



MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

AREA OF PARALLELOGRAMS AND TRIANGLES

Solved Examples

1. The area of a parallelogram is 32cm^2 . If its altitude is twice of its base, then find its base and the altitude

 [Watch Video Solution](#)

2. The area of a parallelogram is 150cm^2 . If the ratio of its base and corresponding altitude is 3: 2, find the length of base and altitude



Watch Video Solution

3. The diagonals of a parallelogram $ABCD$ intersect at O . A line through O meets AB in X and CD in Y . Show that

$$\text{ar}(\triangle XYX) = \frac{1}{2}(\text{ar}(\square ABCD))$$



Watch Video Solution

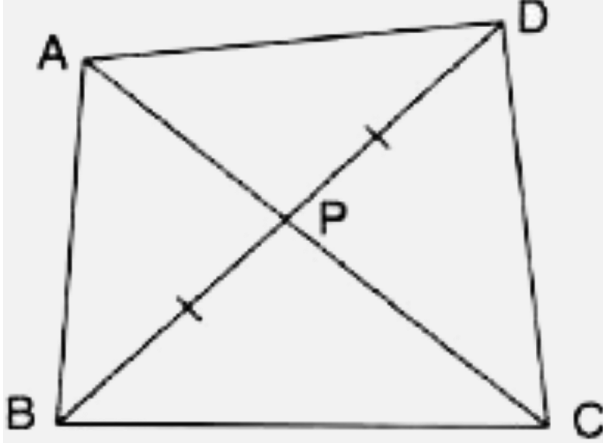
4. Show that a median of a triangle divides it into two triangles of equal areas.



Watch Video Solution

5. In quadrilateral $ABCD$, diagonal BD is bisected by the diagonal AC .

Prove that : $\triangle ABC$ and $\triangle ADC$ are equal in area.



[▶ Watch Video Solution](#)

6. If each diagonals of a quadrilateral separates it into two triangles of equal area then show that the quadrilateral is a parallelogram.

[▶ Watch Video Solution](#)

7. A point O inside a rectangle $ABCD$ is joined to the vertices. Prove that the sum of the areas of a pair of opposite triangles so formed is equal to the sum of the areas of other pair of triangles.

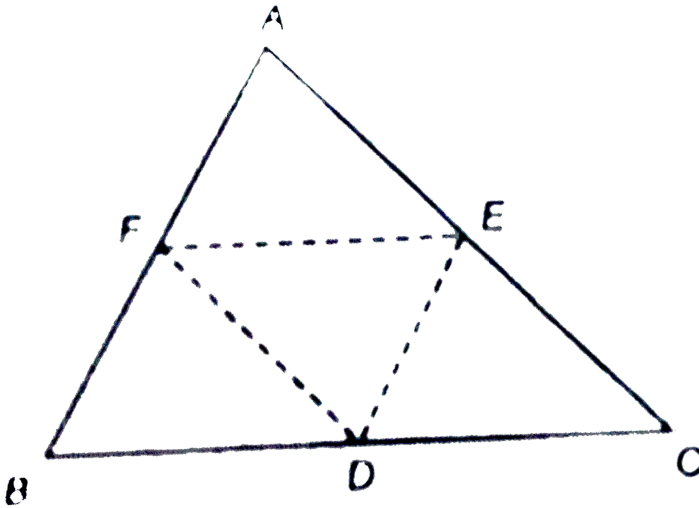
[▶ Watch Video Solution](#)

8. In the adjoining figure D, E and F are the mid-points of the sides BC, CA and AB respectively of $\triangle ABC$. Prove that:

(i) $\square BDEF$ is a parallelogram

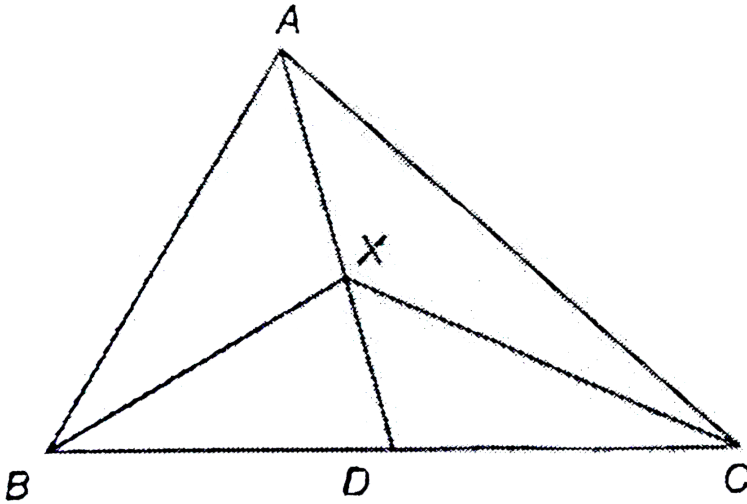
(ii) area of $\triangle DEF = \frac{1}{4} \times$ area of $\triangle ABC$

(iii) $\square BDEF = \frac{1}{2} \times$ area of $\triangle ABC$



9. In the adjoining figure, AD is the median of $\triangle ABC$ and X be any point on side AD . Prove that:

$$\text{area} (\triangle ABX) = \text{area} (\triangle ACX)$$



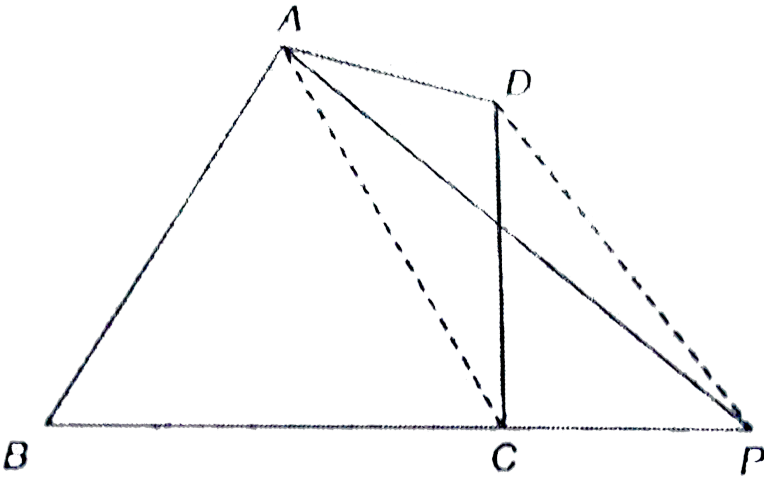
[Watch Video Solution](#)

10. The medians of $\triangle ABC$ intersect at point G . Prove that:

$$\text{area of } \triangle AGB = \frac{1}{3} \times \text{area of } \triangle ABC$$

[Watch Video Solution](#)

11. In the figure, $ABCD$ is a quadrilateral. A line DP drawn parallel to diagonal AC from point D , meet BC produced at P . Prove that:
area of $\triangle ABP =$ area of $\square ABCD$



[Watch Video Solution](#)

12. XY is a line parallel to side BC of a triangle ABC . If $BE \parallel AC$ and $CF \parallel AB$ meet XY at E and F respectively,

show that $ar(ABE) = ar(ACF)$



Watch Video Solution

13. A point D is taken on the side BC of a ABC such that $BD = 2DC$. Prove that $ar(ABD) = 2ar(ADC)$.



Watch Video Solution

14. XY is a line parallel to side BC of a triangle ABC . If $BE \parallel AC$ and $CF \parallel AB$ meet XY at E and F respectively, show that $ar(ABE) = ar(ACF)$



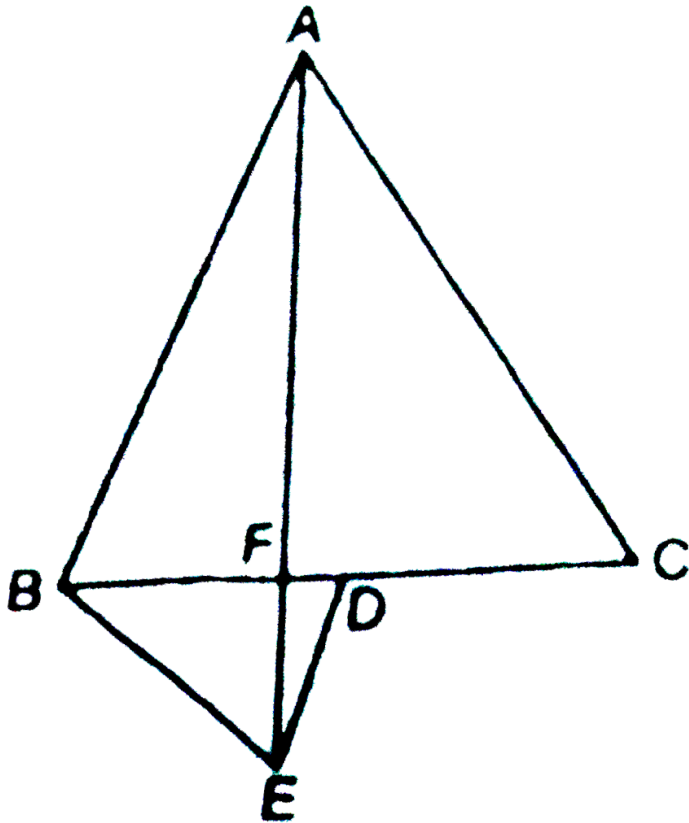
Watch Video Solution

15. In the figure, ABC and BDE are two equilateral triangles such that D is the mid-point of BC . If AE intersects BC at F , show that:

$$(i) \text{ar}(\triangle BDE) = \frac{1}{4} \text{ar}(\triangle ABC) \quad (ii) \text{ar}(\triangle BDE) = \frac{1}{2} \text{ar}(\triangle BAE)$$

$$(iii) \text{ar}(\triangle ABC) = 2 \text{ar}(\triangle BEC) \quad (iv) \text{ar}(\triangle BFE) = \text{ar}(\triangle AFD)$$

$$(v) \text{ar}(\triangle BFE) = 2 \text{ar}(\triangle FED) \quad (vi) \text{ar}(\triangle FED) = \frac{1}{8} \text{ar}(\triangle AFC)$$



