MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

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 the altitude

A. 2

B. 4

C. 8

D. 16

Answer: C

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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

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3. The diagonals of a parallelogram $ABCD$ intersect at O. A line through O meets AB in $x\ and\ CD$ in Y. Show that $ar\ (AXYX) = \frac{1}{2}\left(ar||^{gm}\ ABCD\right)$

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

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5. The diagonals AC and BD of a quadrilateral ABCD intersect at point 'O'. If BO = OD, then prove that the areas of ΔABC and ΔADC are equal

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

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7. The vertices of a rectangle PQRS are joined from an interior point 'O'. Prove that the sum of the area of two opposite triangles so formed is equal to the sum of the areas of remaining two triangles

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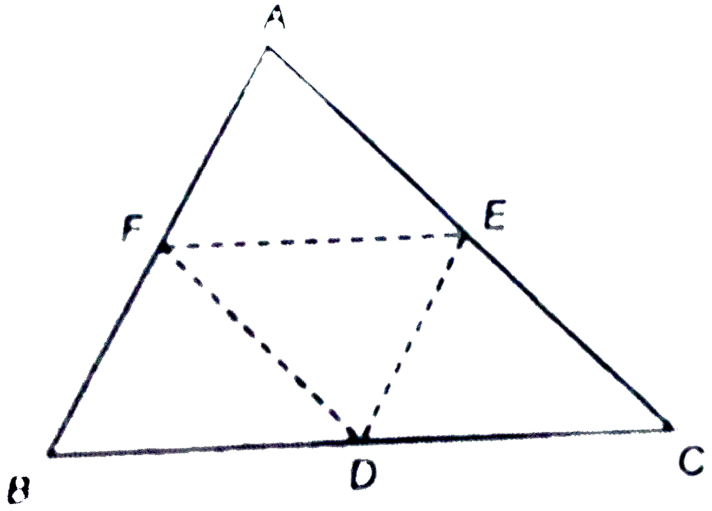
8. In the adjoining figure D, E and F are the mid-points of the sides BC, CA and AB respectively of ΔABC. Prove that:

(i) $\square BDEF$ is a parallelogram

(ii) area of $\Delta DEF = \frac{1}{4} \times$ area of ΔABC

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



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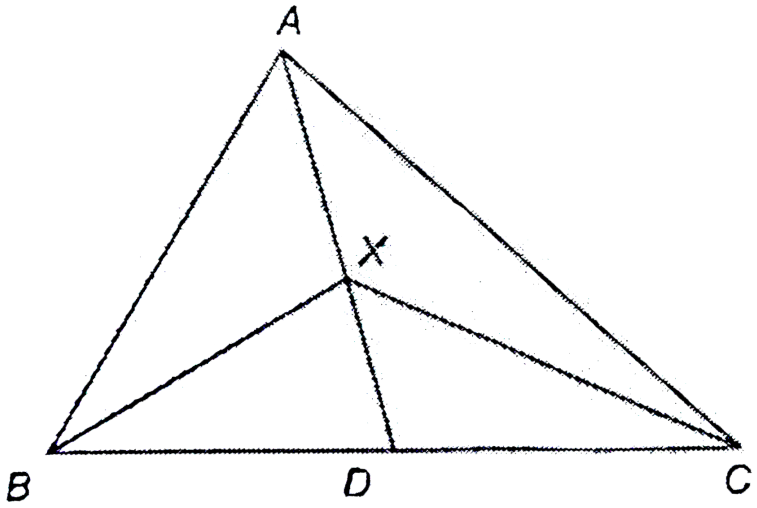
9. In the adjoining figure, AD is the median of ΔABC and X be any point on side AD. Prove that:

area $(\Delta ABX) =$ area (ΔACX)



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10. The medians of ΔABC intersect at point G. Prove that:

area of $\Delta AGB = \frac{1}{3} \times$ area of ΔABC

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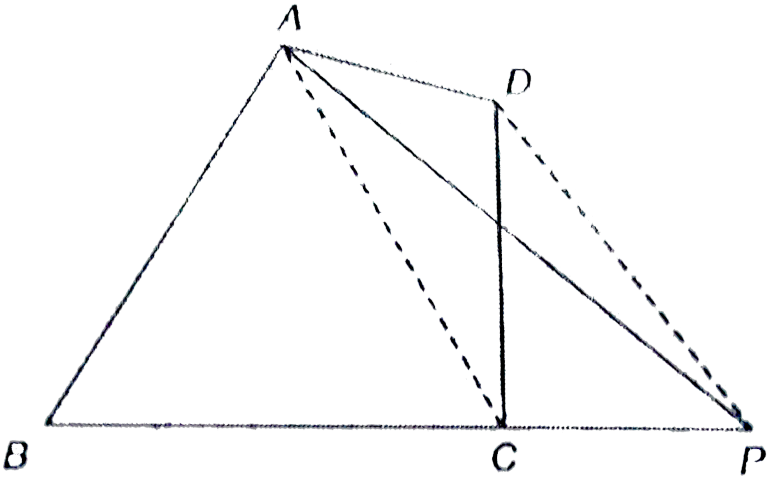
11. In the figure, ABCD is a quadrilateral. A line DP drawn parallel to diagonal AC from point D, meet BC produced at P. Prove that:

area of $\Delta ABP =$ area of $\square ABCD$



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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 $ar\,(ABE) = ar\,(ACF)$

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

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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 $ar\ (ABE) = ar\ (ACF)$

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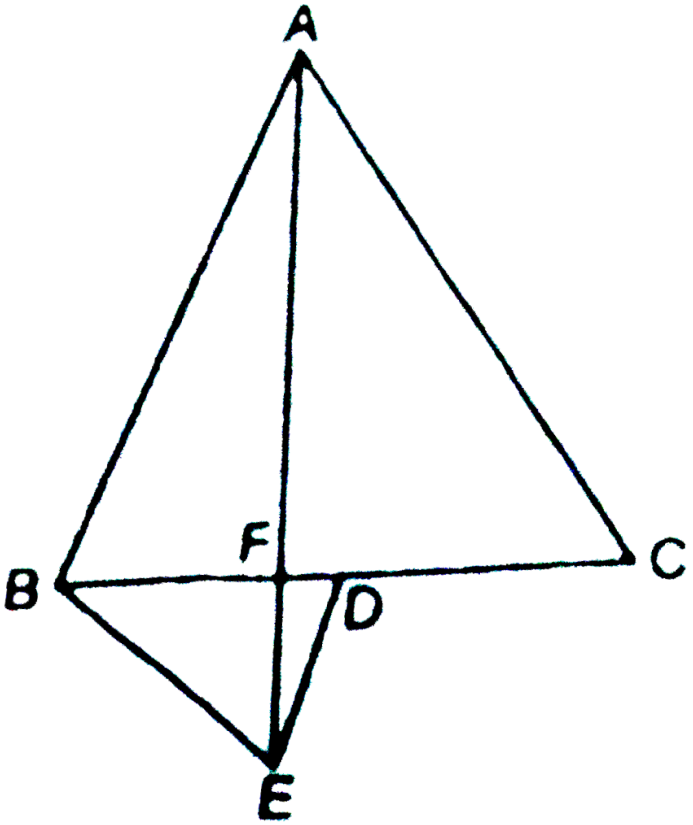
15. In the figure, ABC and BDE are two equilateral triangle such that D is the mid-point of BC. If AE intersects BC at F, show that:

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

(iii) $ar(\Delta ABC) = 2ar(\Delta BEC)$ (iv) $ar(\Delta BFE) = ar(\Delta AFD)$

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



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16. ABCD is a parallelogram. X and Y are mid-points of BC and CD. Prove that $ar(\ \triangle\ AXY) = \frac{3}{8}ar(\ |\ |^{gm}\ ABCD)$

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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 $ar(EFGH) = \frac{1}{2}AR\ (ABCD)$

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2. In Figure, P is a point in the interior of a parallelogram $ABCD$. Show that $ar(APB) + ar(PCD) = \frac{1}{2}ar\ (||^{gm}ABCD)$

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

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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

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4. P and Q are any two points lying on the sides DC and AD respectively of a parallelogramABCD. Show that $ar\,(APB) = ar\,(BQC)$.

