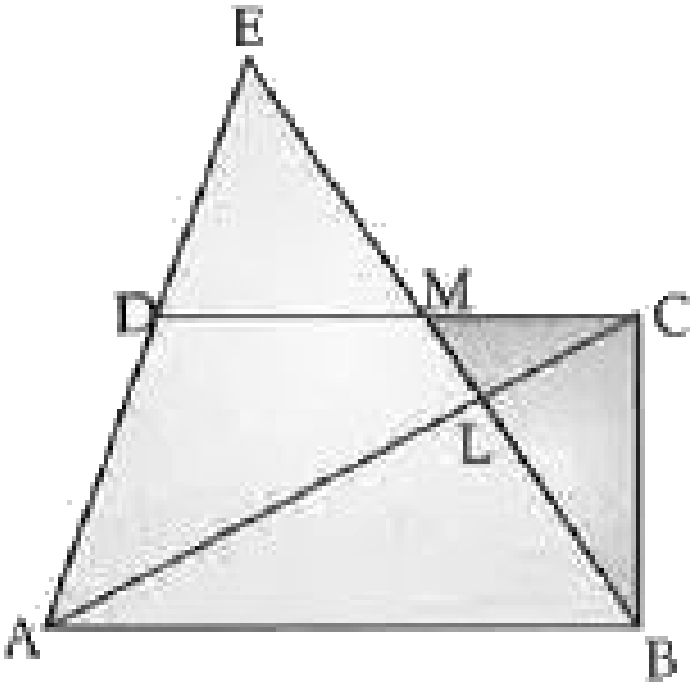
Zee Additional Questions Long Answer Type Questions

1. Throught the mid-point M of the sides of a parallelogram ABCD, the line BM is drawn intersecting AC at L, and AD produced to E. Prove that $EL = 2BL$.



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2. A 5 m long ladder is placed leaning towards a vertical wall such that it reaches the wall at a point 4 m high. If the foot of the ladder is moved 1.6 m towards the wall, find the distance by which the top of the ladder would slide upwards on the wall.

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3. In the figure, OB is the perpendicular bisector of the line segment DE. $FA \perp OB$ and FE intersects OB at point C. Prove that $\frac{1}{OA} + \frac{1}{OB} = \frac{2}{OC}$.

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4. In triangle ABC, AP, BQ and CR are the medians. Prove that $3\left[AB^2+BC^2+AC^2\right]=4\left[AP^2+BQ^2+CR^2\right]$.

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5. If A is the area of a right angled triangle and b is one of the sides containing the right angle. Prove that the length of the altitude on the hypotenuse is $\frac{2Ab}{\sqrt{b^4+4A^2}}$.

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6. In the given figure, AD is the median of ΔABC and $AE\perp BC$. Prove that : $b^2+c^2=2p^2+\frac{1}{2}a^2$.

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7. In an equilateral triangle ABC, D is a point of BC such that 4BD = BC. Prove that $16AD^2 = 13BC^2$.

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

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9. In a right angled triangle, square on the hypotenuse is equal to sum of the squares on the other sides. Prove the statement.

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10. State and prove pythagoras theorem .

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