 [View Text Solution](#)

16. $ABCD$ is a parallelogram X and Y are the mid-points of BC and CD respectively. Prove that

$$ar(\triangle AXY) = \frac{3}{8} ar(\text{parallelogram } ABCD)$$

 [Watch Video Solution](#)

Problems From Ncert Exemplar

1. If E, F, G and H are respectively the mid-points of the sides of a parallelogram $ABCD$, Show that $ar(\triangle EFGH) = \frac{1}{2} ar(\text{parallelogram } ABCD)$

 [Watch Video Solution](#)

2. In Figure, P is a point in the interior of a parallelogram $ABCD$.

Show that $ar(\triangle APB) + ar(\triangle PCD) = \frac{1}{2} ar(\text{parallelogram } ABCD)$

$$ar(\triangle APD) + ar(\triangle PBC) = ar(\triangle APB) + ar(\triangle PCD)$$

 [Watch Video Solution](#)

3. In Fig. 9.24, ABC and ABD are two triangles on the same base AB .

If line-segment CD is bisected by AB at O , show that

 [Watch Video Solution](#)

4. P and Q are any two points lying on the sides DC and AD respectively of a parallelogram $ABCD$. Show that

$$ar(APB) = ar(BQC).$$

 [Watch Video Solution](#)

5. A villager Itwari has a plot of land of the shape of a quadrilateral.

The Gram Panchayat of the village decided to take over some portion of plot from one of the corners to construct a Health

centre. Itwari agrees to the above proposal with the condition that he should be given equal amount of land in lieu of his land adjoining his plot so as to form a triangular plot. Explain how his proposal will be implemented.

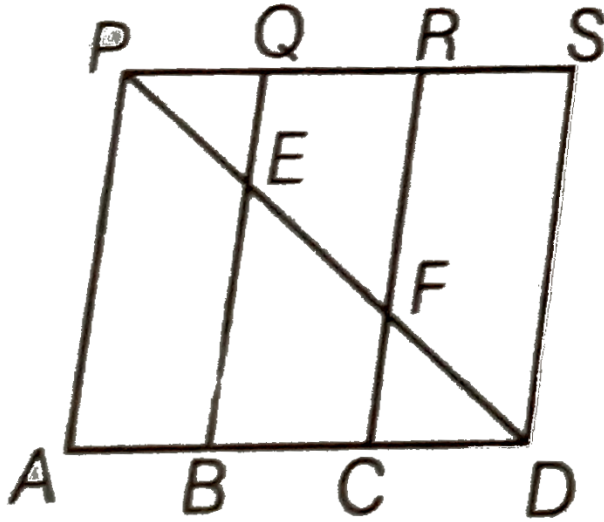
 [Watch Video Solution](#)

6. Diagonals AC and BD of a quadrilateral ABCD intersect at O in such a way that $\ar\ (AOD)\ =\ \ar\ (BOC)$. Prove that ABCD is a trapezium.

 [Watch Video Solution](#)

7. In the figure, PSDA is a parallelogram. Points Q and R are taken on PS such that $PQ = QR = RS$ and $PA\ ||\ QB\ ||\ RC$. Prove that

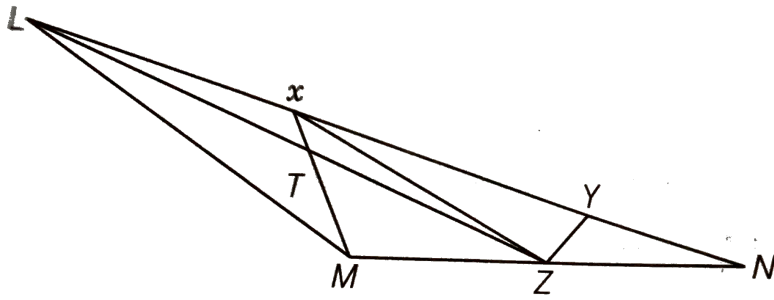
$$ar(PQE) = ar(CFD).$$



[Watch Video Solution](#)

8. X and Y are points on the side LN of the triangle LMN such that $LX = XY = YN$. Through X, a line is drawn parallel to LM to meet MN

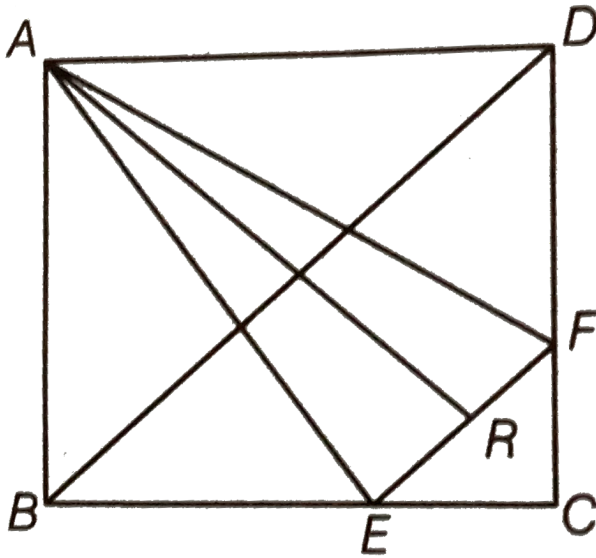
at Z (see figure). Prove that $ar(\triangle LZY) = ar(\triangle MZYX)$.



Watch Video Solution

9. ABCD is a square. E and F are respectively the mid-points of BC and CD. If R is the mid-point of EF, prove that

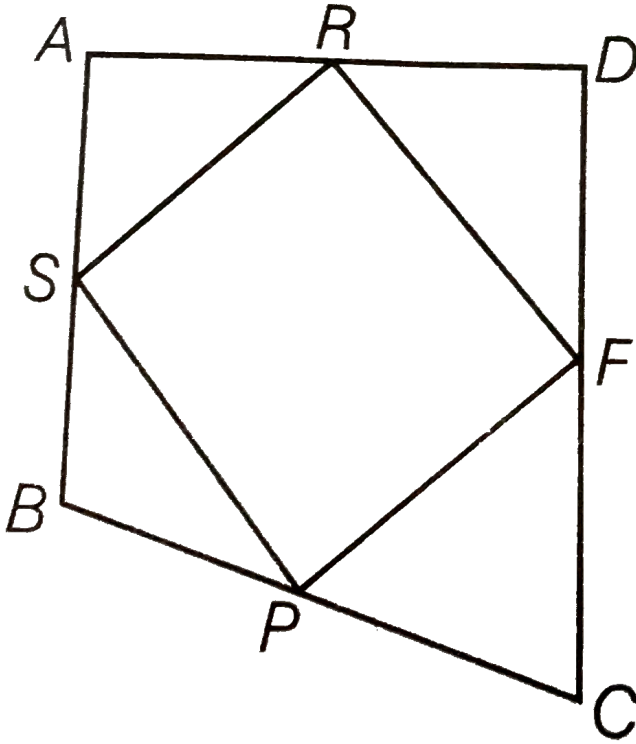
$$ar(\triangle AER) = ar(\triangle AFR).$$



[▶ Watch Video Solution](#)

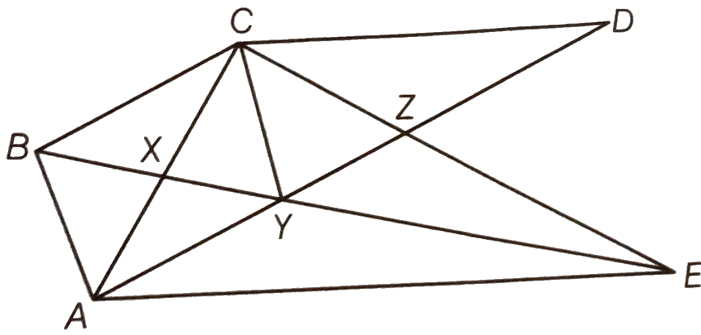
10. If the mid-points of the sides of a quadrilateral are joined in order, prove that the area of the parallelogram, so formed will be

half of the area of the given quadrilateral (figure).



