

## CHAPTER-9

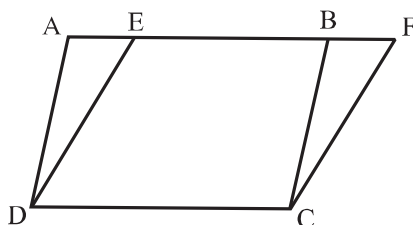
# AREAS OF PARALLELOGRAMS & TRIANGLES

### KEY POINTS

1. Parallelograms on the same base and between same parallels are equal in area.

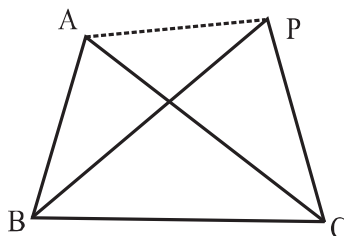
Two parallelograms ABCD and EFCD on the same base DC and between same parallels AF and DC

$$\text{ar}(\text{ABCD}) = \text{ar}(\text{EFCD})$$



2. Two triangles on the same base and between the same parallels are equal in area.

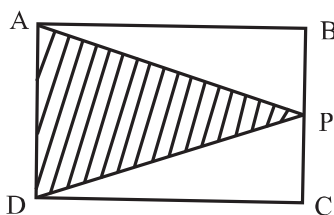
Two triangles ABC and PBC on the same base BC and between same Parallel lines BC and AP in the given figure then  $\text{ar}(\triangle ABC) = \text{ar}(\triangle PBC)$



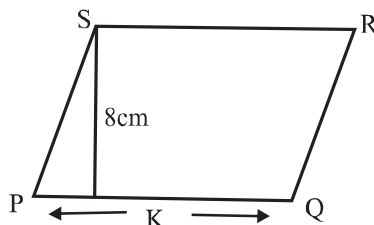
3. Two triangles having the same base and equal areas lies between the same parallels.

### Part – A

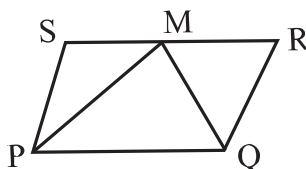
1. If area of Parallelogram ABCD is  $80 \text{ cm}^2$ . Find the area of  $\triangle APD$ .



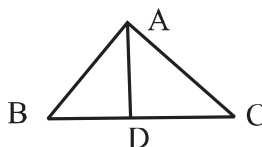
2. If area of Parallelogram PQRS is  $88 \text{ cm}^2$  find K.



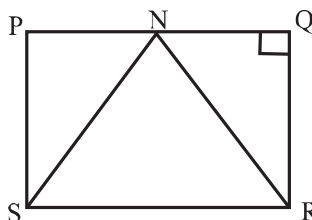
3. PQRS is a Parallelogram and PQM is a triangle. If area of  $\triangle PQM = 18 \text{ cm}^2$ . Find the area of PQRS.



4. In  $\triangle ABC$ , AD is median. If area of  $\triangle ABD = 25 \text{ cm}^2$  find the area of  $\triangle ABC$ .



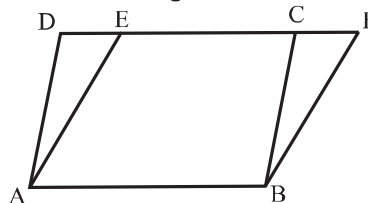
5. In the given figure area of  $\triangle SRN = 21 \text{ cm}^2$   $RQ = 6 \text{ cm}$  find PQ.



6. In the figure ABCD and ABFE are Parallelograms then find ar ( $\triangle BCF$ ).

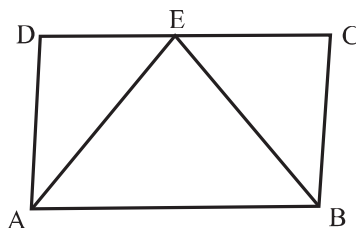
If  $\text{ar}(\triangle ABCE) = 18 \text{ cm}^2$

$\text{ar}(\triangle ABCD) = 25 \text{ cm}^2$



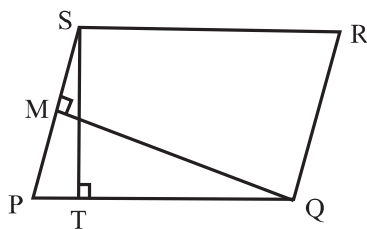
7. If two parallelogram are on equal base and between the same parallels, then what is the ratio of their areas?
8. A triangle and a Parallelograms are on the same base as well as between the same parallels then find the ratio of areas of triangle to that of the parallelogram.

