doubtnut
India's Number 1 Education App

MATHS

BOOKS - ICSE

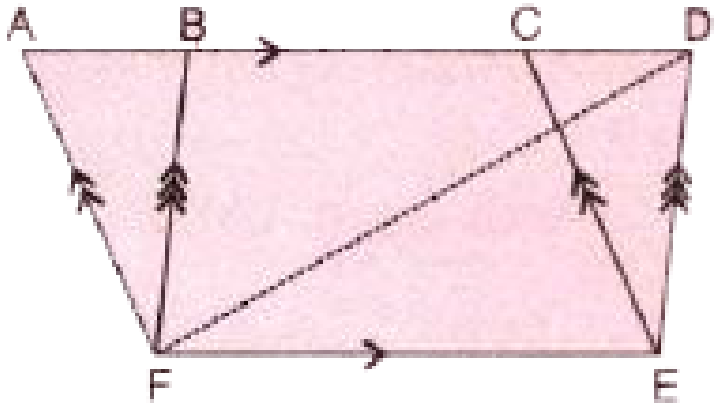
AREA THEOREMS

Example

1. In the adjoining figure, area of parallelogram AFEC is $140cm^2$. State, giving reason, the area of :

(i) parallelogram BFED.

(ii) triangle BFD.



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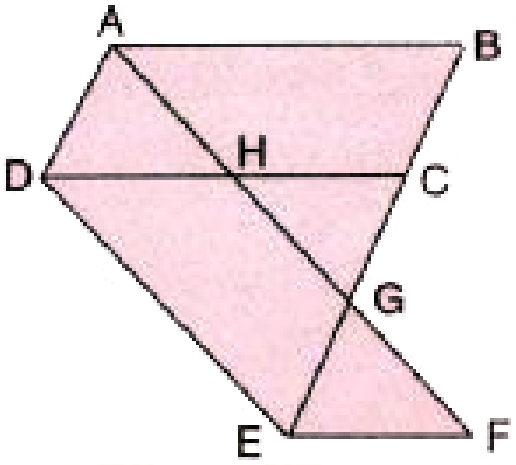
2. In a given figure, $AB||DC||EF, AD||BE \text{and} DE||AF.$

Prove that the area of prallelogram DEFH is

equal to the area of parallelogram ABCD.



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3. P is any point inside a parallelogram ABCD.

Prove that :

Area $(\Delta APB) + Area(\Delta CPD)$

$= Area(\Delta APD) + Area(\Delta BPC)$

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4. Prove that a median divides a triangle into two triangles of equal area.

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5. In ΔABC, AD divides BC in thr ratio $m:n$. Show that $\frac{\text{Area}(\Delta ABD)}{\text{Area}(\Delta ADC)} = \frac{m}{n}$

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6. In triangle ABC, D is a point in side BC such that $2BD = 3DC$. Prove that the area of triangle ABD = $\frac{3}{5} \times \text{Area of} \Delta ABC$

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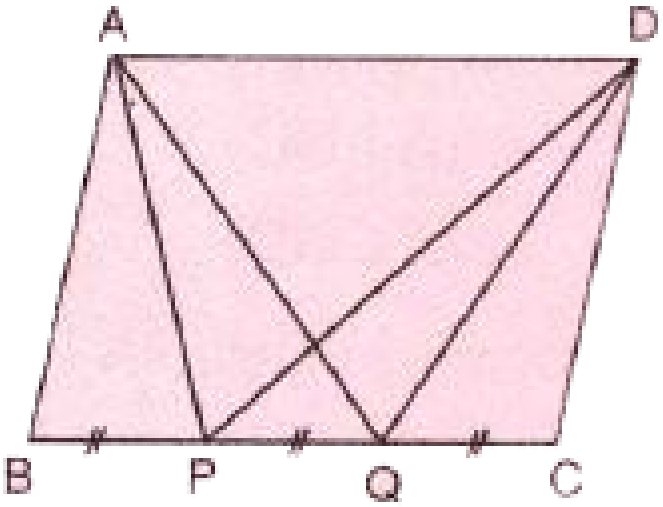
7. In parallelogram ABCD, points P and Q lie on side BC and trisect it. Prove that :

$ar.(\Delta APQ) = ar.(\Delta DPQ)$

$= \frac{1}{6} \times ar.$ (Parallelogram ABCD)



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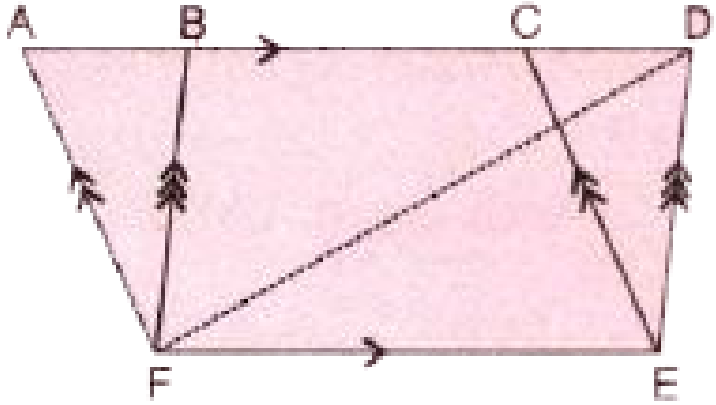

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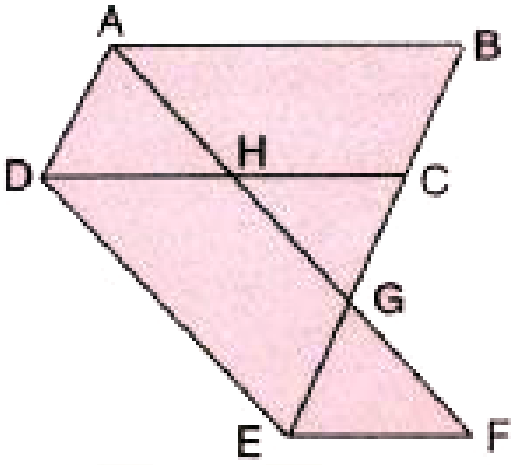

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Area $(\Delta APB) + Area(\Delta CPD)$

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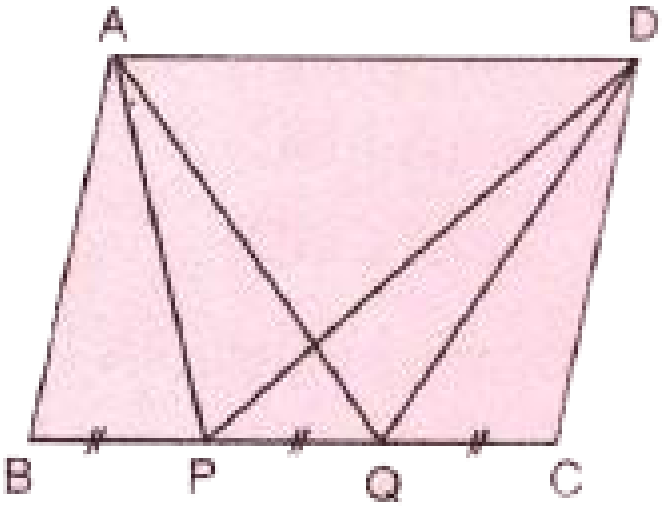

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15. The area of the sector of a circle with radius 6 cm and of angle 60° is

A. $9.42cm^2$

B. $37.68cm^2$

C. $18.84cm^2$

D. $19.84cm^2$

Answer:

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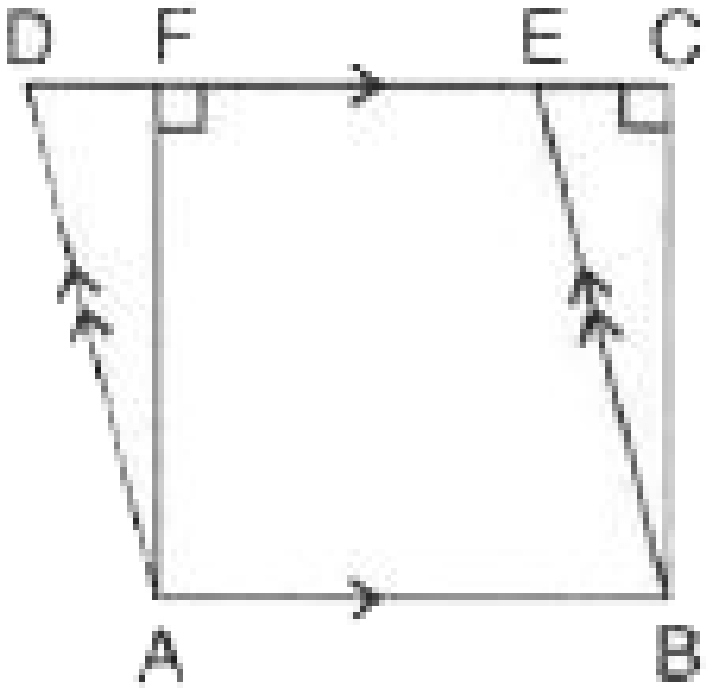
Exercies 16 A

1. In the given figure, if area of triangle ADE is $60cm^\circ$, giving reason, the area of :

(i) parallelogram ABED,

(ii) rectangle ABCF,

(iii) triangle ABE.



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2. The given figure shows a rectangle ABDC and a parallelogram ABEF, drawn on opposite sides of AB. Prove that :

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= Area of rec. ABDC

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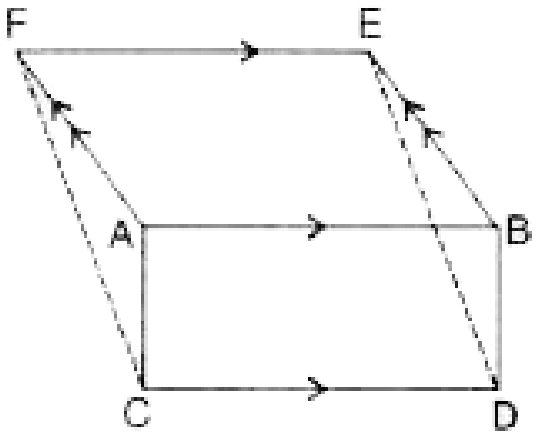

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3. In the given figure, diagonals PR and QS of thr parallelogram PQRS intersect at point O and LM is parallel to PS. Show that :

(i) $2\text{Area}(\Delta POS) = \text{Area}(//gmPMLS)$

(ii) $\text{Area}(\Delta POS) + \text{Area}(\Delta QOR)$

$= \frac{1}{2}\text{Area}(//gmPQRS)$

(iii) $\text{Area}(\Delta POS) + \text{Area}(\Delta QOR)$

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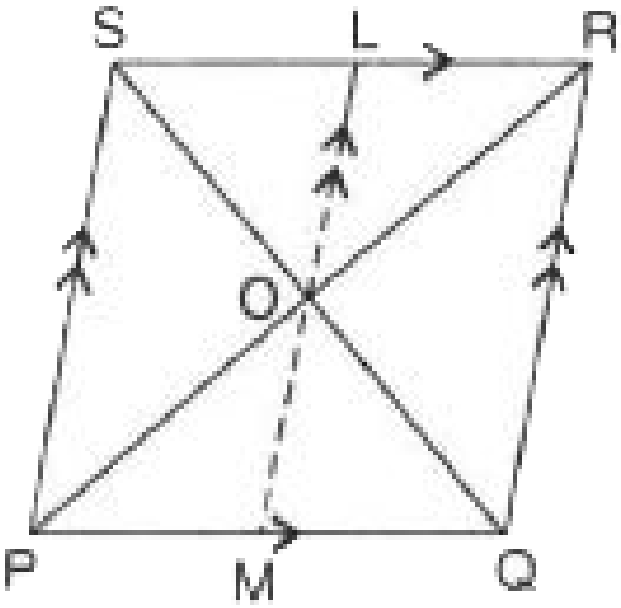

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4. In parallelogram ABCD, P is a point on side AB and Q is a ponit on side BC.

Prove that :

(i) ΔCPD and ΔAQD are equal in area.

(ii) Area (ΔAQD)

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

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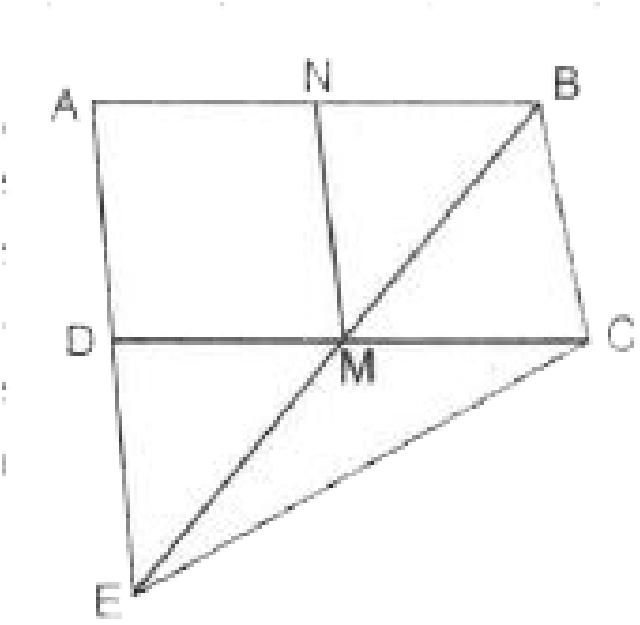
5. In the given figure, M and N are the mid-points of the sides DC and AB respectively of the parallelogram ABCD.

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

(i) State the area of the triangle BEC.

(ii) name the parallelofram which is equal in area to the triangle BEC.



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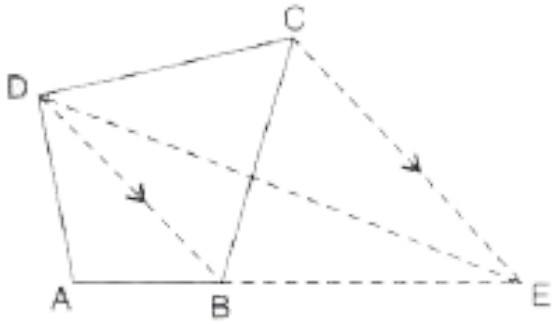
6. In the following figure, CE is drawn parallel to diagonal DB of the quadrilateral ABCD which meets AB produced ar point E.

Prove that ΔADE and quadrilateral ABCD are equal in area.



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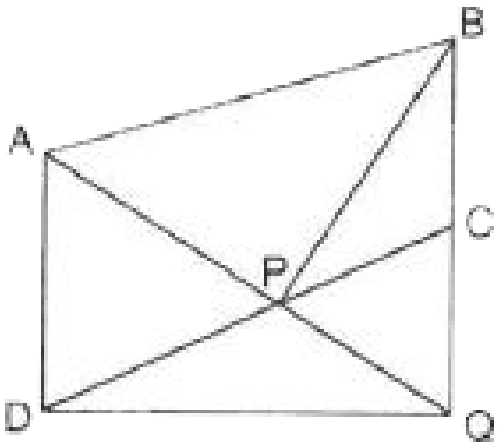
7. ABCD is a parallelogram, a line through A cuts DC at point P and BC produced at Q.