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5. A villager Itwaari has a plot of land of the shape of a quadrilateral. The Gram Panchayat of the village decided to take over some portion of his plot from one of the corners to construct a Health Centre. Itwaari agrees to the above proposal w

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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.

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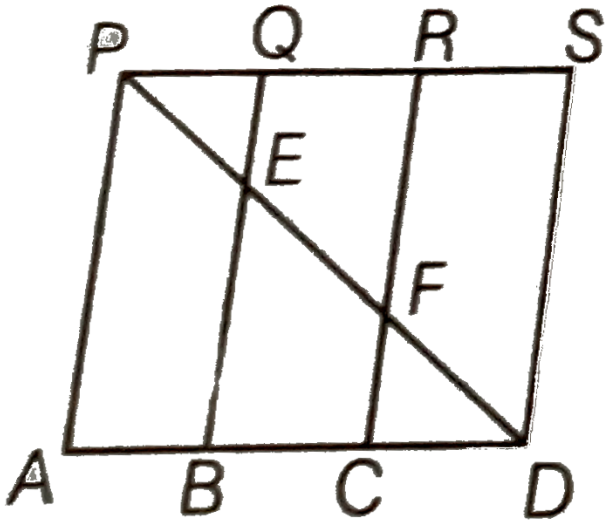
7. In the figure, PSDA is a parallelogram. Points Q and R are taken on PS such that $PQ = QR = RS$ and $PA||QB||RC$. Prove that

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



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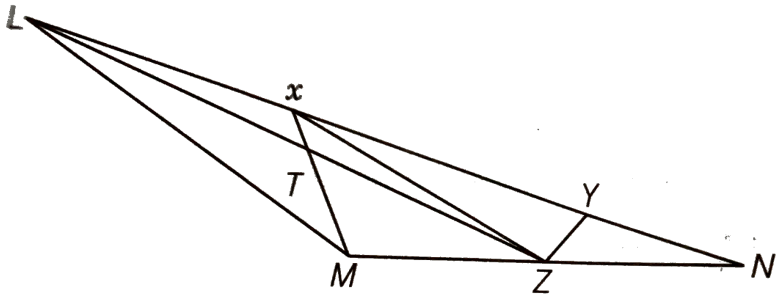
8. X and Y are points on the side LN of the triangle LMN such that LX = XY = YN. Through X, a line is drawn parallel to LM to meet MN

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



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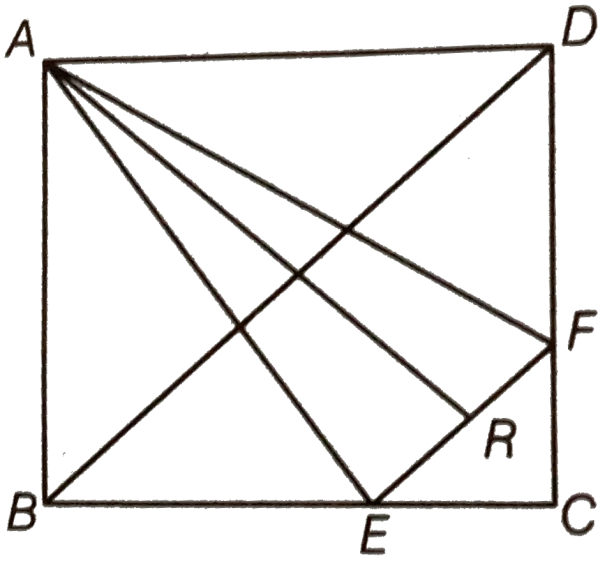
9. ABCD is a square. E and F are respectively the mid-points of BC and CD. If R is the mid-point of EF, prove that

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



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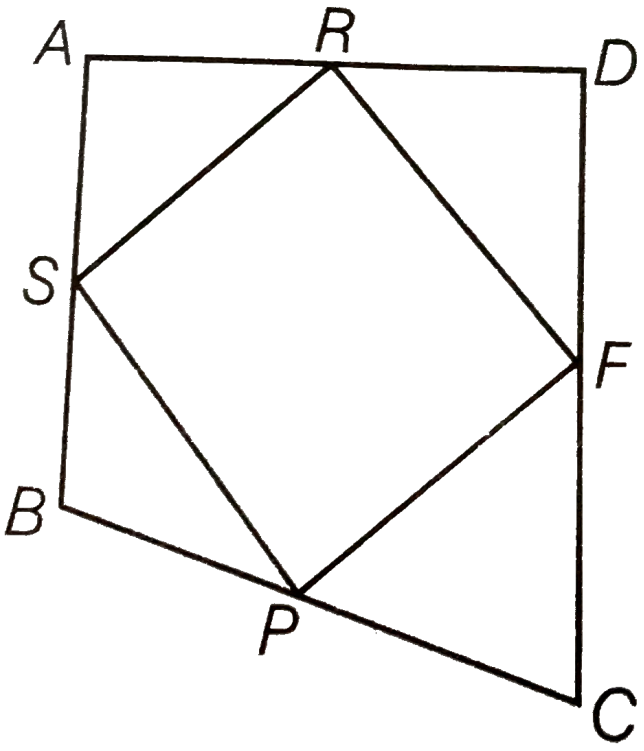
10. If the mid-points of the sides of a quadrilateral are joined in order, prove that the area of the parallelogram, so formed will be

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



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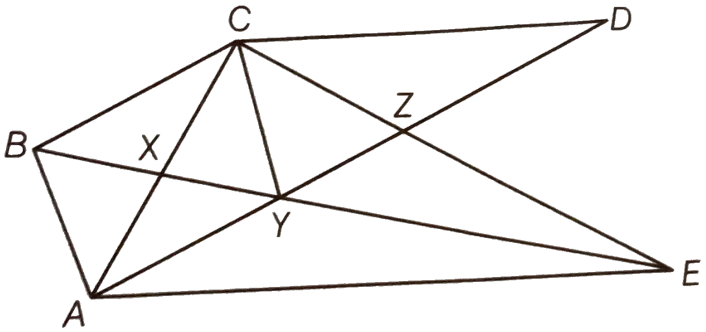
11. In figure, $CD \| AE$ and $CY \| BA$. Prove that $ar(\Delta CBX) = ar(\Delta AXY)$.



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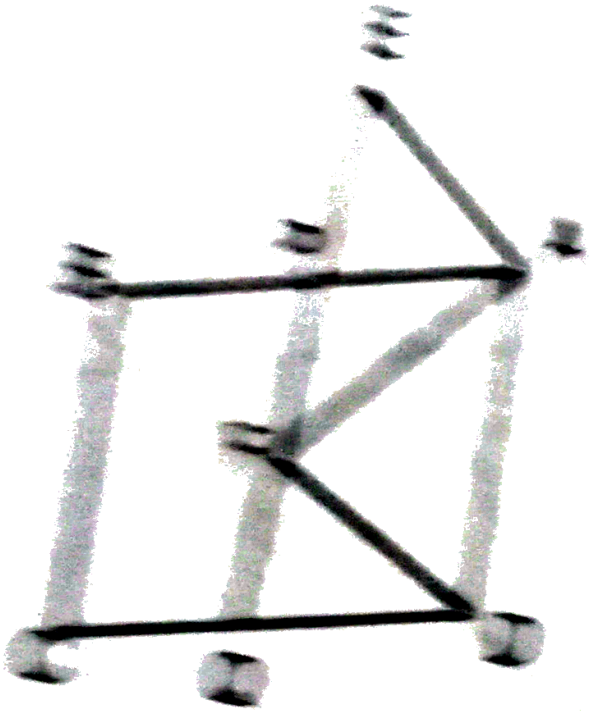
12. In figure, ABCD and AEFD are two parallelograms. Prove that $ar(\Delta PEA) = ar(\Delta QFD)$.



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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.

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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.