9. In  $\triangle ABC$ , D, E, F are respectively the mid points of the sides AB, BC and AC. Find ratio of the area of  $\triangle DEF$  and area of  $\triangle ABC$ .
10. If the base of a parallelogram is 8 cm and its altitude is 5 cm then find its area.
11. If two triangles are on the same base and between the same parallels. Then find the ratio of area of the two triangles.
12. In given figure. If area of parallelogram ABCD is  $30 \text{ cm}^2$  then find  $\text{ar}(\triangle ADE) + \text{ar}(\triangle BCE)$

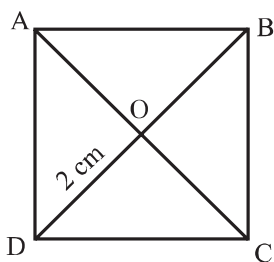


**Part – B**

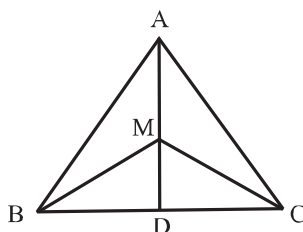
13. Show that the median of a triangle divides it into two triangles of equal areas.
14. P and Q are any two points lying on the side DC and AD respectively of a parallelogram ABCD. Show that  $\text{ar}(\triangle APB) = \text{ar}(\triangle BQC)$ .
15. If the ratio of altitude and area of the parallelogram is 2:11 then find the length of the base of parallelogram.
16. In figure if PQRS is a parallelogram in which  $PQ=12\text{cm}$ ,  $ST=9\text{cm}$ ,  $QM=6\text{cm}$ ,  $ST \perp PQ$ ,  $QM \perp SP$  then find length of SP.



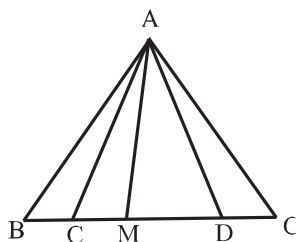
17. In given fig. ABCD is a square whose diagonals are intersecting at O. If  $OD = 2 \text{ cm}$  then find the length of AB.



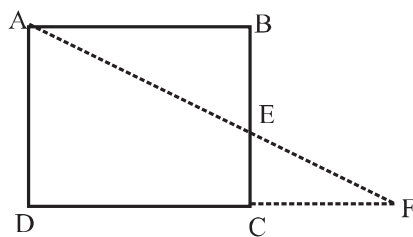
18. Show that the diagonals of a parallelogram divide it into four triangles of equal area.
19. M is any point on the median AD of  $\triangle ABC$ . Show that  $\text{ar}(\triangle AMB) = \text{ar}(\triangle AMC)$ .



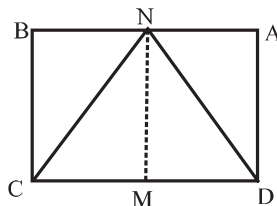
20. If D, E and F are respectively the mid points of sides BC, CA, and AB of  $\triangle ABC$  show that.
- BDEF is a parallelogram.
  - $\text{ar}(\triangle DEF) = \frac{1}{4} \text{ar}(\triangle ABC)$
21. In the given figure  $BC = CD = DE$   
M is the mid point of CD then find the area of  $\triangle AMC$ .



22. ABCD is a parallelogram. Through point A, a line AEF is drawn to meet BC at E. DC produced at F. Show that  $\text{ar}(\triangle BEF) = \text{ar}(\triangle DCE)$ .



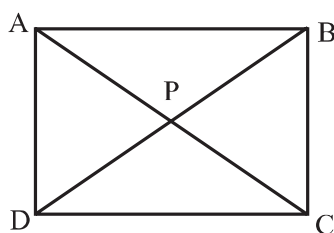
23. In the given figure, the area of parallelogram ABCD is  $40 \text{ cm}^2$ . If MN is a median of  $\triangle CDN$  then find the area of  $\triangle NDM$ .