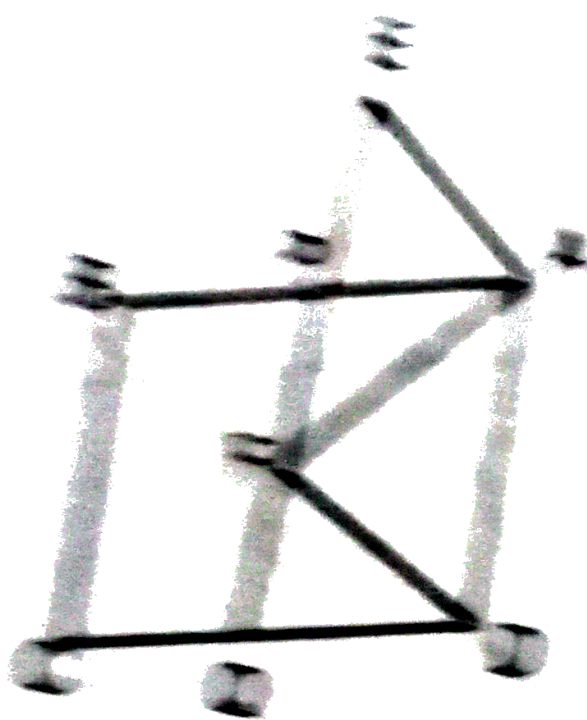
Watch Video Solution

11. In figure, $CD \parallel AE$ and $CY \parallel BA$. Prove that $ar(\triangle CBX) = ar(\triangle AXY)$.



 [Watch Video Solution](#)

12. In figure, ABCD and AEFD are two parallelograms. Prove that $ar(\triangle PEA) = ar(\triangle QFD)$.



 [Watch Video Solution](#)

Exercise

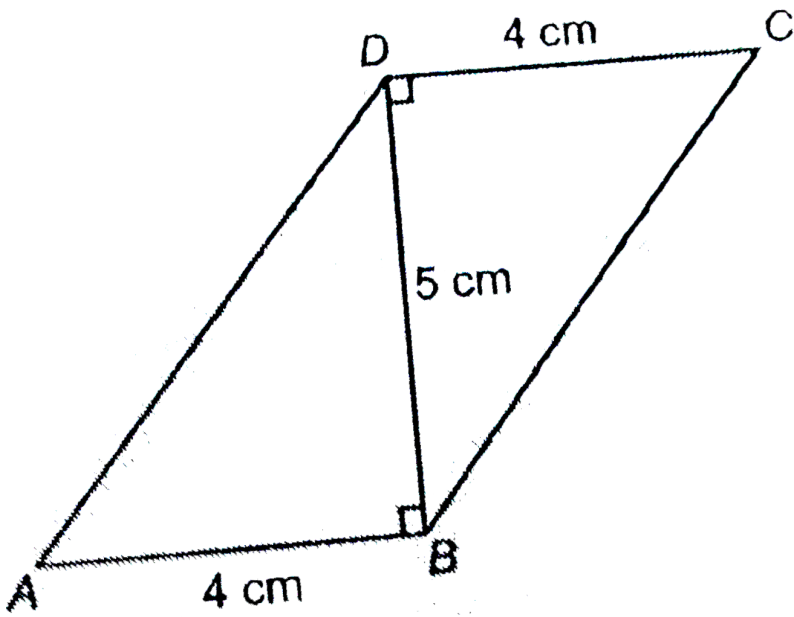
1. The base of a parallelogram is 3 times of its corresponding height. If the area of the parallelogram is 48cm^2 , then find the base and the corresponding height of the parallelogram.

 [Watch Video Solution](#)

2. The ratio of the base and corresponding height of a parallelogram is $5:2$. If the area of the parallelogram is 90cm^2 , then find its base and the corresponding height.

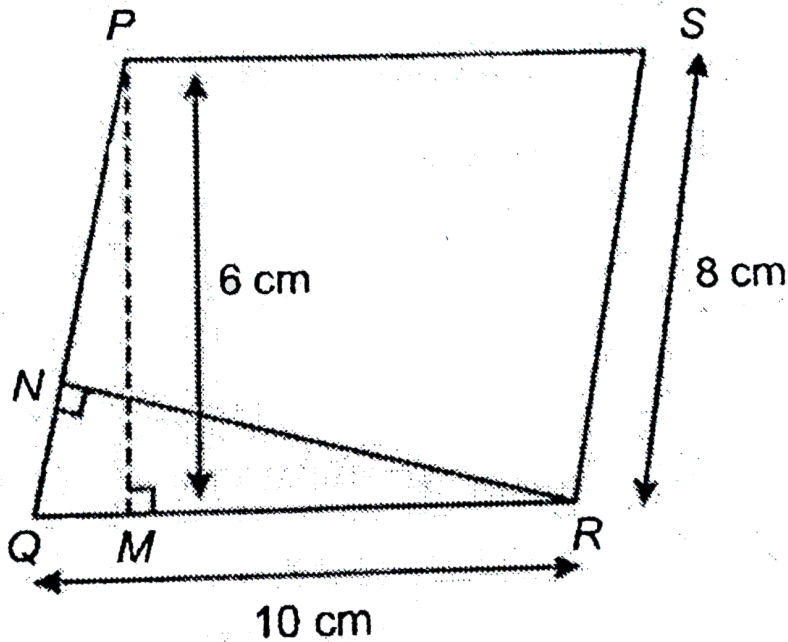
 [Watch Video Solution](#)

3. In the adjoining figure, prove that ABCD is a parallelogram. Also find its area.



[Watch Video Solution](#)

4. In the figure, find the length of RN.



[Watch Video Solution](#)

5. Show that the segment joining the mid-points of a pair of opposite sides of a parallelogram, divides it into two equal parallelograms.

[Watch Video Solution](#)

6. Prove that of all parallelograms of which the sides are given, the parallelogram which is rectangle has the greatest area.

 [Watch Video Solution](#)

7. Show that the diagonals of a parallelogram divide it into four triangles of equal area.

 [Watch Video Solution](#)

8. If the diagonals AC , BD of a quadrilateral $ABCD$, intersect at O , and separate the quadrilateral into four triangles of equal area, show that quadrilateral $ABCD$ is a parallelogram.

 [Watch Video Solution](#)

9. The diagonal AC of a quadrilateral ABCD divides it into two triangles of equal areas. Prove that diagonal AC bisects the diagonal BD.

 [Watch Video Solution](#)

10. Prove that the area of a rhombus is equal to half the rectangle contained by its diagonals. Given: A rhombus $ABCD$ such that its diagonals AC and BD intersect at O . To Prove:
$$\text{ar} (\text{rhombus } ABCD) = \frac{1}{2} (\text{area of the rectangle contained by its diagonals} = \frac{1}{2}(AC \times BD))$$

 [Watch Video Solution](#)

11. $\triangle ABC$ and $\triangle DBC$ are on same base BC and their vertices A and D are on opposite sides of BC. It is given that:

area of $\triangle ABC =$ area of $\triangle DBC$

Prove that BC bisects the line segment AD.