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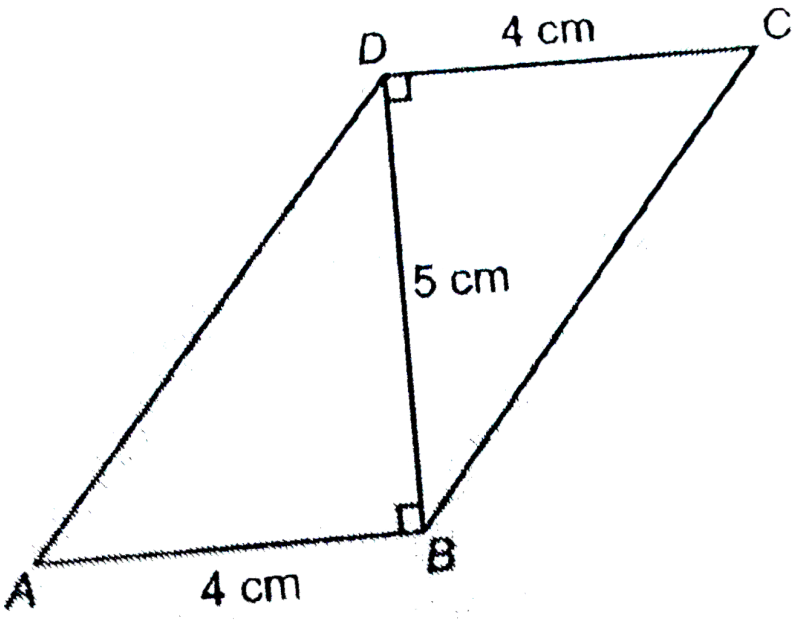
3. In the adjoining figure, prove that ABCD is a parallelogram. Also find its area.



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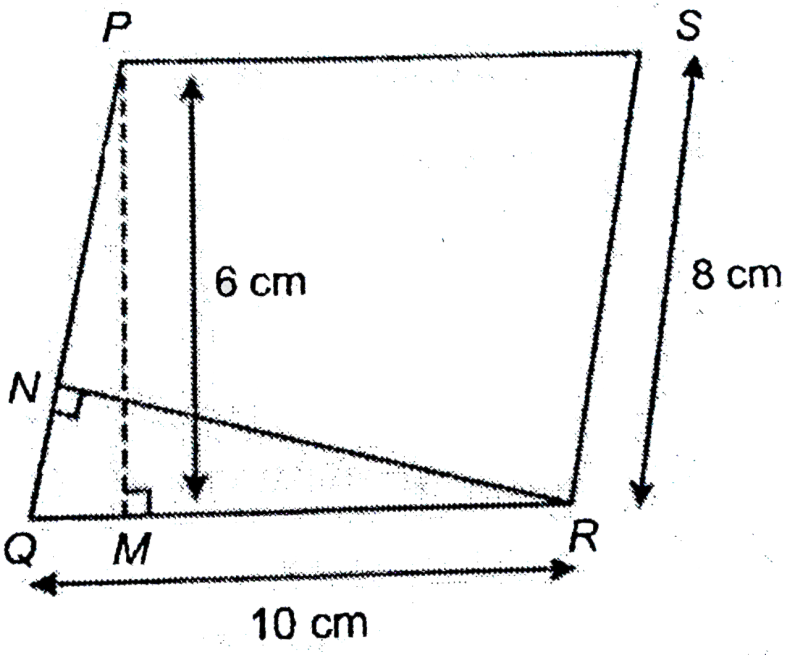
4. In the figure, find the length of RN.



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

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

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

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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.

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

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10. Show that the area of a rhombus is half the product of the lengths of its diagonals. GIVEN : A rhombus $ABCD$ whose diagonals AC and BD intersect at O. TO PROVE : $ar(rhombus ABCD) = \frac{1}{2}(AC x BD)$

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11. ΔABC and ΔDBC are on same base BC and their vertices A and D are on opposite sides of BC. It is given that:

area of $\Delta ABC =$ area of ΔDBC

Prove that BC bisects the line segment AD.

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

area of $\Delta AOB +$ area of $\Delta COD =$ area of $\Delta AOD +$ area of ΔBOC

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

area of $\Delta AOD =$ area of ΔAOB

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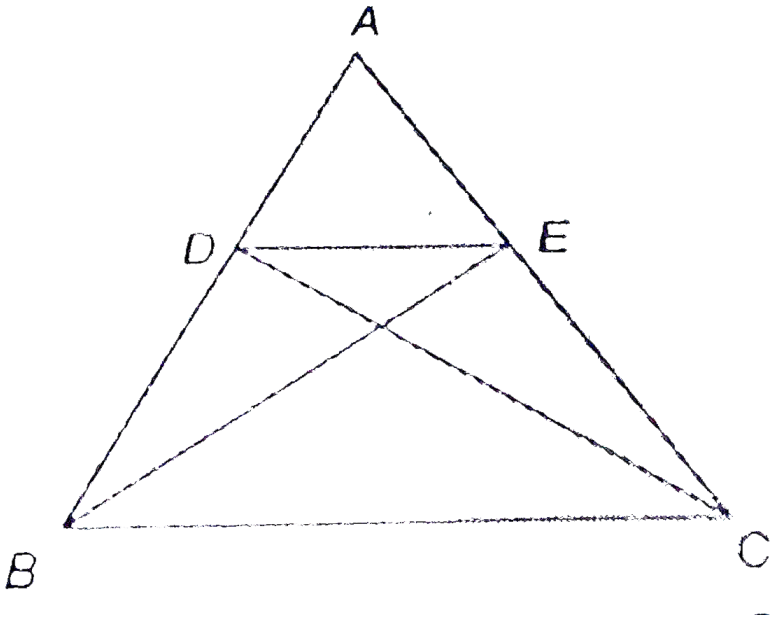
14. In the adjoining figure, D and E are the points on the sides AB and AC respectively of ΔABC and area of $\Delta BCE =$ area of ΔBCD.

Prove that $DE \mid\mid BC$



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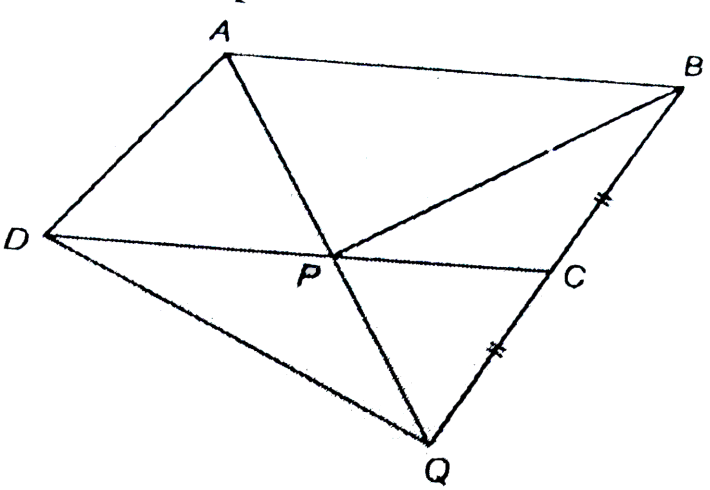
15. In the adjoining figure, ABCD is a parallelogram. Prove that : area of $\Delta BPC =$ area of ΔDPQ