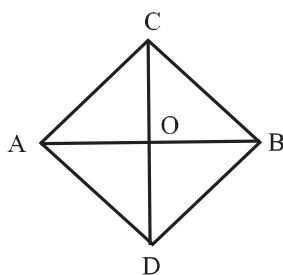
### Part-C

24. In the figure, P is the point in the interior of parallelogram ABCD then show that

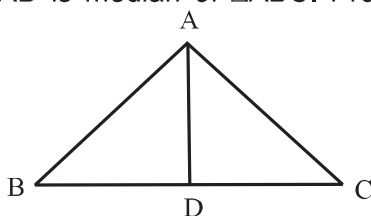
- (i)  $\text{ar}(\triangle APB) + \text{ar}(\triangle PCD) = \frac{1}{2} \text{ar}(\text{ABCD})$
- (ii)  $\text{ar}(\triangle APD) + \text{ar}(\triangle PBC) = \text{ar}(\triangle APB) + \text{ar}(\triangle PCD)$



25. ABCD is a trapezium in which the  $AB \parallel DC$ . If diagonal AC and BD intersect at O. Prove that  $\text{ar}(\triangle AOD) = \text{ar}(\triangle BOC)$ .
26. ABCD is a parallelogram whose diagonals AC and BD intersect at O. A line through O intersects AB at P and DC at Q. Prove that  $\text{ar}(\triangle POA) = \text{ar}(\triangle QOC)$ .
27. Diagonal PR and QS of quadrilateral PQRS intersect at T such that  $PT = TR$  and  $PS = QR$ , show that  $\text{ar}(\triangle PTS) = \text{ar}(\triangle RTQ)$ .
28. In the figure, ABC and ABD are two triangles on the same base AB. If line segment CD bisects AB at O show that  $\text{ar}(\triangle ABC) = \text{ar}(\triangle ABD)$ .

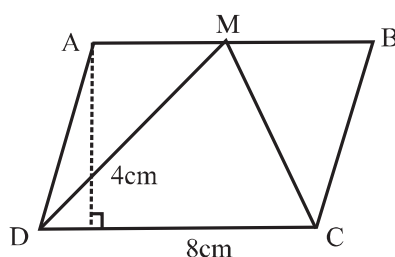


29. In given figure AD is median of  $\triangle ABC$ . Prove that  $\text{ar}(\triangle ABD) = \text{ar}(\triangle ACD)$ .



### Part – D

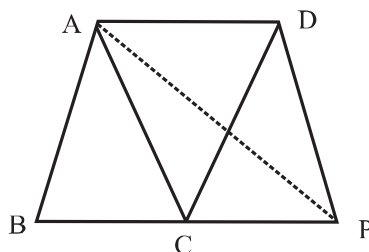
30. Prove that parallelogram on the same base and between same parallels are equal in area.
31. Prove that the two triangles on the same base and between the same parallels are equal in area.
32. If a triangle and parallelogram are on the same base and between the same parallels then prove that the area of triangle is equal to the half the area of parallelogram using this find  $\text{ar}(\triangle CMD)$ .



33. 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  $\text{ar}(\triangle ABE) = \text{ar}(\triangle ACF)$ .
34. If E, F, G and H are respectively the mid points of the sides of a parallelogram ABCD. Show that  $\text{ar}(\triangle EFGH) = \frac{1}{2} \text{ar}(\triangle ABCD)$ .
35. There is a plot in a village in the shape of a quadrilateral ABCD. Head of the village wants to get floor cemented so as to use it for panchayat meetings.

Later he decided to construct playground of shape  $\triangle ABP$  for children. If  $AC \parallel DP$  then

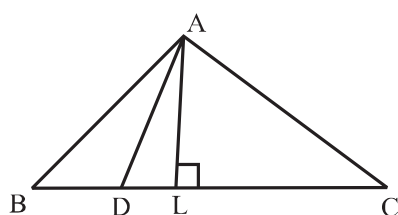
- (a) Prove that  $\text{ar}(\triangle ABCD) = \text{ar}(\triangle ABP)$
- (b)  $\text{area}(\square ABCD) = 2 \times \underline{\hspace{2cm}}$



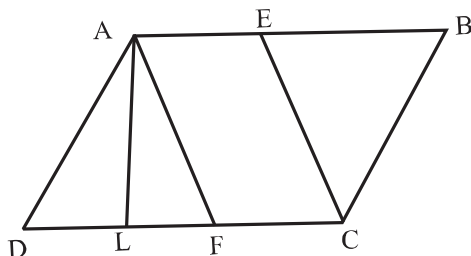
36. A farmer has a square plot of land where he wants to grow five different crops at a time. On half of the area in the middle he want to grow different crops.

- a) Explain by diagram how he can divide the area to fulfill his purpose.
- b) For same base and between the same parallels write the relation between area of triangle and parallelogram formed.