Prove that triangle BCP is equal in area to triangle DPQ.



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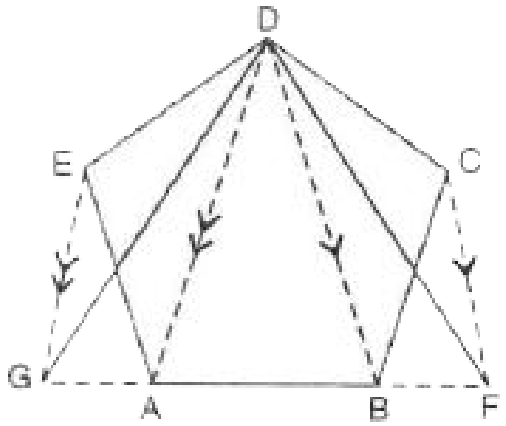
8. The given figure shows a pentagon ABCDE. EG drawn parallel to DA meets BA produced at G and CF drawn parallel to DB meets AB produced at F.

Prove that the area of pentagon ABCDE is equal to the area of triangle GDF.



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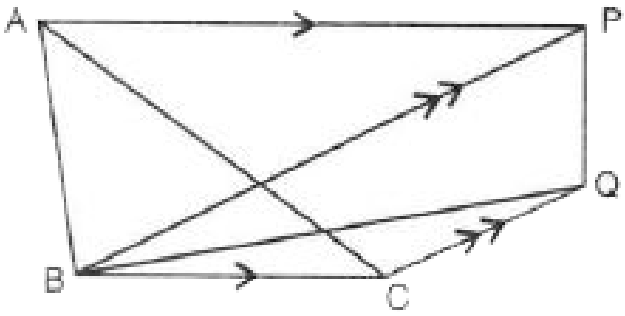
9. In the given figure, AP is parallel to BC, BP is parallel to CQ. Prove that the areas of triangles ABC and BQP are equal.



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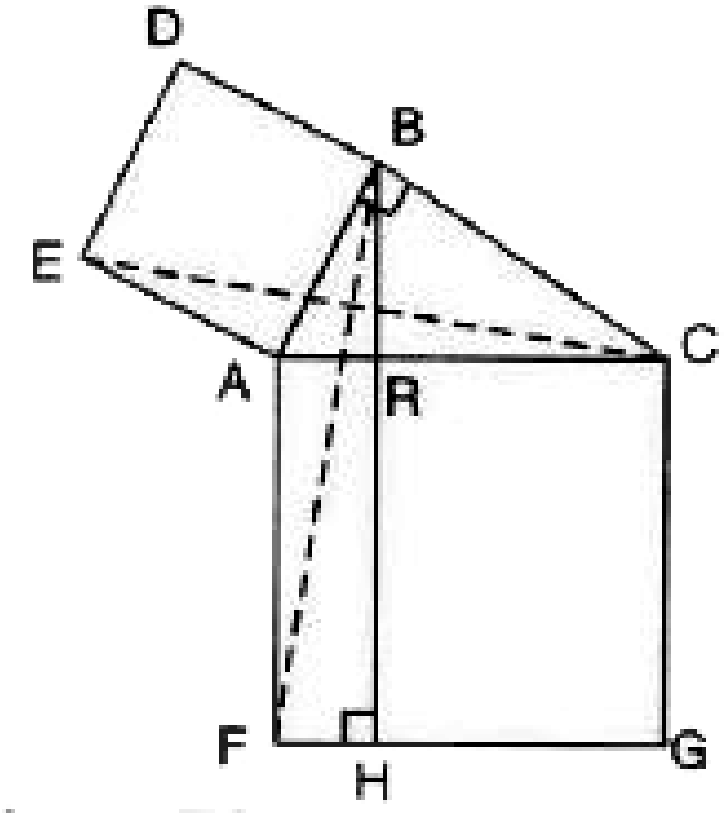
10. In the figure given alongside, squares ABDE and AFGC are drawn on the side AB and the hypotenuse AC of the right triangle ABC.

If BH perpendicular to FG, prove that :

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

(ii) Area of the square ABDE

= Area of the rectangle ARHF.



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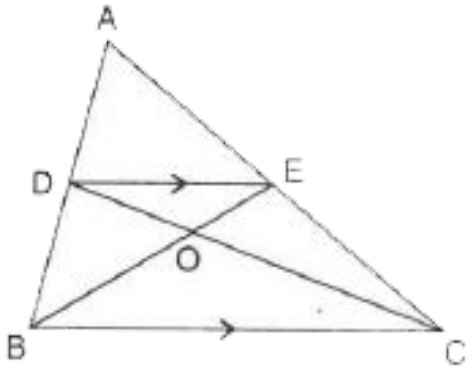
11. In the following figure, DE is parallel to BC.

Show that :

(i) $\text{Area}(\Delta ADC) = \text{Area}(\Delta AEB)$

(ii) $\text{Area}(\Delta BOD) = \text{Area}(\Delta COE)$.



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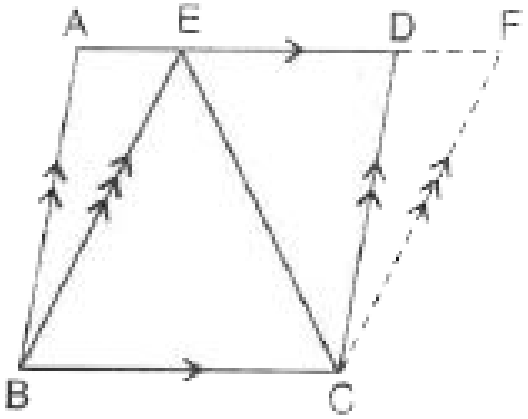
12. ABCD and BCFE are parallelograms. If area of triangle $EBC = 480cm^2$, $AB = 30cm \text{and} BC = 40cm$, Calculate,

(i) area of parallelogram ABCD,

(ii) area of the parallelogram BCFE,

(iii) length of altitude from A on CD,

(iv) area of triangle ECF.



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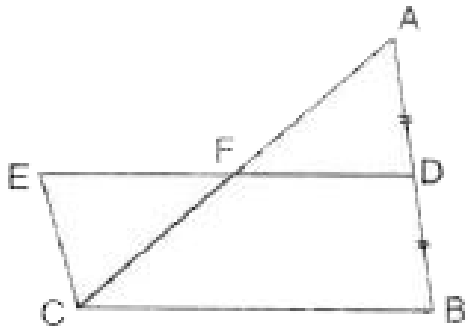
13. In the given figure, D is mid-point of side AB of $\triangle ABC$ and BDEC is a parallelogram.

Prove that :

Area of ΔABC = Area of $//gmBDEC$



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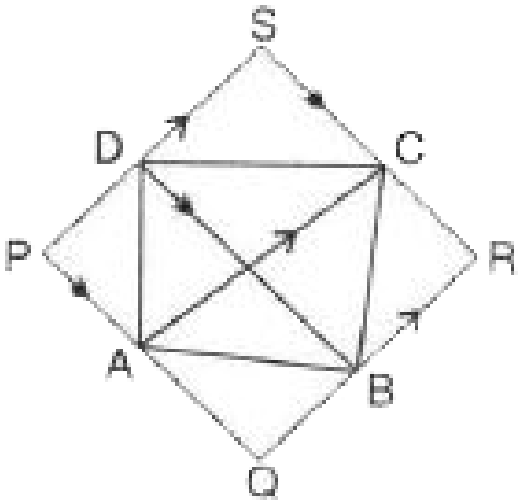
14. In the following figure, $AC||PS||QR$ and $PQ||DB||SR$.