[Watch Video Solution](#)

12. O' is an interior point of a parallelogram ABCD. Prove that :

area of $\triangle AOB +$ area of $\triangle COD =$ area of $\triangle AOD +$ area of $\triangle BOC$

$\triangle AOB +$ area of $\triangle COD =$ area of $\triangle AOD +$ area of $\triangle BOC$



[Watch Video Solution](#)

13. O' is any point on diagonal AC of a parallelogram ABCD. Prove

that :

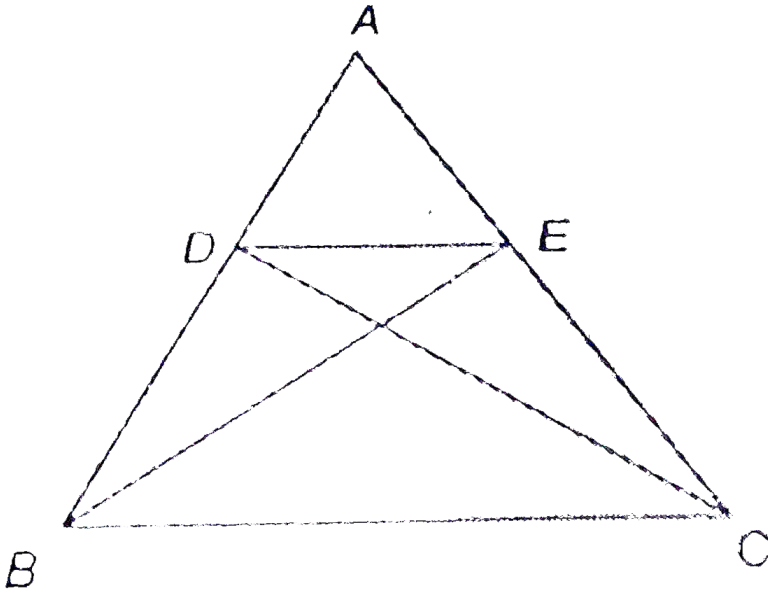
area of $\triangle AOD =$ area of $\triangle AOB$



[Watch Video Solution](#)

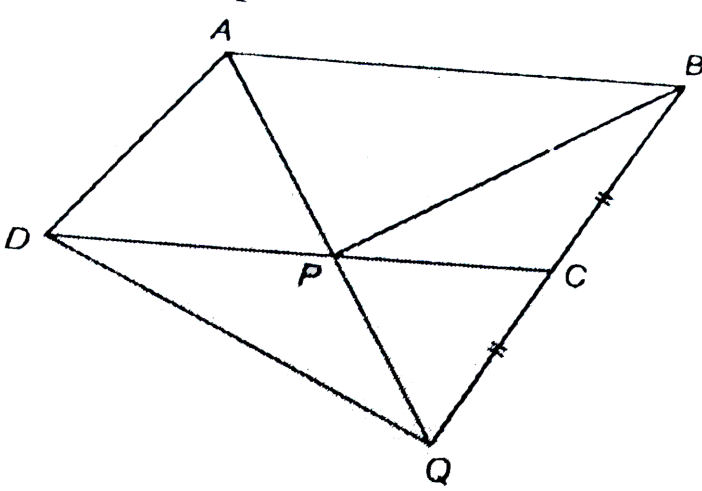
14. In the adjoining figure, D and E are the points on the sides AB and AC respectively of $\triangle ABC$ and area of $\triangle BCE =$ area of $\triangle BCD$.

Prove that $DE \parallel BC$



[▶ Watch Video Solution](#)

15. In the adjoining figure, ABCD is a parallelogram. Prove that : area of $\triangle BPC =$ area of $\triangle DPQ$



[▶ Watch Video Solution](#)

16. In a quadrilateral $ABCD$, AM and CN are perpendiculars from the vertices A and C respectively on diagonal BD . Prove that:

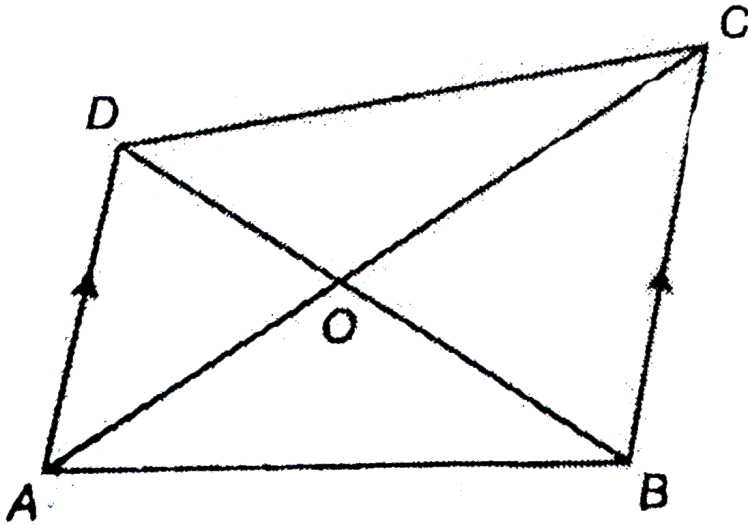
$$\text{area of } \square ABCD = \frac{1}{2} \times BD \times (AM + CN)$$

[▶ Watch Video Solution](#)

17. In the adjoining figure, $ABCD$ is a quadrilateral in which $AD \parallel BC$. AC and BD intersect each other at point ' O '. Prove

that:

$$\text{area of } \triangle COD = \text{area of } \triangle ABO$$



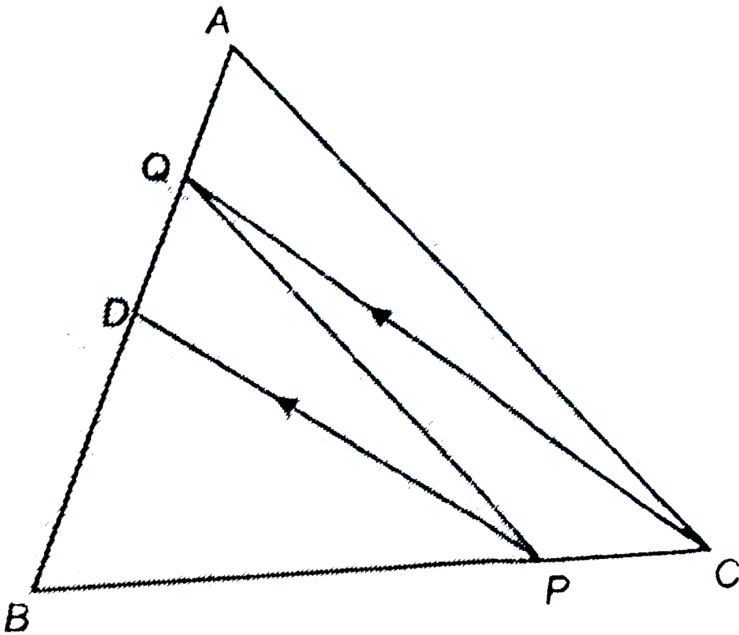
[▶ Watch Video Solution](#)

18. Any point D is taken on the side BC of a $\triangle ABC$ and AD is produced to E such that $AD = DE$, prove that area of $\triangle BCE =$ area of $\triangle ABC$,

[▶ Watch Video Solution](#)

19. In the adjoining figure, D is the mid-point of side AB of $\triangle ABC$ and P be any point on side BC. If $CQ \parallel PD$, then prove that:

$$\text{area of } \triangle BPQ = \frac{1}{2} \times \text{area of } \triangle ABC$$



[Watch Video Solution](#)

20. In a ABC , E is the mid-point of median AD . Show that

$$ar(BED) = \frac{1}{4} ar(ABC)$$



Watch Video Solution

21. In parallelogram ABCD, P is a point on side AB and Q is a point on side BC.

Prove that :

(i) ΔCPD and ΔAQD are equal in area.

(ii) Area (ΔAQD)

$$= \text{Area}(\Delta APD) + \text{Area}(\Delta CPB)$$



Watch Video Solution

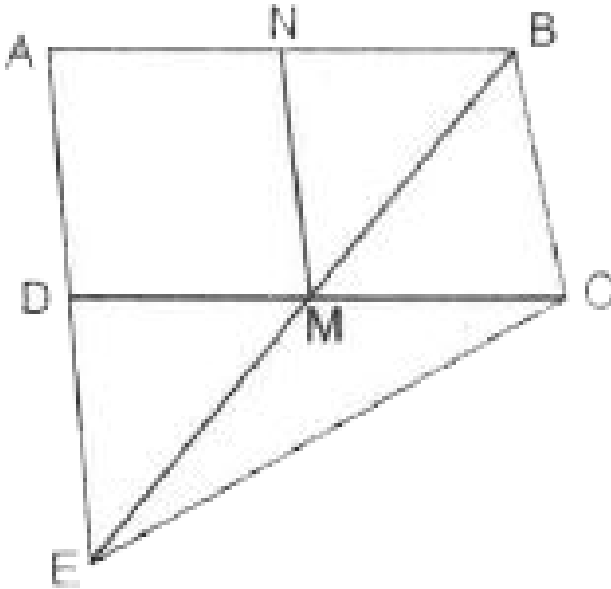
22. In the given figure, M and N are the mid-points of the sides DC and AB respectively of the parallelogram ABCD.

If the area of parallelogram ABCD is 48cm^2 ,

(i) State the area of the triangle BEC.

(ii) name the parallelogram which is equal in area to the triangle

BEC.



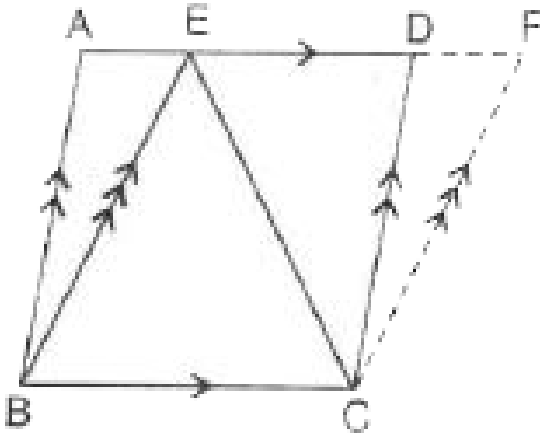
[Watch Video Solution](#)

23. ABCD and BCFE are parallelograms. If area of triangle

$EBC = 480\text{cm}^2$, $AB = 30\text{cm}$ and $BC = 40\text{cm}$, Calculate,

- (i) area of parallelogram ABCD,
- (ii) area of the parallelogram BCFE,
- (iii) length of altitude from A on CD,

(iv) area of triangle ECF.