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

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

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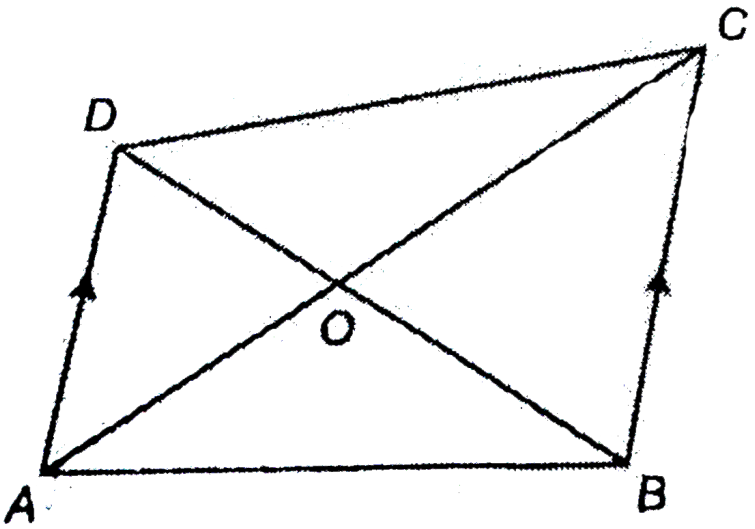
17. In the adjoining figure, ABCD is a quadrilateral in which $AD \| BC$. AC and BD intersect each other at point 'O'. Prove

that:

area of $\Delta COD =$ area of ΔABO



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18. D is a point on the base BC of ΔABC. AD is produced upto E such that DE = AD. Prove that:

area of $\Delta BCE =$ area of ΔABC

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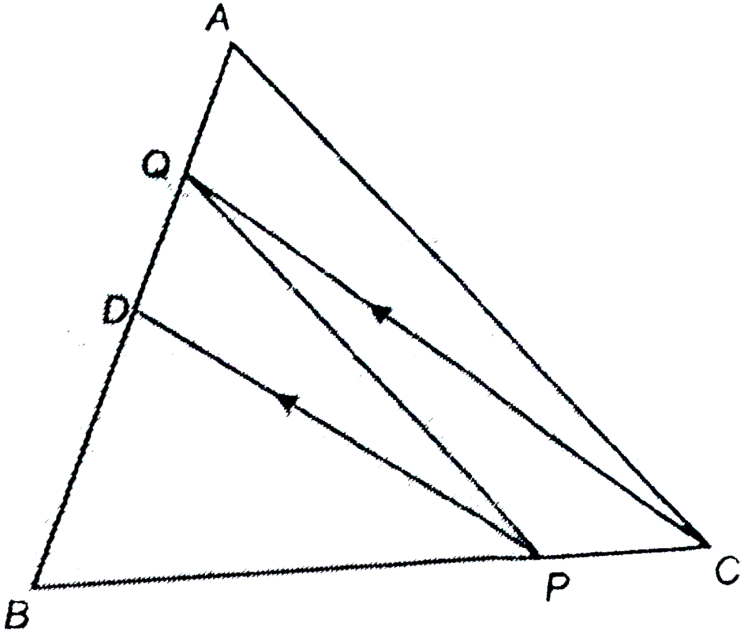
19. In the adjoining figure, D is the mid-point of side AB of ΔABC and P be any point on side BC. If $CQ \mid\mid PD$, then prove that:

area of $\Delta BPQ = \frac{1}{2} \times$ area of ΔABC



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

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

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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 $(\Delta AQD) =$ area of $\Delta APD +$ area of ΔCPB

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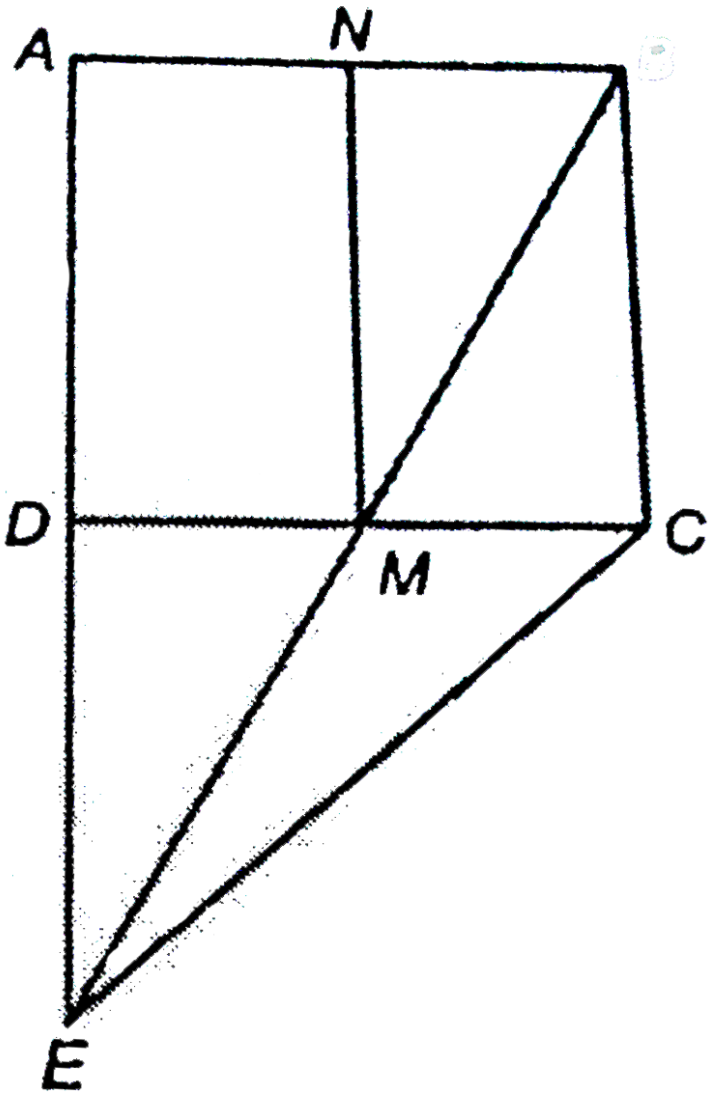
22. In the given figure, M and N are the mid-points of the sides DC and AB respectively of the parallelogram ABCD. If the area of parallelogram is $48cm^2$

(i) State the area of ΔBEC

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

BEC.



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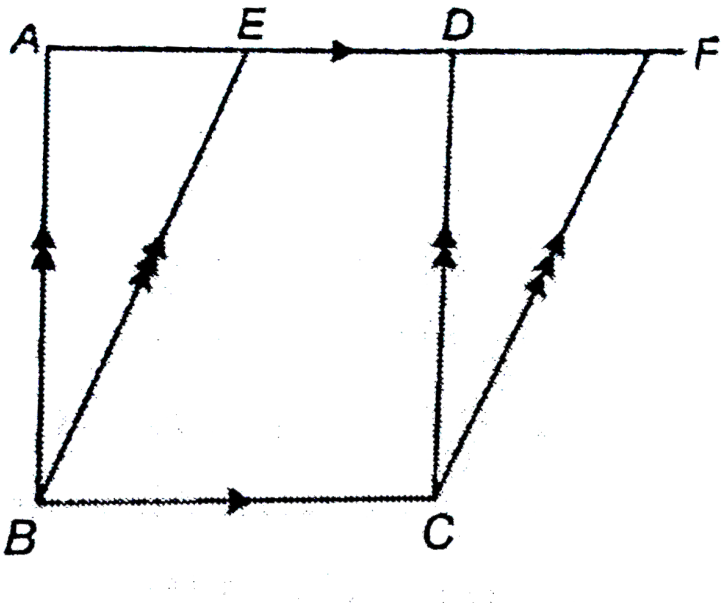
23. ABCD and BCFE are parallelgorams. If area of triangle $EBC = 480cm^2$, $AB = 30cm$ and $BC = 40cm$. Calculate

(i) area of parallelogram ABCD

(ii) area of parallelogram BCEF

(iii) length of altitude from A on CD.

(iv) area of ΔECF



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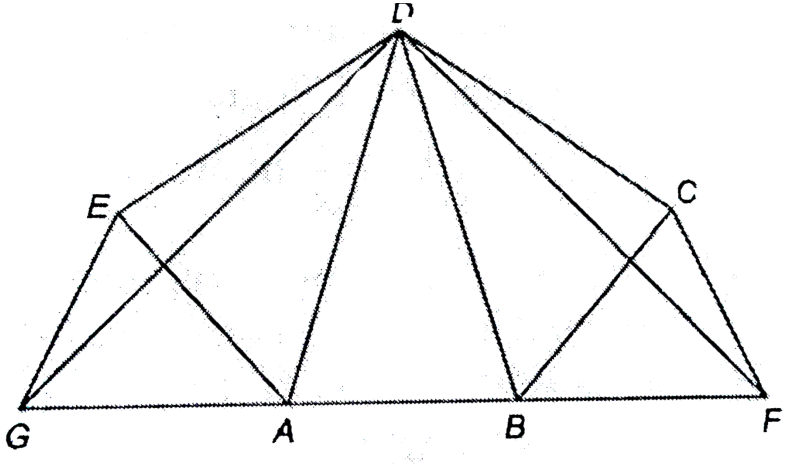
24. The given figure shows a pentagon ABCDE.EG drawn parallel to DA meets BA produced at G and CF drawn parallel to DB meets AB produced at F. Prove that the area of pentagon ABCDE is equal to the area of triangle GDF.