Prove that :

Area of quadrilateral $PQRS = 2 \times$ Area of quad. ABCD.



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15. ABCD is a trapezium with $AB//DC$. A line parallel to AC intersects Ab at point M and BC at point N. Prove that :

$\text{area of}\Delta ADM = \text{area of}\Delta ACN.$

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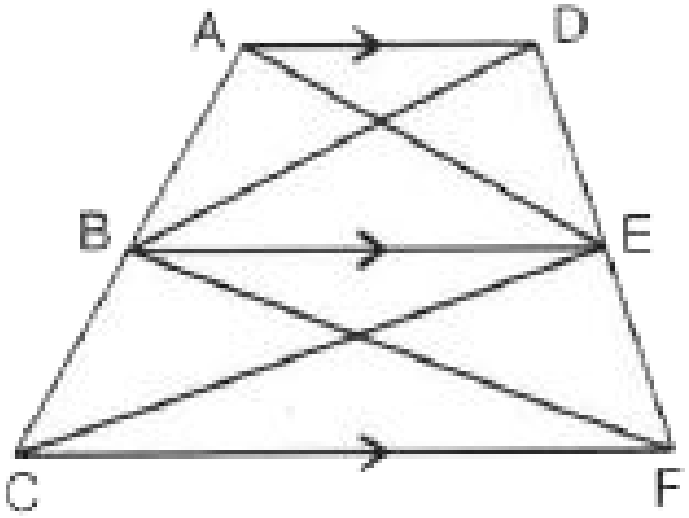
16. In the given figure, $AD//BE//CF$.

prove that :

area (ΔAEC)

= area (ΔDBF)



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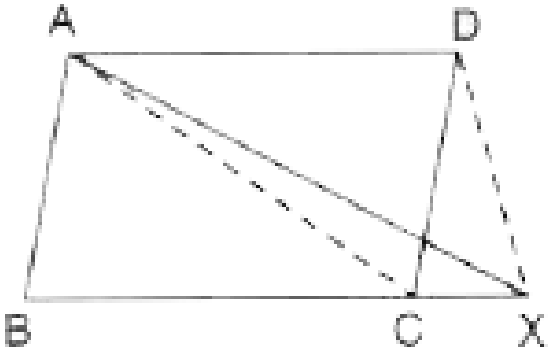
BC is produced to point X. prove that :

$\text{area}(\Delta ABX) = \text{area}(\ .\ ACXD)$



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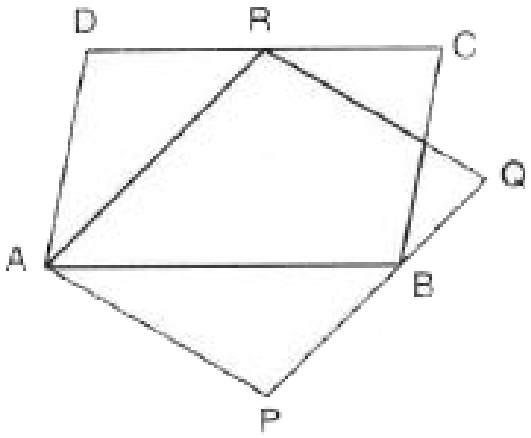
18. The given figure shows parallelograms ABCD and APQR. Show that these parallelograms are equal in area.

[Join B and R]



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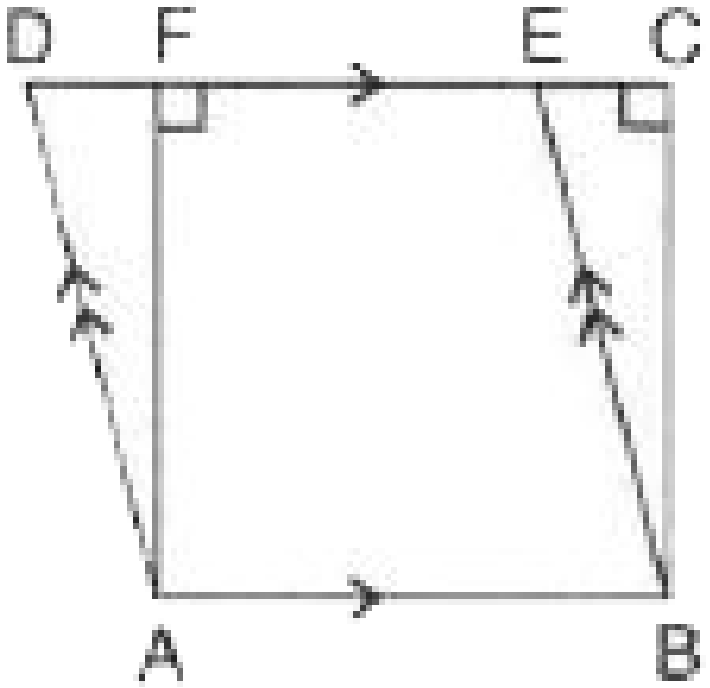

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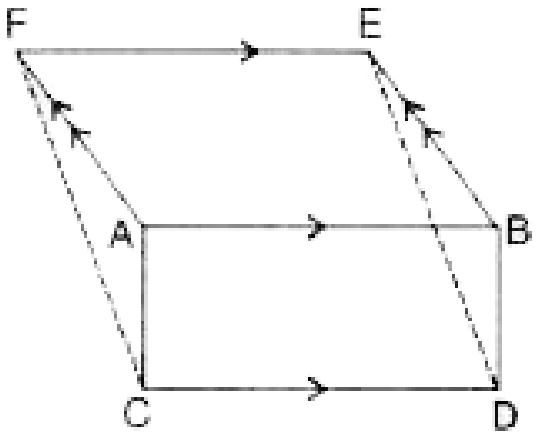

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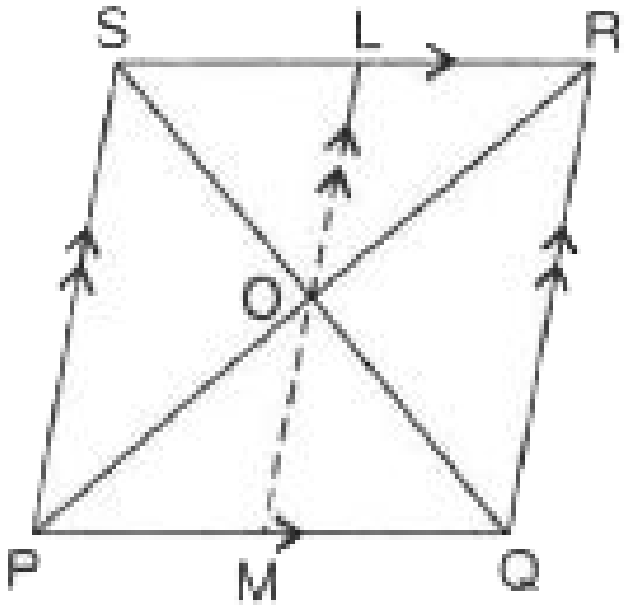