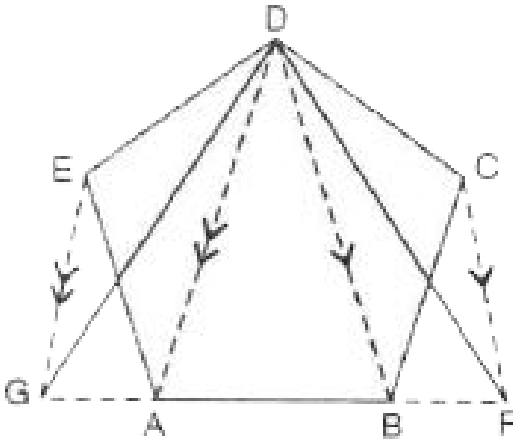


[Watch Video Solution](#)

24. The given figure shows a pentagon ABCDE. EG drawn parallel to DA meets BA produced at G and CF drawn parallel to DB meets AB produced at F.

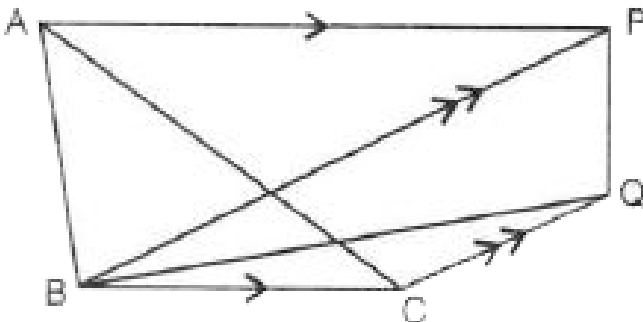
Prove that the area of pentagon ABCDE is equal to the area of

triangle GDF.



[Watch Video Solution](#)

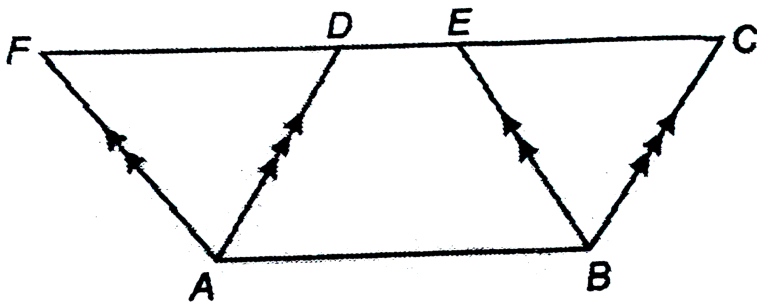
25. In the given figure, AP is parallel to BC, BP is parallel to CQ. Prove that the areas of triangles ABC and BQP are equal.



26. The following figure shows two parallelograms $ABCD$ and $ABEF$

prove that

area of $\triangle ADF = \text{area of } \triangle BCE$



27. The side AB of a parallelogram $ABCD$ is produced to any point P . A line through A and parallel to CP meets CB produced at Q and then parallelogram $PBQR$ is completed as shown in Figure. Show that $ar(\text{parallelogram } ABCD) = ar(\text{parallelogram } PBQR)$

Figure. Show that $ar(\text{parallelogram } ABCD) = ar(\text{parallelogram } PBQR)$

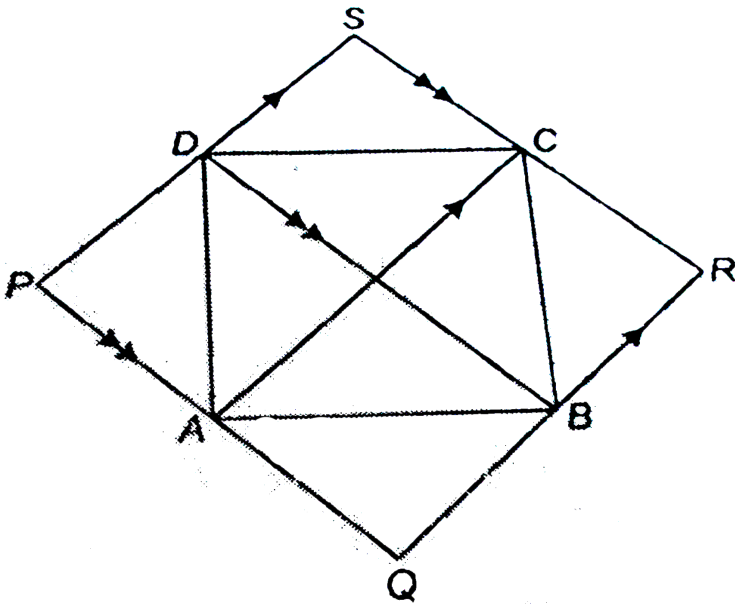
 Watch Video Solution

28. A point E is taken on the side BC of a parallelogram ABCD. AE and DC are produced to meet at F. Prove that $ar(\Delta ADF) = ar(ABFC)$.

 Watch Video Solution

29. In the following figure, $AC \parallel PS \parallel QR$ and $PQ \parallel DB \parallel SR$, prove that area of quadrilateral $PQRS = 2 \times$ area of quadrilateral

ABCD



[Watch Video Solution](#)

30. O is any point on the diagonal BD of the parallelogram $ABCD$. Prove that $ar(\triangle OAB) = ar(\triangle OBC)$

[Watch Video Solution](#)

31. D is the mid-point of side AB of the triangle ABC. E is the mid-point of CD and F is the mid-point of AE. Prove that

$$8 \times \text{area of } (\triangle AFD) = \text{area of } \triangle ABC$$

 [Watch Video Solution](#)

32. In $\triangle ABC$, E and F are mid-points of sides AB and AC respectively. If BF and CE intersect each other at point O, prove that the $\triangle OBC$ and quadrilateral AEOF are equal in area.

 [Watch Video Solution](#)

33. ABCD is a parallelogram. P and Q are the mid-points of sides AB and AD respectively.

Prove that area of triangle APQ = $\frac{1}{8}$ of the area of parallelogram ABCD.

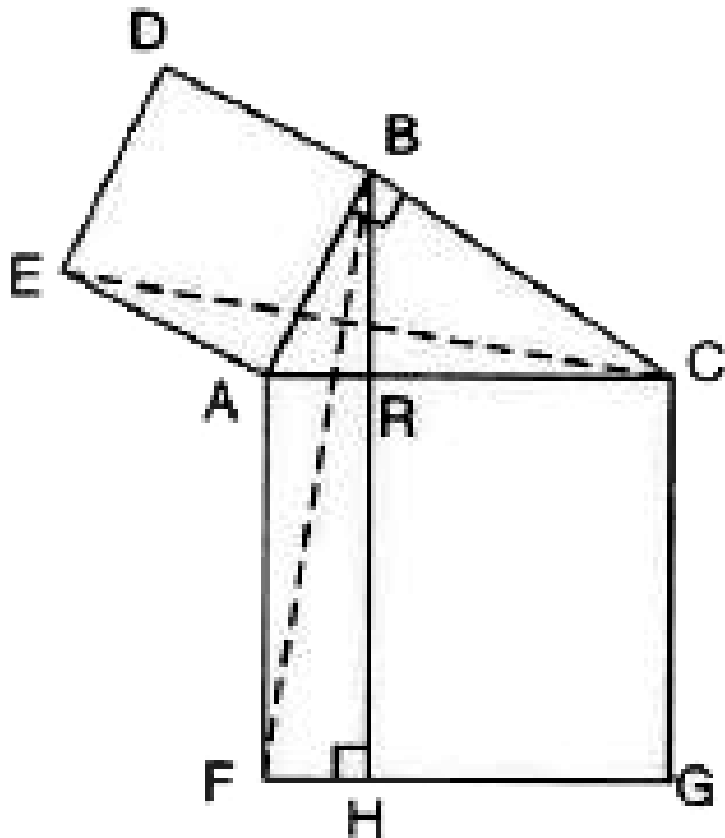
34. In the figure given alongside, squares ABDE and AFGC are drawn on the side AB and the hypotenuse AC of the right triangle ABC.

If BH perpendicular to FG, prove that :

(i) $\triangle EAC \cong \triangle BAF$.

(ii) Area of the square ABDE

= Area of the rectangle ARHF.