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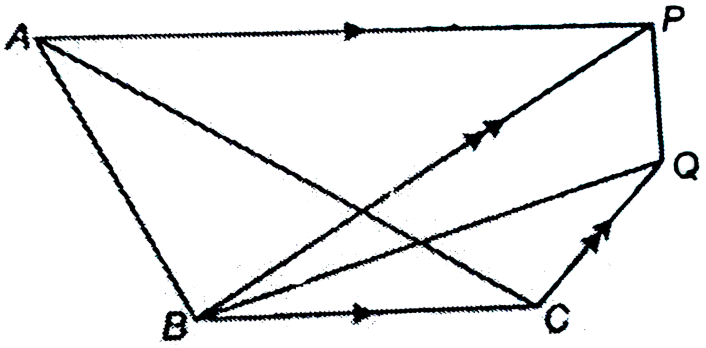
25. In the given figure, AP is parallel to BC, BP is parallel to CQ. Prove that the areas of triangle ABC and BQP are equal



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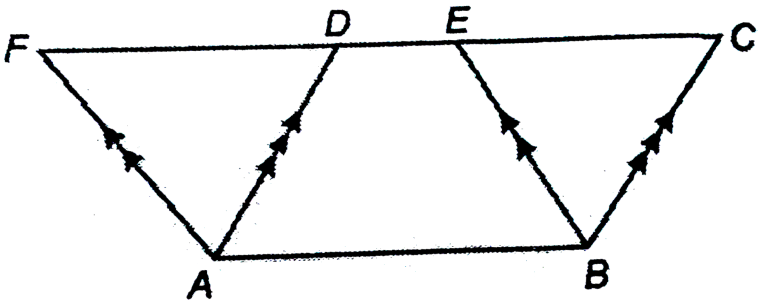
26. The following figure shows two paralelograms ABCD and ABEF prove that

area of $\Delta ADF = areaof\Delta BCE$



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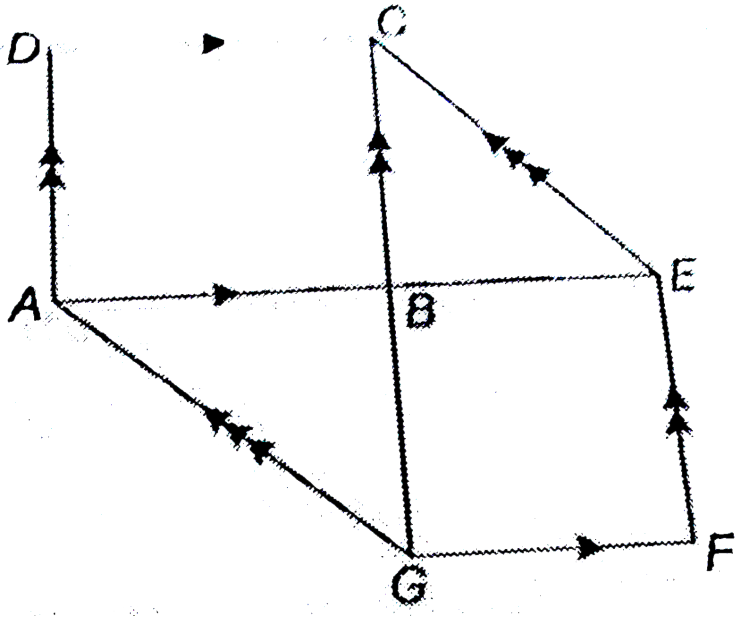
27. The side AB of a parallelogram ABCD is produced to any point E. A line through A and parallel to CE meets CB produced at G and then parallelogram EBGF is completed (see the figure). Prove that area of $||gmABCD =$ area of $||gmBEFG$.



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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

$ar(\Delta ADF) = ar(ABFC)$.

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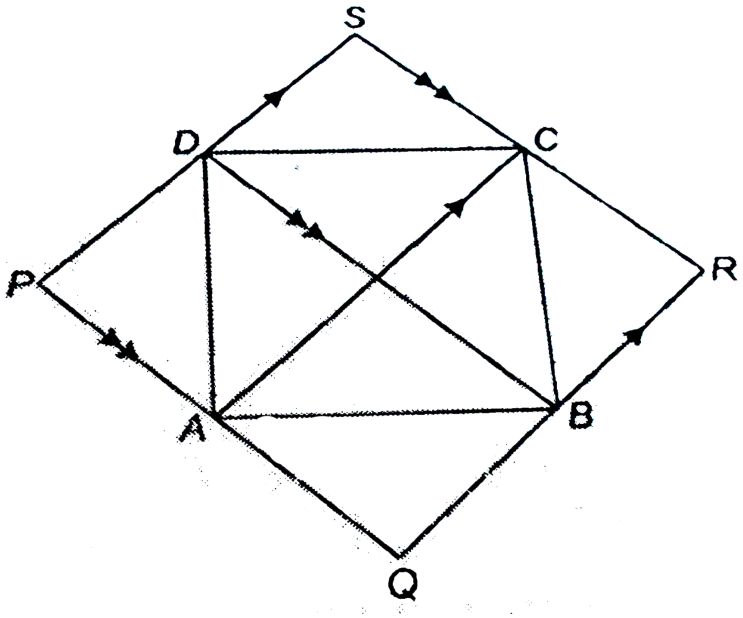
29. In the following figure, $AP||PS||QR$ and $PQ||DB||SR$, prove that area of quadrilateral $PQRS = 2 \times$ area of quadrilateral ABCD



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

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

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

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33. ABCD is a parallelogram. P and Q are the mid-point of sides AB and AD resepctively. Prove that area of $\Delta APQ = \frac{1}{8}$ of area of parallelogram ABCD

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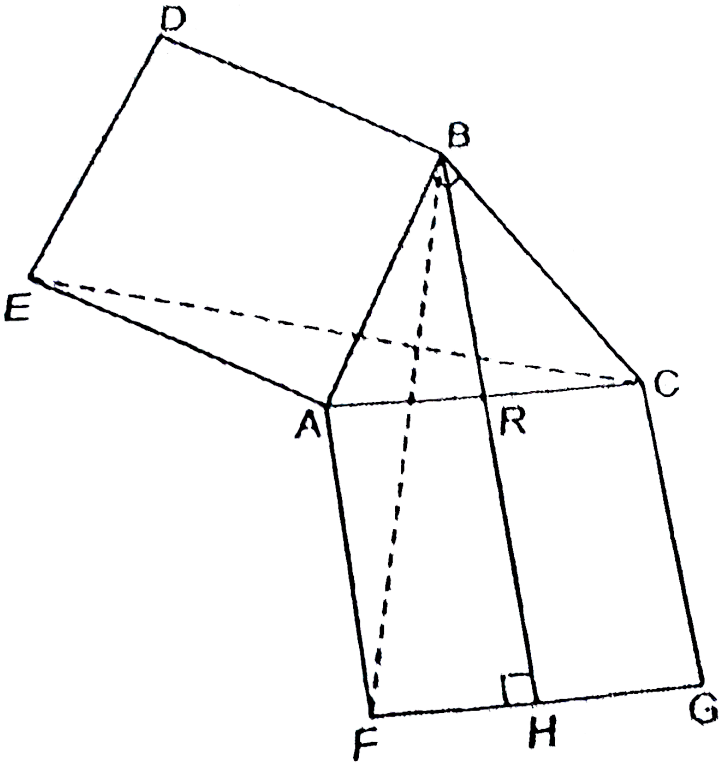
34. In the given figure, squares ABDE and AFGC are drawn on the side AB and the hypotenuse AC of the right angle triangle ABC. If BH is perpendicular to FG, Prove that

(i) $\Delta EAC \cong \Delta BAF$

(ii) area of square ABDE= area of rectangle ARHF.