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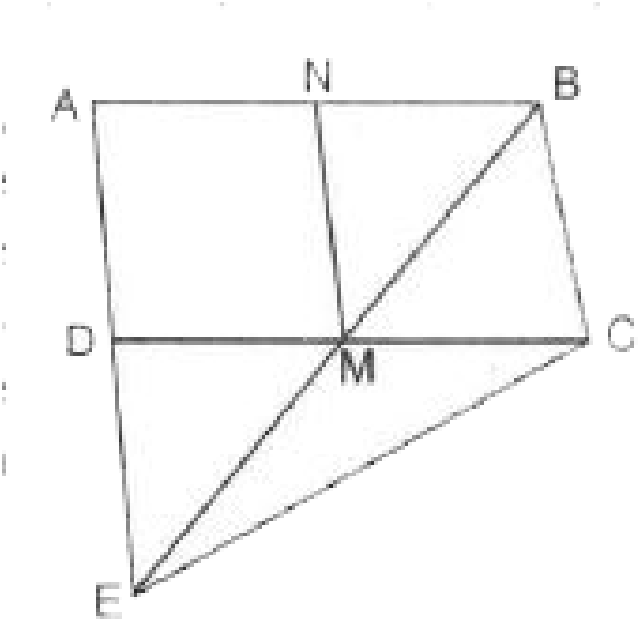

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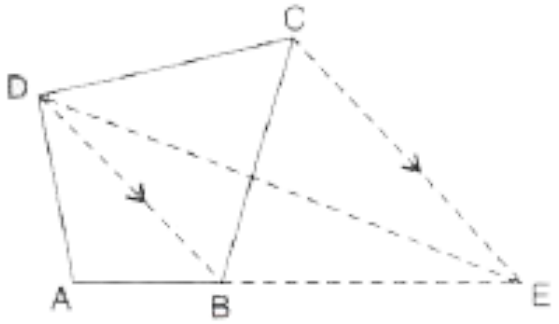

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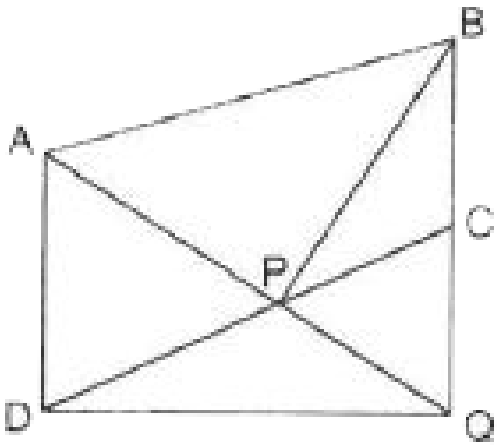

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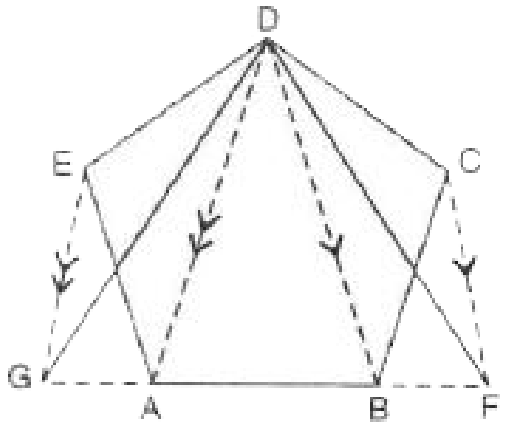

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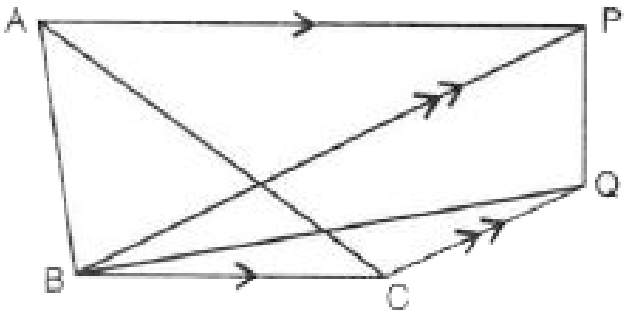

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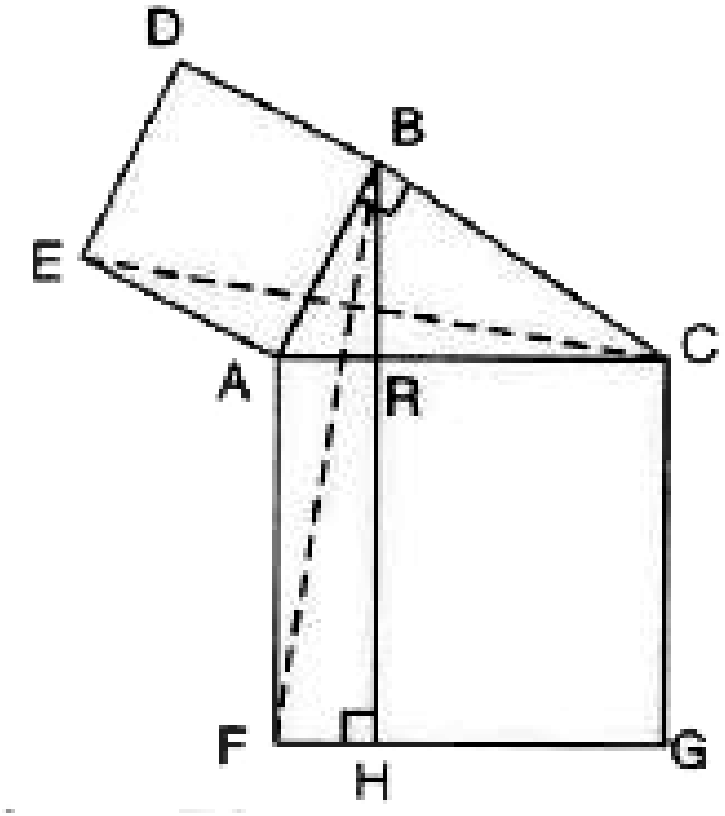

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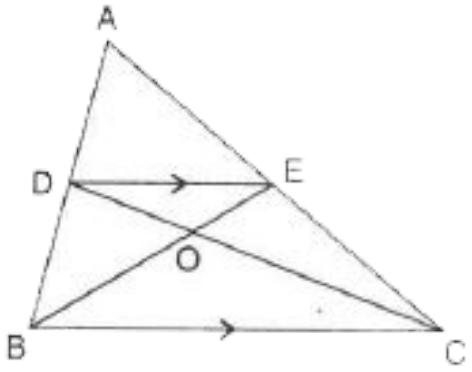

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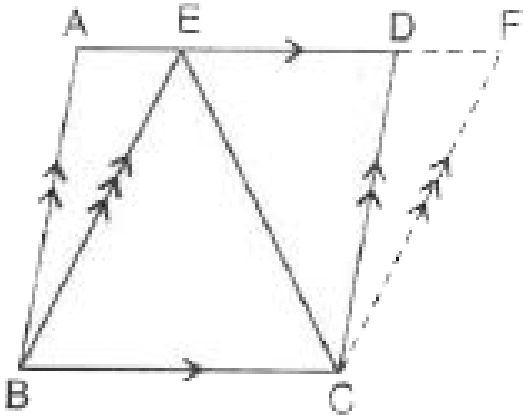

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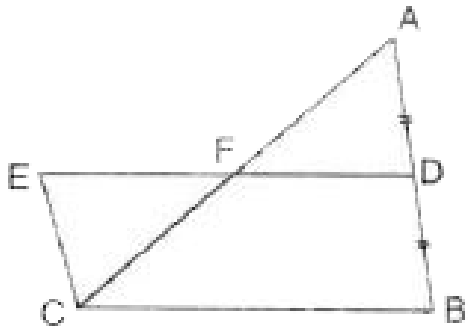
Prove that :