37. In the adjoining figure, the point D divides the side BC of  $\triangle ABC$  in the ratio  $m:n$ . Prove that  $\text{ar}(\triangle ABD) : \text{ar}(\triangle ADC) = m : n$ .

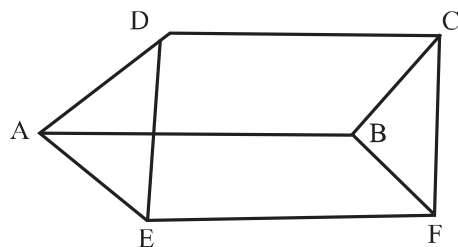


38. ABCD is a parallelogram. E is a point on BA such that  $BE = 2EA$  and F is a point on DC such that  $DF = 2FC$ . Prove that AECF is a parallelogram whose area is one third of the area of parallelogram ABCD.



39. In the adjoining figure, two parallelogram ABCD and AEFB are drawn on opposite sides of AB. Prove that

$$\text{ar}(\square ABCD) + \text{ar}(\square AEFB) = \text{ar}(\square EFCD)$$



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CHAPTER-9  
**AREAS OF PARALLELOGRAMS TRIANGLES**  
**ANSWERS**

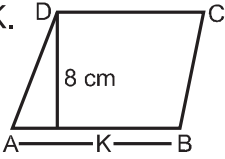
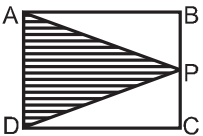
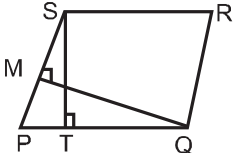
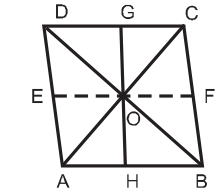
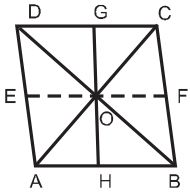
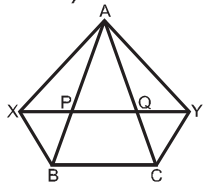
1.  $40 \text{ cm}^2$
2.  $11 \text{ cm}$
3.  $36 \text{ cm}^2$
4.  $50 \text{ cm}^2$
5.  $7 \text{ cm}$
6.  $7 \text{ cm}^2$
7.  $1:1$
8.  $1:2$
9.  $1:4$
10.  $40 \text{ cm}^2$
11.  $1:1$
12.  $15 \text{ cm}^2$
15.  $\frac{11}{2}$  units
16.  $18 \text{ cm}$
17.  $\sqrt{8} \text{ cm}$
21.  $\frac{1}{6} \Delta ABC$
23.  $10 \text{ cm}^2$
32.  $16 \text{ cm}^2$
35.  $\text{area}(\square ADPC) = 2 \text{ ar}(\triangle ACD)$
36.  $\text{area of triangle} = \frac{1}{2} \text{ area of parallelogram.}$

## PRACTICE TEST

### AREAS OF PARALLELOGRAMS & TRIANGLES

Time : 50 Min.

M.M. 20

1. If area of parallelogram ABCD is  $96 \text{ cm}^2$ , find K. 
2. If area of parallelogram ABCD is  $60 \text{ cm}^2$ . Find area of  $\triangle APD$ . 
3. Show that the median of a triangle divides it into two triangles of equal area.
4. In figure if PQRS is a parallelogram in which  $PQ = 12 \text{ cm}$ ,  $ST = 9 \text{ cm}$ ,  $QM = 6 \text{ cm}$ ,  $ST \perp PQ$ ,  $QM \perp SP$ , then find length of SP. 
5. The base BC of  $\triangle ABC$  is divided at D. Such that  $BD = \frac{1}{2} DC$ . Prove that  $\text{ar}(\triangle ABD) = \frac{1}{3} \text{ar}(\triangle ABC)$  
6. ABCD is a parallelogram and O is a point in the interior, Prove that  $\text{ar}(\triangle AOB) + \text{ar}(\triangle COD) = \text{ar}(\triangle AOD) + \text{ar}(\triangle BOC)$  
7. In the adjoining figure, PQ is a line parallel to the side BC to  $\triangle ABC$ . If  $BX \parallel CA$  and  $Cy \parallel BA$  meet the line PQ produced in X and Y respectively. Show that  $\text{ar}(\triangle ABX) = \text{ar}(\triangle ACY)$  
8. Prove that parallelogram on the same base and between same parallels are equal in area.