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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

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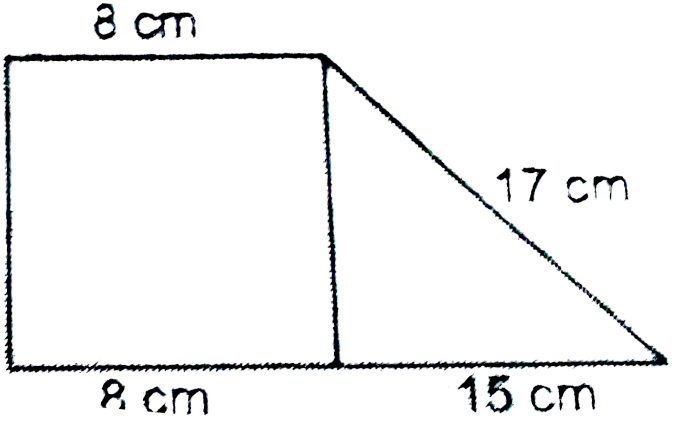
2. Find the area of trapezium in the given figure.



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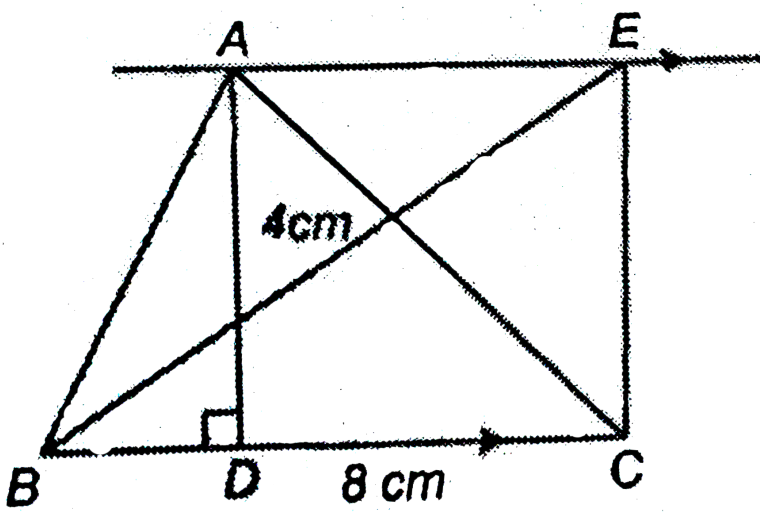
3. In the given figure, $BC = 8cm$ and $AD = 4cm$. $AD \mid\mid BC$, find the area of ΔEBC



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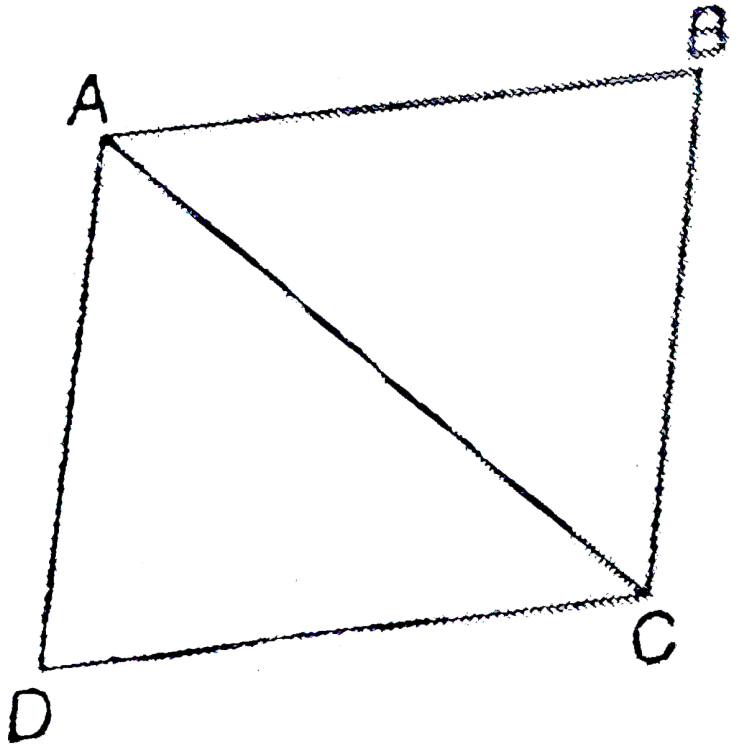
4. In the given figure, ABCD is a parallelogram whose area is $60cm^2$.

Find the area of ΔACB



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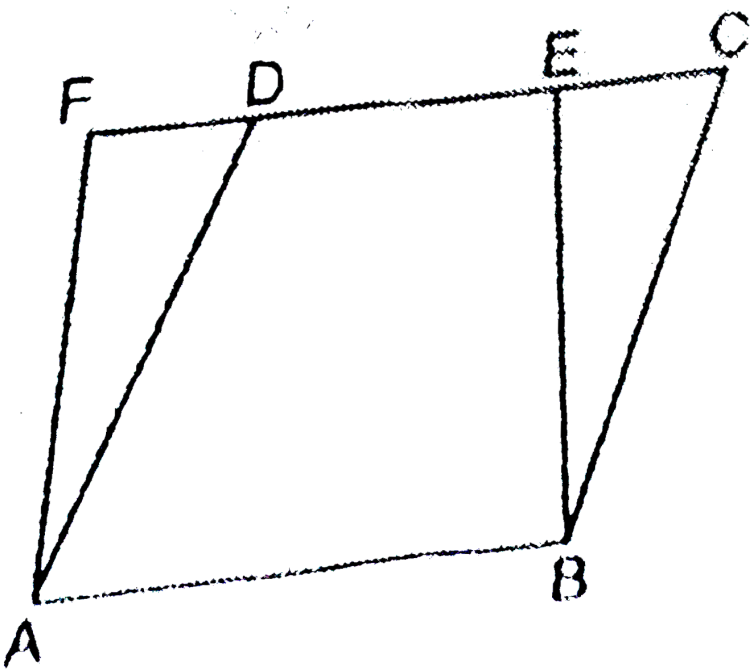
5. In the given figure, if the area of parallelogram ABCD is $40cm^2$, find the area of parallelogram ABEF



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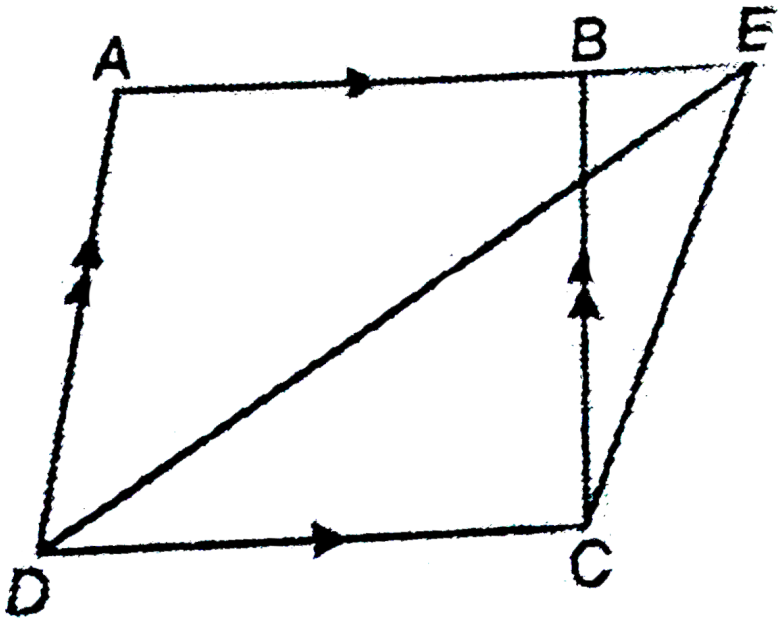
6. In the given figure, if the area of $\Delta EDC = 25cm^2$, find the area of parallegram ABCD