[▶ Watch Video Solution](#)

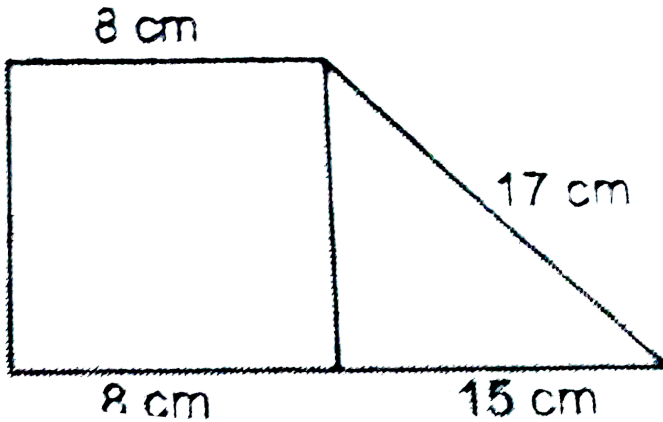
Revision Exercise Very Short Answer Questions

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

Find the area of rhombus

[▶ Watch Video Solution](#)

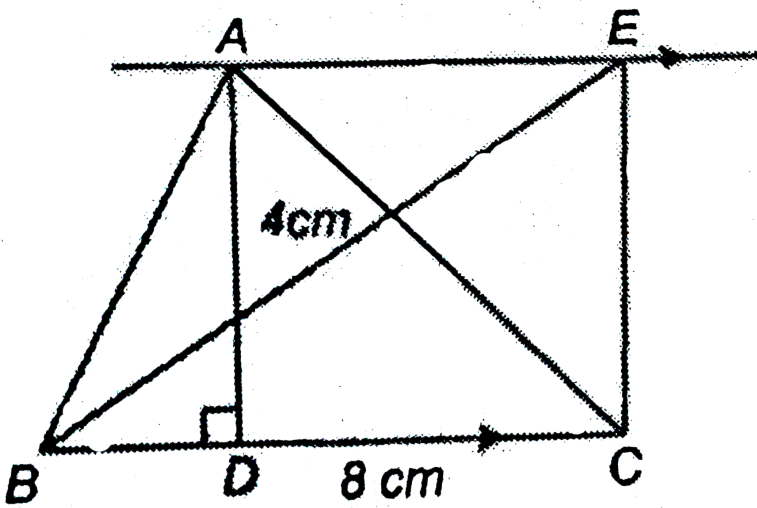
2. Find the area of trapezium in the given figure.



[▶ Watch Video Solution](#)

3. In the given figure, $BC = 8\text{cm}$ and $AD = 4\text{cm}$. $AD \parallel BC$,

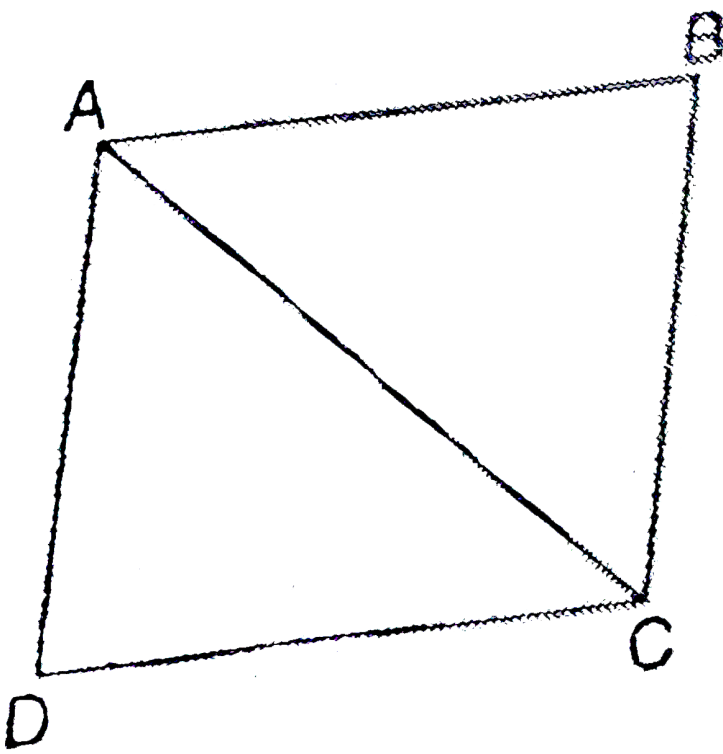
find the area of $\triangle EBC$



[Watch Video Solution](#)

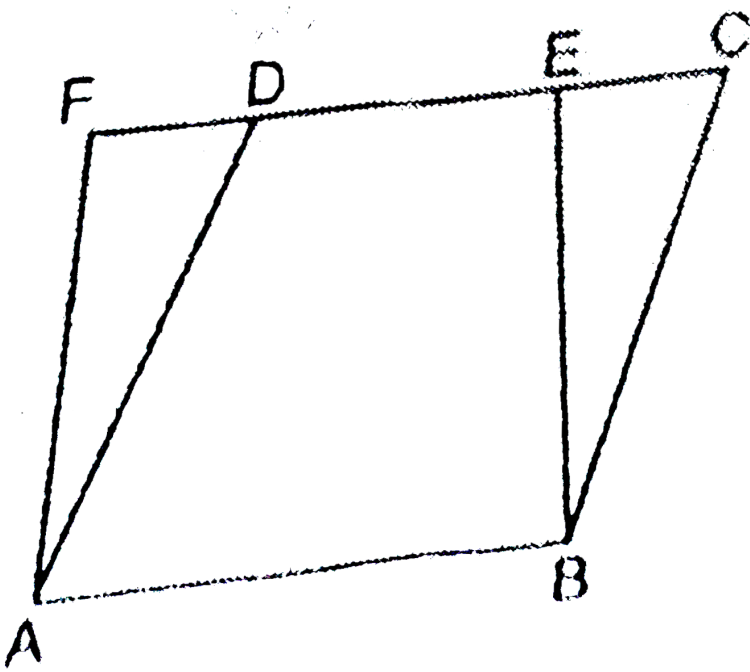
4. In the given figure, ABCD is a parallelogram whose area is 60cm^2 .

Find the area of $\triangle ACB$



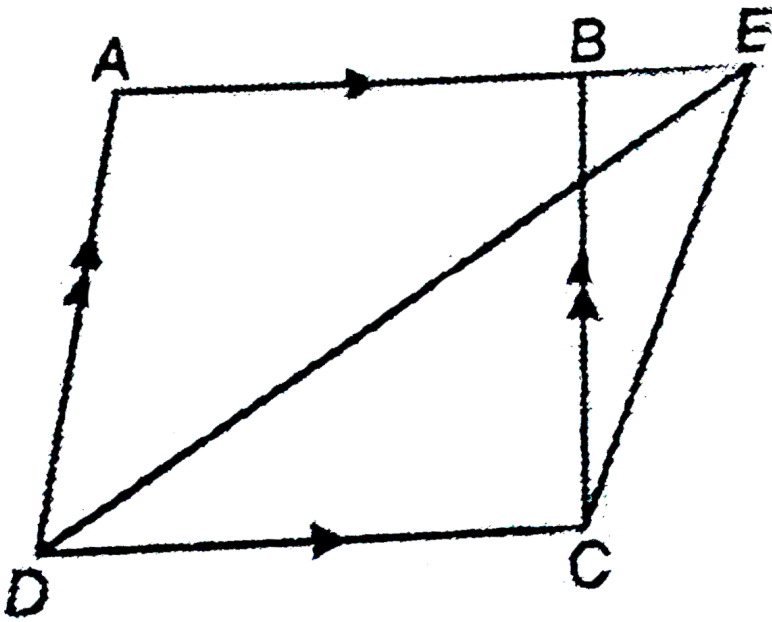
 [Watch Video Solution](#)

5. In the given figure, if the area of parallelogram ABCD is 40cm^2 , find the area of parallelogram ABEF



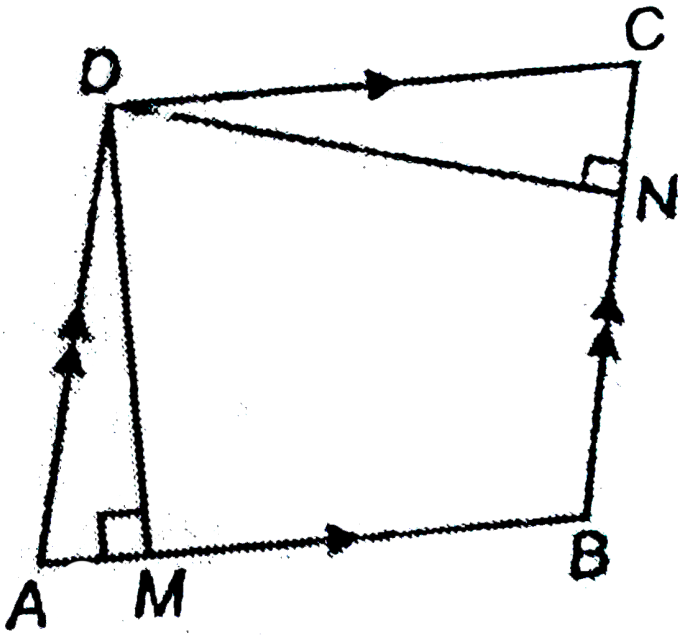
[▶ Watch Video Solution](#)