Area of ΔABC = Area of $//gmBDEC$



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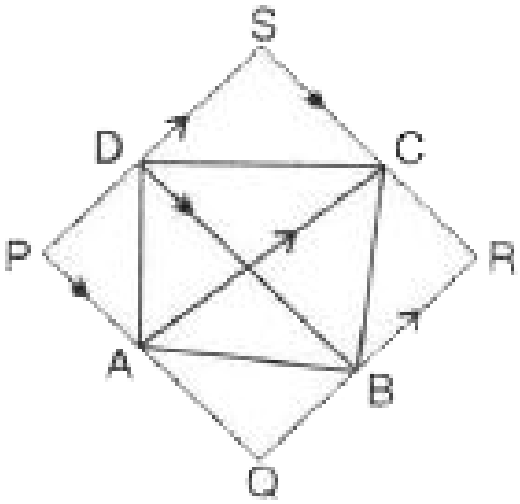
Prove that :

Area of quadrilateral $PQRS = 2 \times$ Area of quad. ABCD.



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33. ABCD is a trapezium with $AB//DC$. A line parallel to AC intersects Ab at point M and BC at point N. Prove that :

$\text{area of}\Delta ADM = \text{area of}\Delta ACN.$

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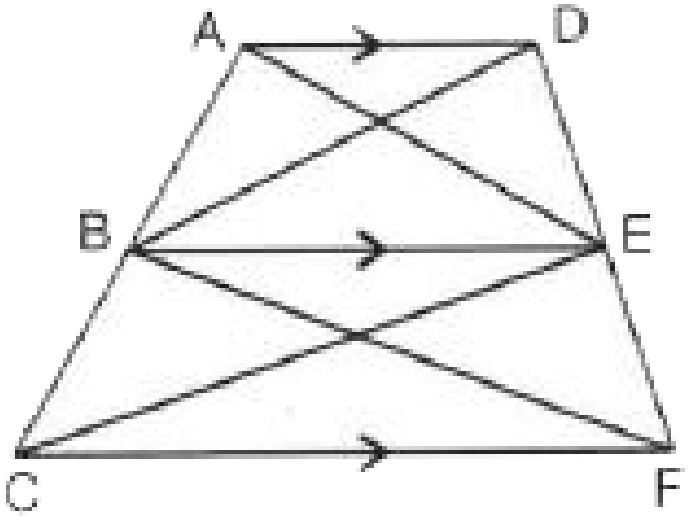
34. In the given figure, $AD//BE//CF$.

prove that :

area (ΔAEC)

= area (ΔDBF)



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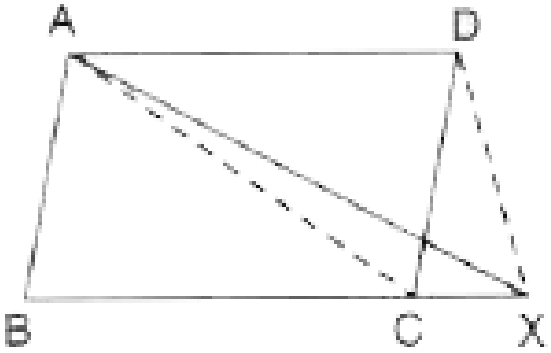
35. In the given figure, ABCD is a parallelogram

BC is produced to point X. prove that :

$\text{area}(\Delta ABX) = \text{area}(\ .\ ACXD)$



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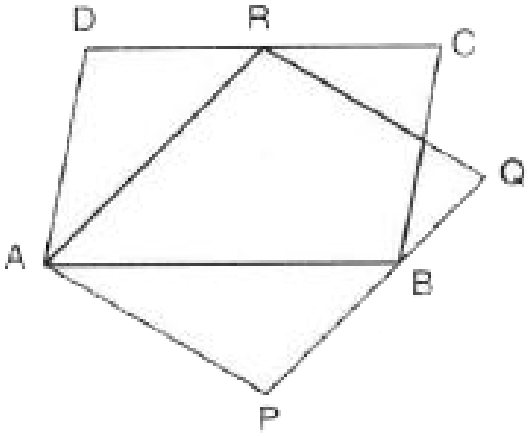
36. The given figure shows parallelograms ABCD and APQR. Show that these parallelograms are equal in area.

[Join B and R]



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Exercies 16 B

1. Show that :

(i) a diagonal divides a parallelogram into two triangles of equal area.

(ii) the ratio of the areas of two triangles of the same height is equal to the ratio of their bases.

(iii) the ratio of the areas of two triangles on the same base is equal to the ratio of their heights.

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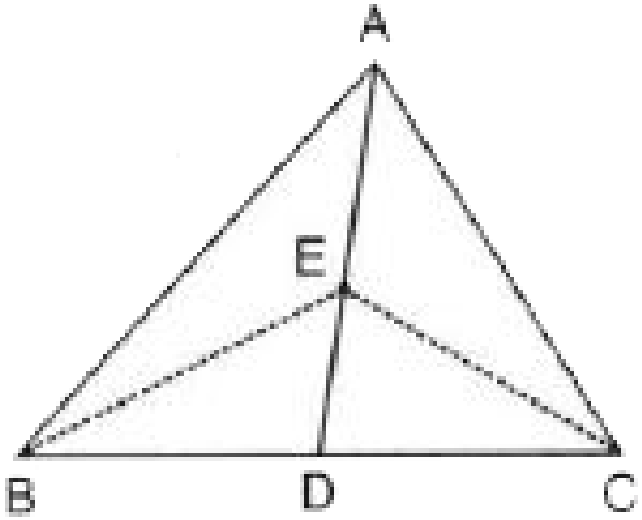
2. In the given figure, AD is median of ΔABC and E is any point on median AD. Prove that Area (ΔABE) = Area (ΔACE)



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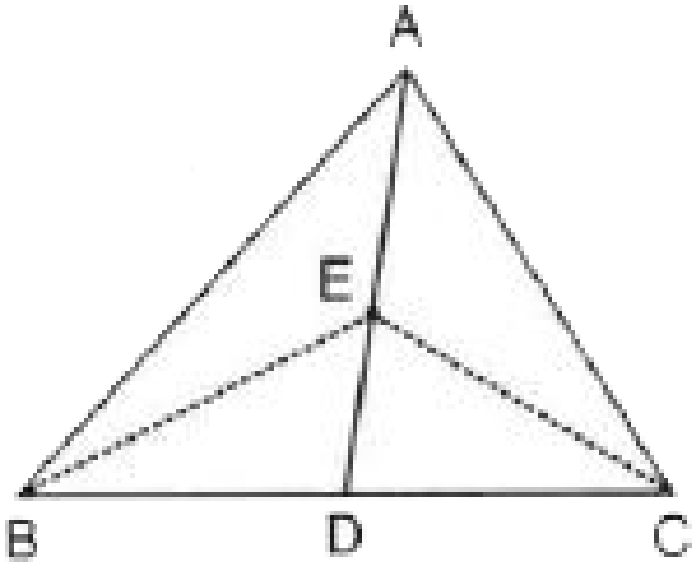
3. In the figure of question 2, if E is the mid point of median AD, then prove that :

$$\text{Area}(\Delta ABE) = \frac{1}{4}\text{Area}(\Delta ABC).$$



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4. ABCD is a parallelogram. P and Q are the mid-points of sides AB and AD reapectively. Prove that area of triangle APQ= $\frac{1}{8}$ of the area of parallelogram ABCD.