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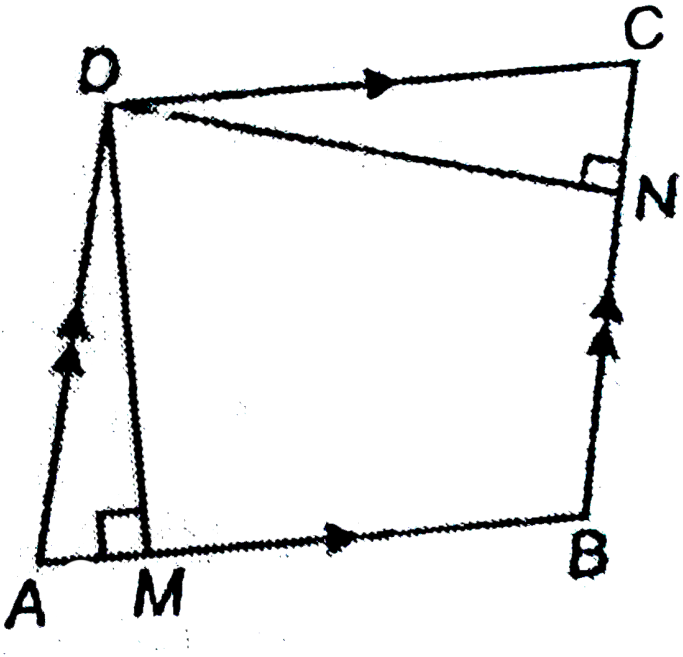
7. In the adjoining figure, $AB = 8cm$, $DM = 6cm$ and $BC = 6cm$. Find the length of DN



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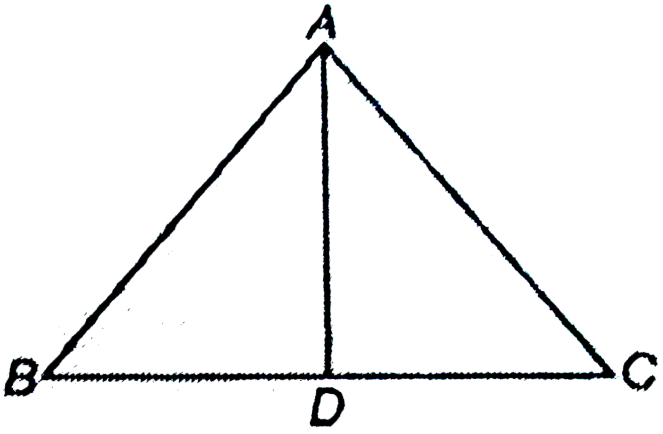
8. In the given figure AD is the median. If the area of $\Delta ABD = 10cm^2$, find the area of ΔABC



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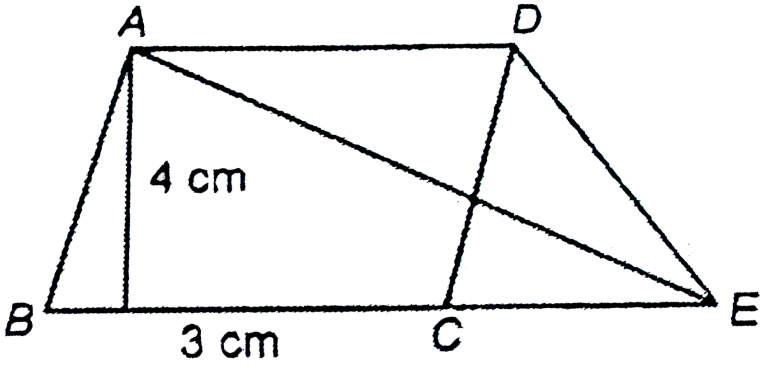
9. In the given figure, ABCD is a parallelogram. Find the area of ΔAED



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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

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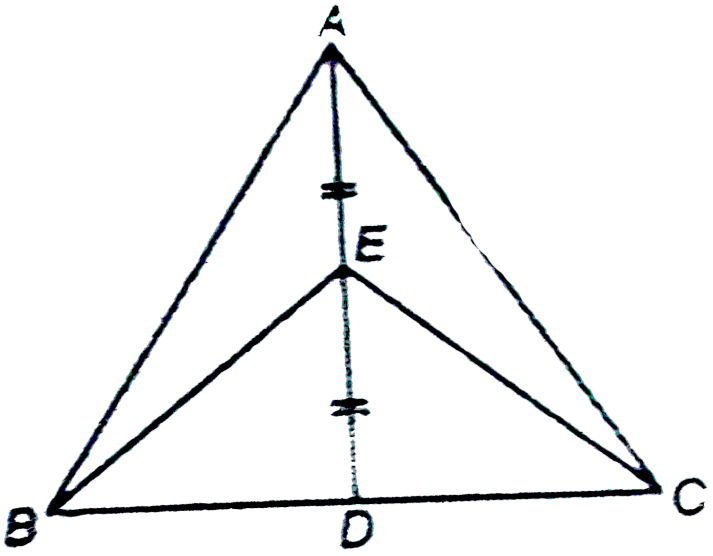
Revision Exercise Short Answer Questions

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

area of $\Delta ACE = \frac{1}{4}$ area of ΔABC



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

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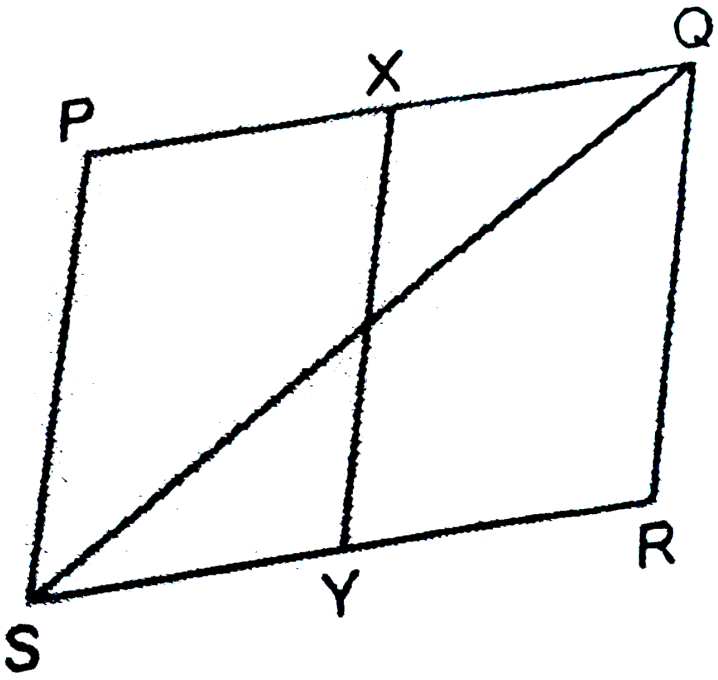
3. In the given figure, PQRS is a parallelogram. If X and Y are mid-point of PQ and SR respectively and diagonal SQ is joined. Find the ratio of area of $(\ ||\ gmXQRY)$: $\text{area}\ \ (\Delta QSR)$



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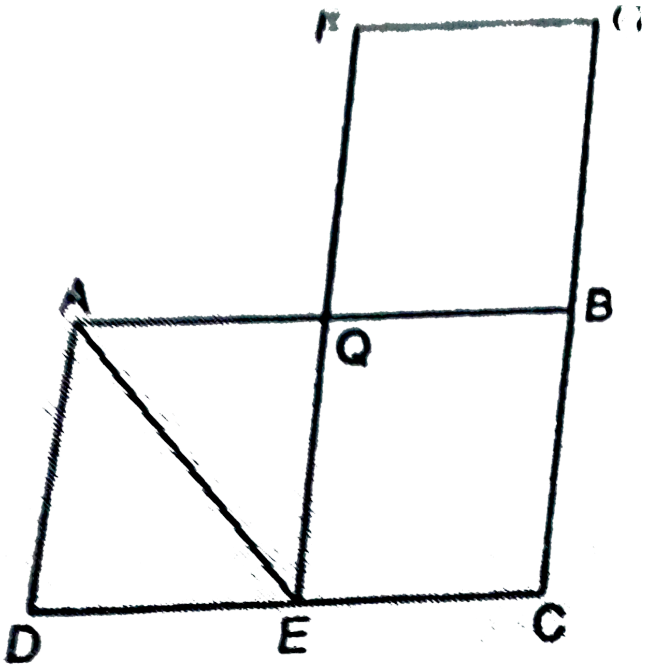
4. In the given figure, ABCD and FECG are parallelograms equal in area. If $ar(\Delta AQE) = 12cm^2$, find $ar(\ ||^{gm}\ FGBQ)$



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5. In a trapezium ABCD, AB || 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 ar(DCNM) and ar(MNBA).