6. In the given figure, if the area of $\triangle EDC = 25\text{cm}^2$, find the area of parallelogram ABCD



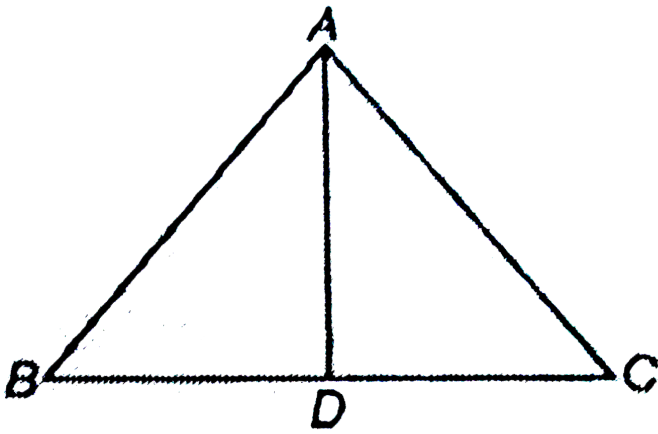
[Watch Video Solution](#)

7. In the adjoining figure, $AB = 8\text{cm}$, $DM = 6\text{cm}$ and $BC = 6\text{cm}$. Find the length of DN



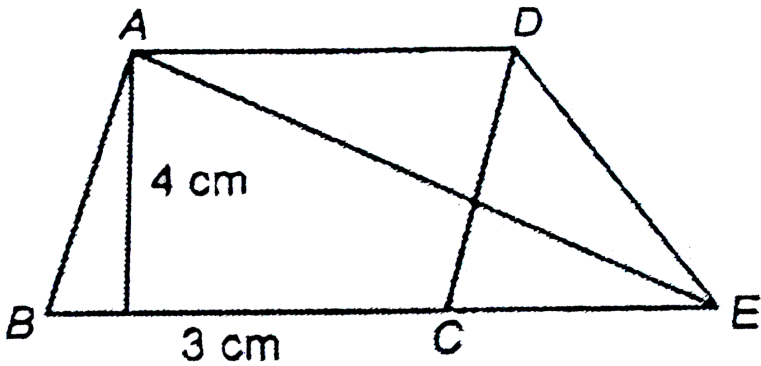
[▶ Watch Video Solution](#)

8. In the given figure AD is the median. If the area of $\triangle ABD = 10\text{cm}^2$, find the area of $\triangle ABC$



[▶ Watch Video Solution](#)

9. In the given figure, ABCD is a parallelogram. Find the area of $\triangle AED$



[▶ Watch Video Solution](#)

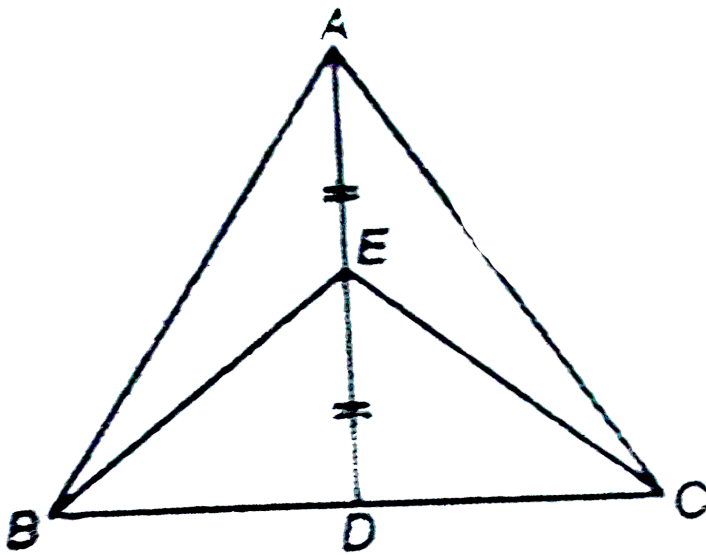
10. The area of a parallelogram is 180cm^2 . If the ratio of its base and altitude is 9:5, find the length of the base and corresponding altitude

 [Watch Video Solution](#)

Revision Exercise Short Answer Questions

1. In the adjoining figure, $BD = DC$ and $AE = ED$. Prove that

$$\text{area of } \triangle ACE = \frac{1}{4} \text{ area of } \triangle ABC$$

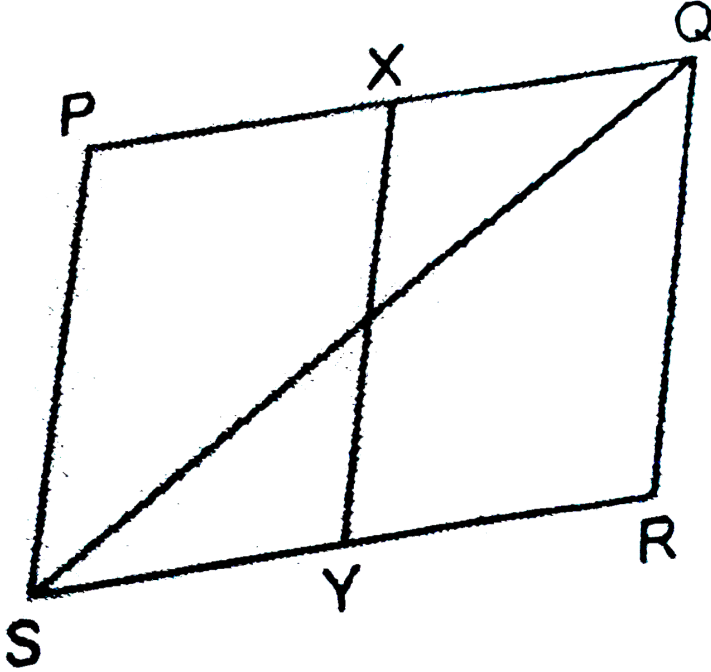


[▶ Watch Video Solution](#)

2. In a $\triangle ABC$, D , E and F are the mid-point of sides BC , CA and AB respectively. If area of $\triangle ABC = 16\text{cm}^2$, find the area of trapezium $FBCE$

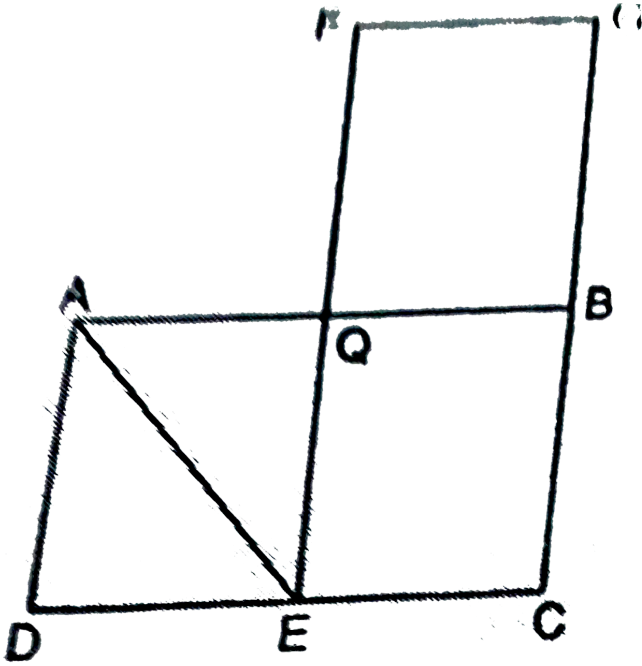
[▶ Watch Video Solution](#)

3. In the given figure, PQRS is a parallelogram. If X and Y are mid-point of PQ and SR respectively and diagonal SQ is joined. Find the ratio of area of (| | gm XQRY): area (ΔQSR)



[▶ Watch Video Solution](#)

4. In the given figure, ABCD and FECG are parallelograms equal in area. If $ar(\Delta AQE) = 12cm^2$, find $ar(| | gm FGBQ)$

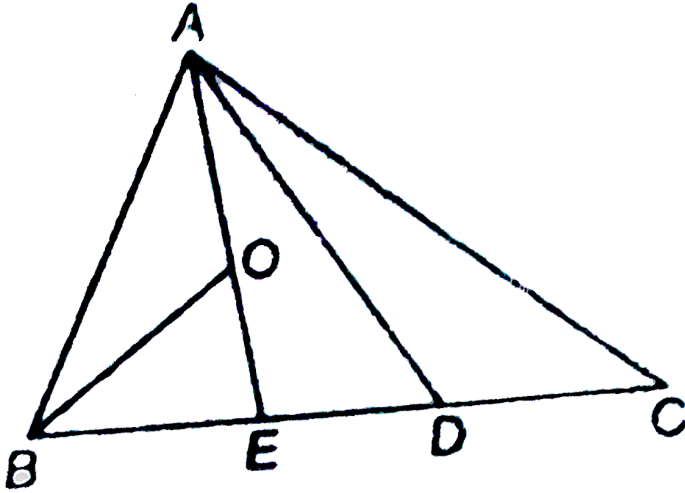


[▶ Watch Video Solution](#)

5. In a trapezium ABCD, $AB \parallel DC$, $AB = a$ cm, and $DC = b$ cm. If M and N are the midpoints of the nonparallel sides, AD and BC respectively then find the ratio of $\text{ar}(\text{DCNM})$ and $\text{ar}(\text{MNBA})$.