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

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6. In a parallelogram ABCD, point P lies in DC such that DP:PC= $3:2$. If area of $\Delta DPB = 30sq.$ cm, ffind the area of the parallelogram ABCD.

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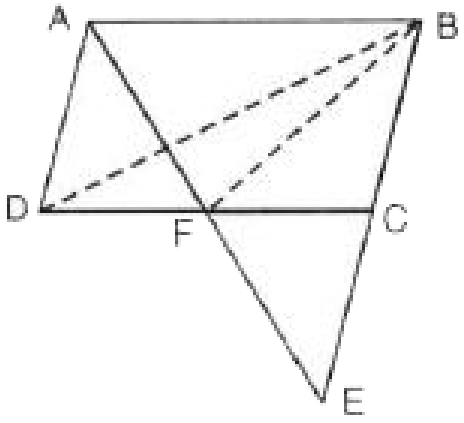
7. ABCD is a parallelogram in which BC is produced to E such that CE=BC and AE intersects CD at F.

If $ar.(\Delta DFB) = 30cm^2$, find the area of

parallelogram



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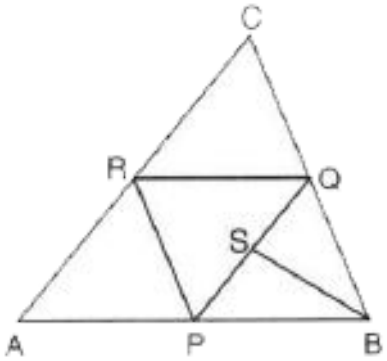
8. The following figure shows a triangle ABC in which P, Q and R are mid-points of sides AB, BC and CA respectively. S is mid-point of PO.

Prove that : $ar.(\Delta ABC) = 8 \times ar.(\Delta QSB)$



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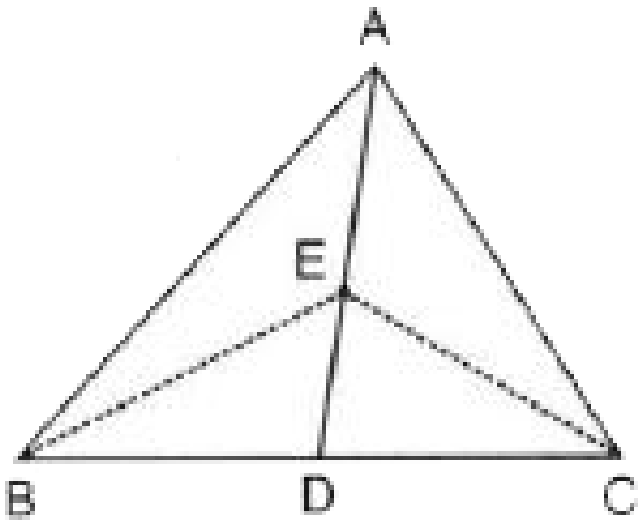

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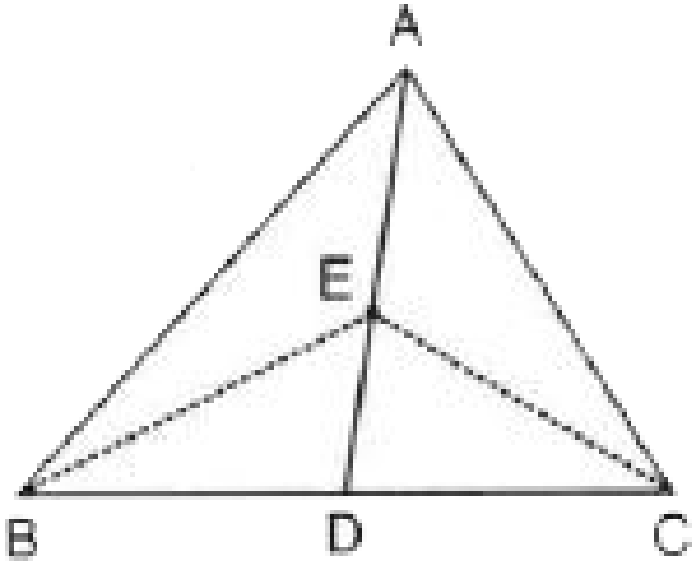

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13. The base BC of triangle ABC is divided at D so that BD = $\frac{1}{2}$ DC.

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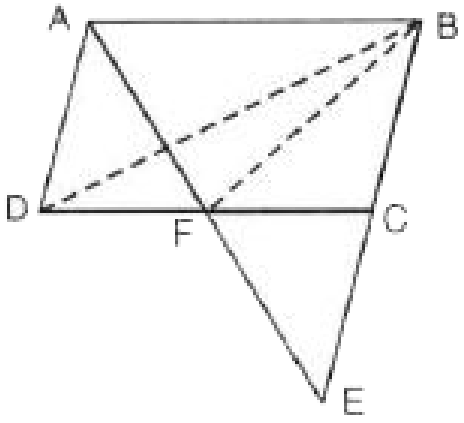
If $ar.(\Delta DFB) = 30cm^2$, find the area of

parallelogram



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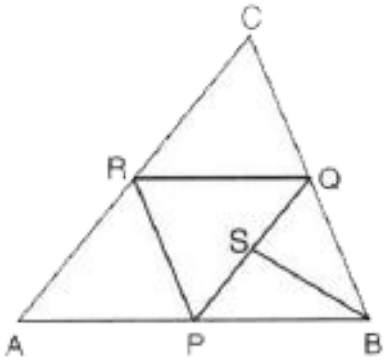
Prove that : $ar.(\Delta ABC) = 8 \times ar.(\Delta QSB)$



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Exercies 16 C

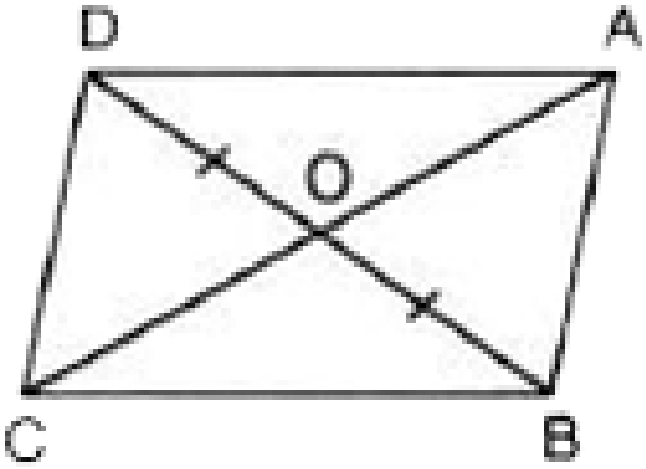
1. In the given figure, the diagonals AC and BD intersects at point O. If OB=OD and $AB//DC$

, prove that :

(i) $\text{Area}(\Delta DOC) = \text{Area}(\Delta AOB)$.

(ii) $\text{Area}(\Delta DCB) = \text{Area}(\Delta ACB)$.

(iii) ABCD is a parallelogram.



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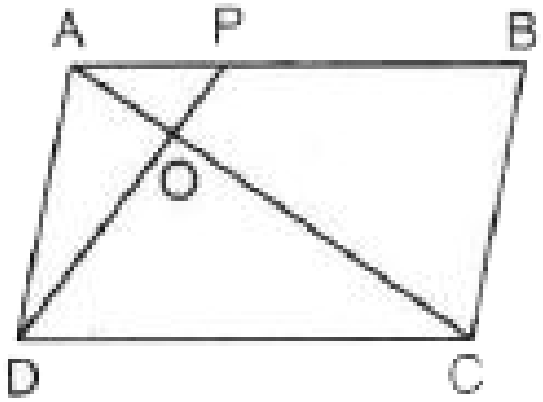
2. The given figure shows a parallelogram ABCD with area $324sq.$ cm. P is a point in AB such that AP:PB= $1:2$. Find the area of ΔAPD.