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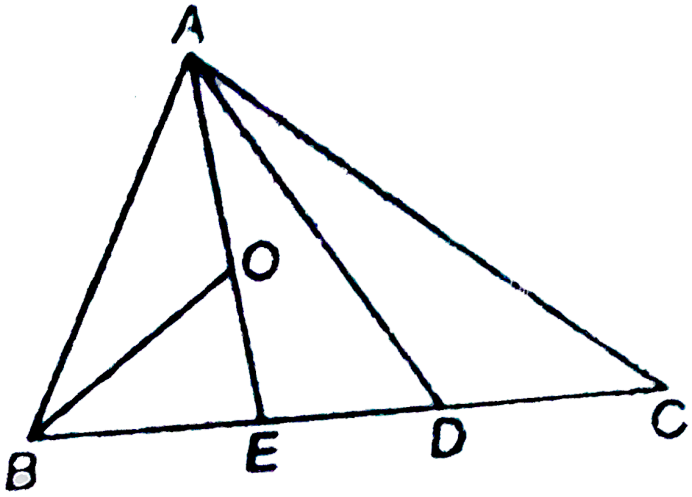
6. In the given figure, D is the mid-point of BC, E is the mid-point of BD and O is the mid-point of AE. Find the ratio of area of ΔBOE and ΔABC



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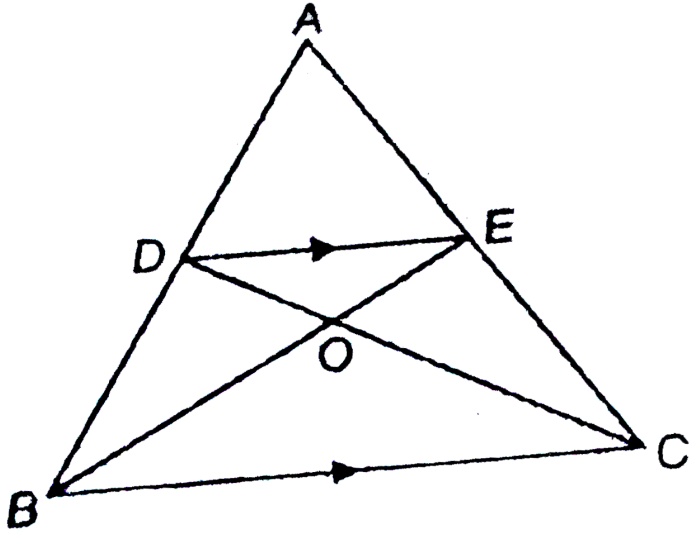
7. In the adjoining figure, $DE \| BC$. Prove that area $(\Delta ACD) =$ area (ΔABE)



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8. The base BC of ΔABC is divided at D, so that $BD = \frac{1}{2}DC$ .Prove that $ar(\Delta ABD) = \frac{1}{3}ar(\Delta ABC)$

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

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

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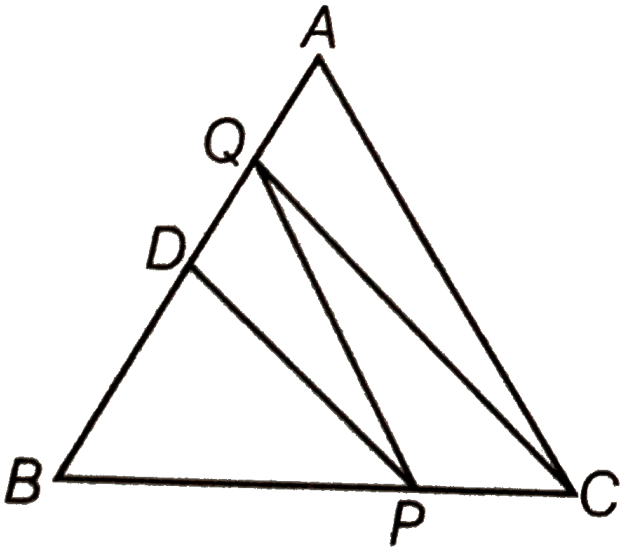
Revision Exercise Long Answer Question

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

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



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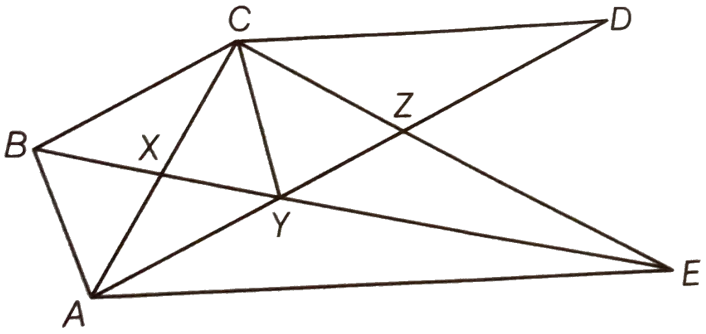
2. In figure, $CD \| AE$ and $CY \| BA$. Prove that $ar(\Delta CBX) = ar(\Delta AXY)$.



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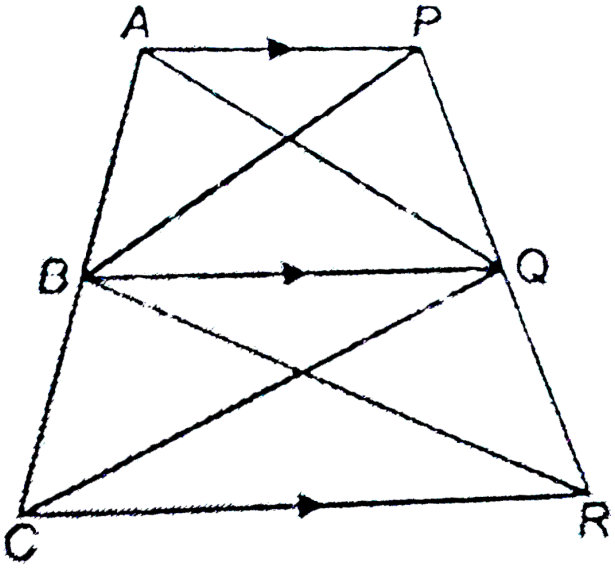
3. In the given figure, $AP||BQ||CR$. Prove that $ar(\Delta AQC) = ar(\Delta PBR)$



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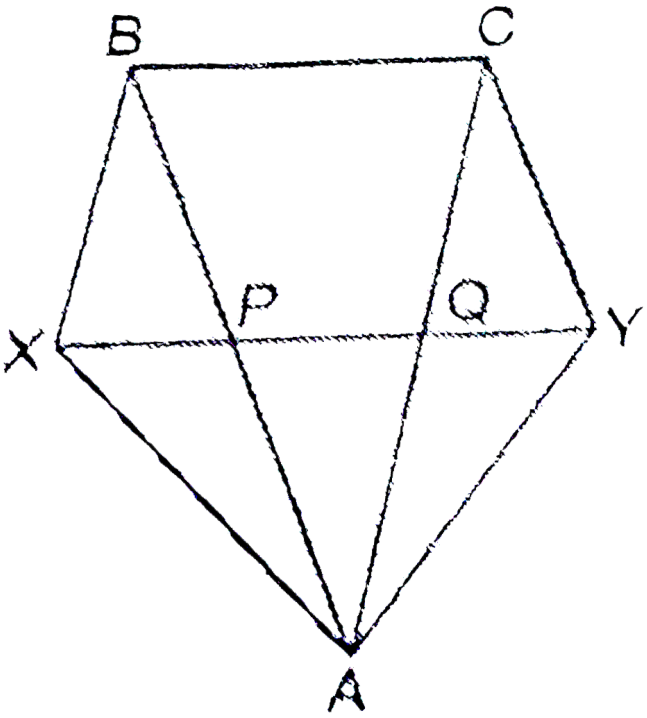
4. In the given figure, $BC||XY, BX||CA$ and $AB \mid \mid YC$. Prove that area $(\Delta ABX) =$ area (ΔACY)



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

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