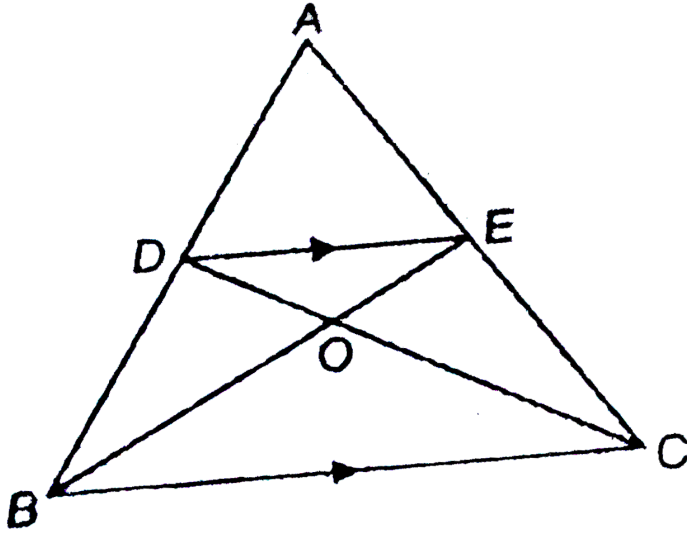
[▶ Watch Video Solution](#)

6. In the given figure, D is the mid-point of BC, E is the mid-point of BD and O is the mid-point of AE. Find the ratio of area of $\triangle BOE$ and $\triangle ABC$



[▶ Watch Video Solution](#)

7. In the adjoining figure, $DE \parallel BC$. Prove that area $(\triangle ACD) = \text{area} (\triangle ABE)$



[▶ Watch Video Solution](#)

8. The base BC of triangle ABC is divided at D so that $BD = \frac{1}{2} DC$.
Prove that area of $\triangle ABD = \frac{1}{3}$ of the area of $\triangle ABC$.

[▶ Watch Video Solution](#)

9. Prove that of all parallelograms of which the sides are given, the parallelogram which is rectangle has the greatest area.

 [Watch Video Solution](#)

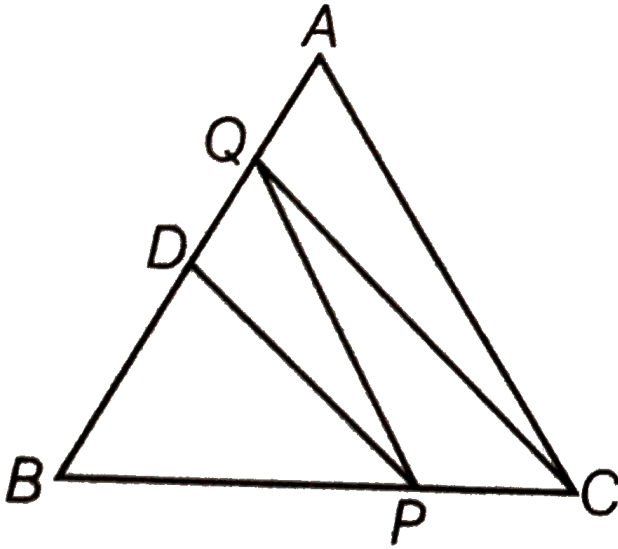
10. Show that the segment joining the mid-points of a pair of opposite sides of a parallelogram, divides it into two equal parallelograms.

 [Watch Video Solution](#)

Revision Exercise Long Answer Question

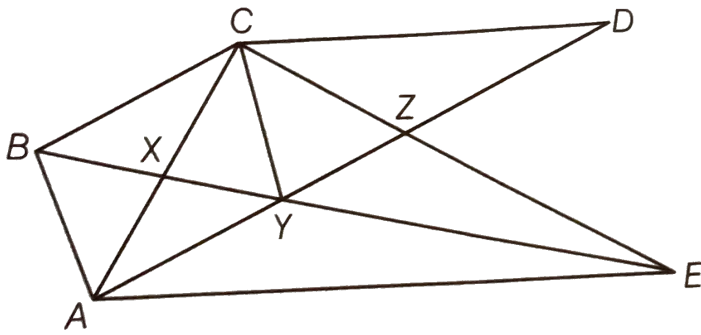
1. In $\triangle ABC$, D is the mid-point of AB and P is any point on BC . If $CQ \parallel PD$ meets AB and Q (shown in figure), then prove that

$$ar(\Delta BPQ) = \frac{1}{2}ar(\Delta ABC).$$



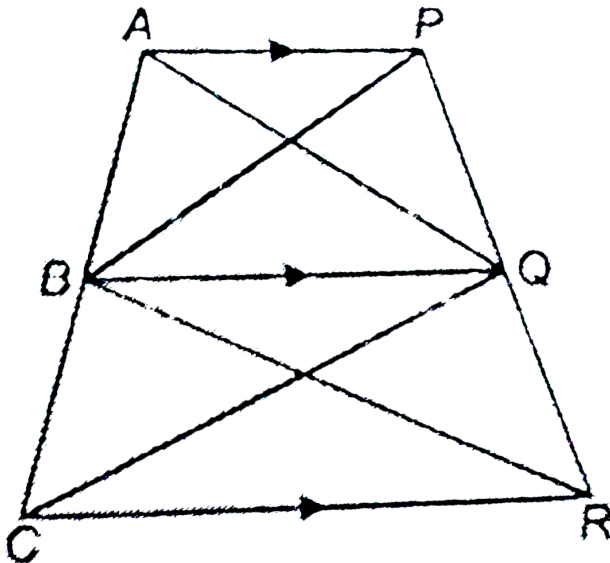
Watch Video Solution

2. In figure, $CD \parallel AE$ and $CY \parallel BA$. Prove that $ar(\Delta CBX) = ar(\Delta AXY)$.



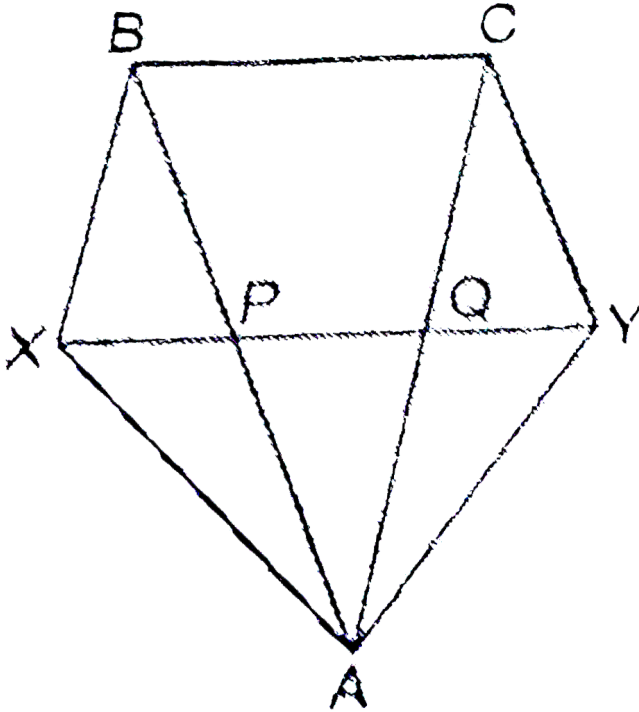
 [Watch Video Solution](#)

3. In the given figure, $AP \parallel BQ \parallel CR$. Prove that $ar(\Delta AQC) = ar(\Delta PBR)$



 Watch Video Solution

4. In the given figure, $BC \parallel XY$, $BX \parallel CA$ and $AB \parallel YC$. Prove that $\text{area}(\triangle ABX) = \text{area}(\triangle ACY)$



 Watch Video Solution

5. Show that the diagonals of a parallelogram divide it into four triangles of equal area.



[Watch Video Solution](#)