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

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4. In parallelogram ABCD, P is mid-point of AB. CP and BD intersect each other at point O. If area of $\Delta POB = 40cm^2$ and OP:OC= $1:2$, find :

(i) Areas of ΔBOC and ΔPBC

(ii) Areas of ΔABC and parallelogram ABCD.

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5. The medians of a triangle ABC intersect each other at point G. If one of its medians is AD, Prove that :

(i) $\text{Area}\,(\Delta \text{ABD}) = 3\text{x} \quad Area(\Delta BGD)$

(ii) $\text{Area}\,(\Delta \text{ACD}) = 3\text{x} \quad Area(\Delta CGD)$

(iii) $\text{Area}\,(\Delta \text{BGC}) = (1)/(3)\text{x} \quad Area(\Delta ABC)$

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6. The perimeter of a triangle is $300m$. If its sides are in the ratio $3:5:7$. Find the area of the triangle.

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7. In parallelogram ABCD, E is a point in AB and DE meets diagonal AC at point F. If DF:FE= $5:3$ and area of ΔADF is $60cm^2$, find :

(i) area of ΔADE

(ii) if AE:EB= $4:5$, find the area of ΔADB

(iii) also, find area of parallelogram ABCD.

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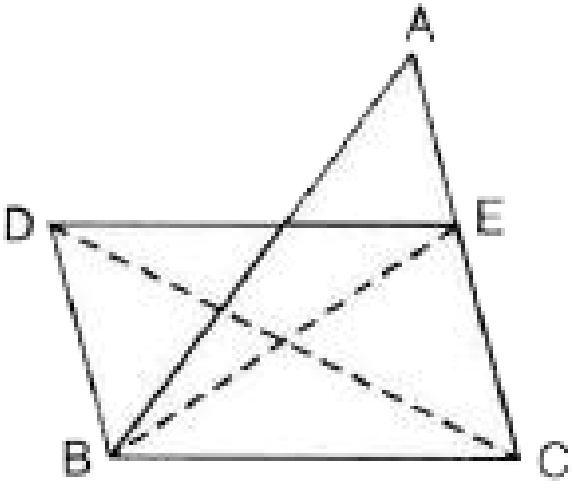
8. In the following figure, BD is parallel to CA, E is mid-point of CA and BD = $\frac{1}{2}$ CA.

Prove that :

$ar.(\Delta ABC) = 2 \times ar.(\Delta DBC)$



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9. In the following figure, OAB is a triangle and

$AB//DC.$

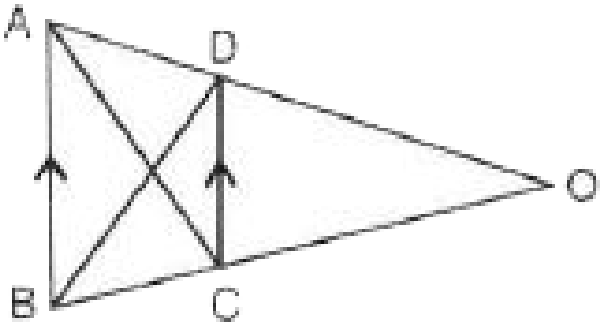
If the area of $\Delta CAD = 140cm^2$ and the area

of $\Delta ODC = 172cm^2$, find

(i) the area of ΔDBC

(ii) the area of ΔOAC

(iii) the area of ΔODB.



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10. E, F, G and H are the mid-points of the sides of a parallelogram ABCD. Show that area of

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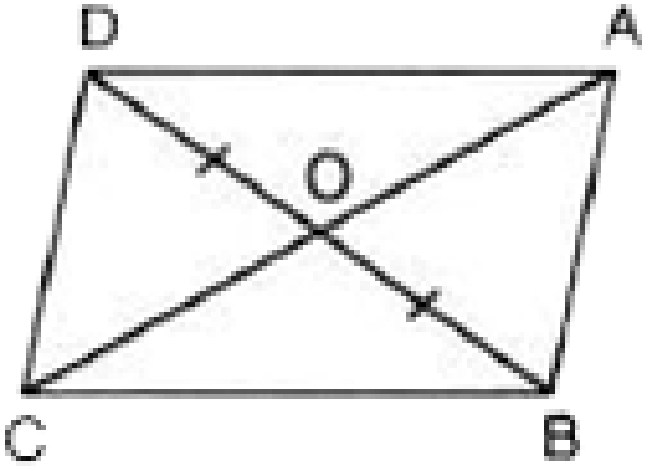

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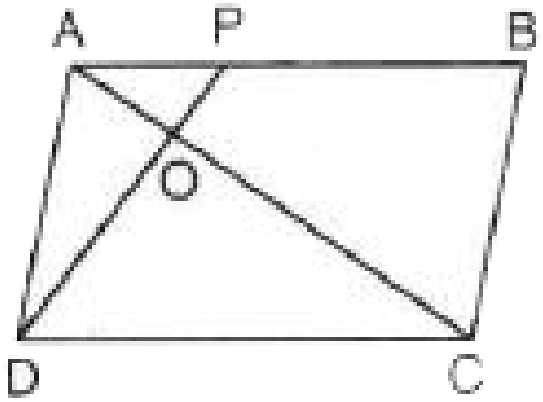

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17. The perimeter of a triangle ABC is 37 cm and the ratio between the lengths of its altitudes be $6:5:4$. Find the lengths of its sides.

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18. In parallelogram ABCD, E is a point in AB and DE meets diagonal AC at point F. If DF:FE= $5:3$ and area of ΔADF is $60cm^2$, find :

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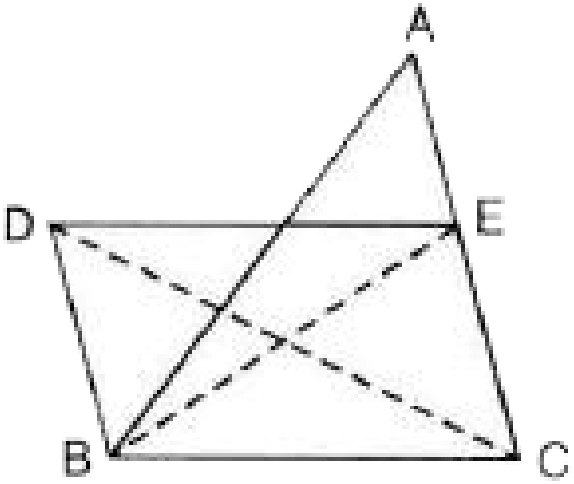

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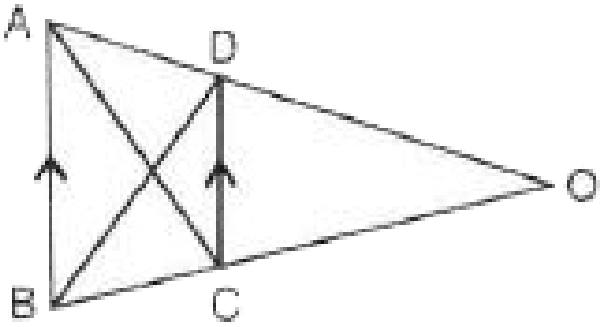

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