



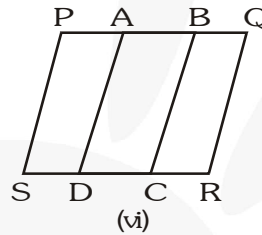
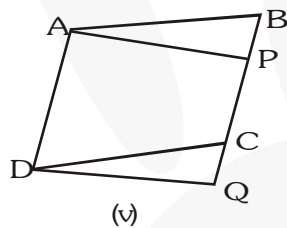
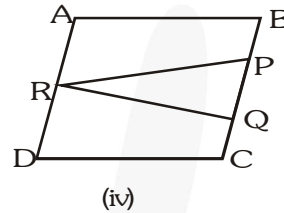
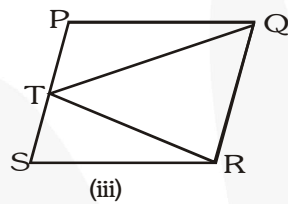
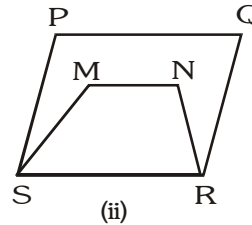
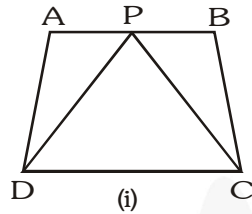
## NCERT SOLUTIONS

### Area of Parallelogram and Triangle

 eSaral हैं, तो सब सरल हैं।

## Ex - 9.1

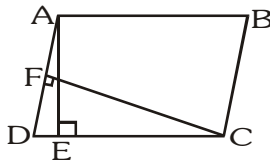
- Q1.** Which of the following figures lie on the same base and between the same parallels. In such a case, write the common base and the two parallels.



- Sol.**
- (i)  $\triangle PDC$  and quadrilateral  $ABCD$  have same base  $DC$ . The two figures are between the parallels  $AB$  and  $DC$ .
  - (ii) Figure  $PQRS$  and  $MNRS$  are not between the same parallels.
  - (iii)  $\triangle QTR$  & parallelogram  $PQRS$  have same base  $QR$  & between same parallels  $QR$  &  $PS$
  - (v) Parallelogram  $ABCD$  and  $APQD$  have common base  $AD$  and also, between same parallel  $AD$  and  $BQ$ .
  - (vi) No two figures have same base and between same parallels.

## Ex - 9.2

- Q1.** In fig, ABCD is a parallelogram,  $AE \perp DC$  and  $CF \perp AD$ . If  $AB = 16$  cm,  $AE = 8$  cm and  $CF = 10$  cm, find  $AD$ .



**Sol.** In figure

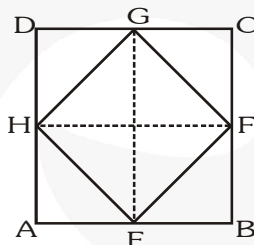
$$AD \times CF = CD \times AE$$

$$\Rightarrow AD \times 10 = 16 \times 8 \text{ cm}$$

$$\Rightarrow AD = 12.8 \text{ cm}$$

- Q2.** If E, F, G and H are respectively the mid-points of the sides of a parallelogram ABCD, show that  $\text{ar}(\text{EFGH}) = \frac{1}{2} \text{ar}(\text{ABCD})$ .

**Sol.**  $\because$  E and G are the mid-points of AB and CD respectively  
 $\therefore$  EG is parallel to BC or AD.



Also  $\text{ar}(\parallel \text{gm EBCG}) = \text{ar}(\parallel \text{gm AEGD})$

$$= \frac{1}{2} \text{ar}(\parallel \text{gm ABCD}) \quad \dots(1)$$

$$\therefore \text{ar}(\triangle EFG) = \frac{1}{2} \text{ar}(\parallel \text{gm EBCG}) \quad \dots(2)$$

$$\text{Similarly, ar}(\triangle EHG) = \frac{1}{2} \text{ar}(\parallel \text{gm AEGD}) \quad \dots(3)$$

Adding (2) and (3), we get :

$$\Rightarrow \text{ar}(\triangle EFG) + \text{ar}(\triangle EHG) = \frac{1}{2} [\text{ar}(\parallel \text{gm EBCG}) + (\parallel \text{gm AEGD})]$$

$$\Rightarrow \text{ar}(\parallel \text{gm EFGH})$$

$$\frac{1}{2} \left[ \frac{1}{2} (\parallel \text{gm ABCD}) + \frac{1}{2} \text{ar}(\parallel \text{gm ABCD}) \right]$$

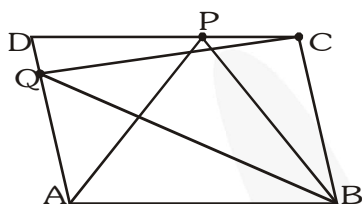
From (1)

$$\Rightarrow \text{ar}(\text{EFGH}) = \frac{1}{2} [\text{ar}(\text{||gm ABCD})]$$

$$\Rightarrow \text{Thus, ar}(\text{||gm EFGH}) = \frac{1}{2} \text{ar}(\text{||gm ABCD}).$$

**Q3.** P and Q are any two points lying on the sides DC and AD respectively of a parallelogram ABCD. Show that  $\text{ar}(\triangle APB) = \text{ar}(\triangle BQC)$ .

**Sol.**  $\text{ar}(\triangle APB) = \frac{1}{2} \text{ar}(\text{ABCD}) \quad \dots(1)$



$$\text{ar}(\triangle BQC) = \frac{1}{2} \text{ar}(\text{ABCD}) \quad \dots(2)$$

From (1) and (2),

$$\text{ar}(\triangle APB) = \text{ar}(\triangle BQC)$$

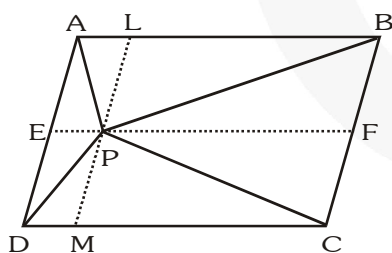
**Q4.** In figure, P is point in interior of a parallelogram ABCD. Show that :

(i)  $\text{ar}(\triangle APB) + \text{ar}(\triangle PCD)$

$$= \frac{1}{2} \text{ar}(\text{||gm ABCD})$$

(ii)  $\text{ar}(\triangle APD) + \text{ar}(\triangle PBC)$

$$= \text{ar}(\triangle APB) + \text{ar}(\triangle PCD) .$$



**Sol.** (i) Through P, draw a line  $EF \parallel AB$ .

Since  $\triangle ABP$  and parallelogram ABFE are on the same base AB and between the same parallels AB and EF.

$$\therefore \text{ar}(\triangle ABP) = \frac{1}{2} \text{ar}(\text{||gm ABFE}) \quad \dots(1)$$

Similarly,  $\triangle DCP$  and parallelogram  $DCFE$  are on the same base  $DC$  and between the same parallel  $DC$  and  $EF$ .

$$\therefore \text{ar}(\triangle DCP) = \frac{1}{2} \text{ar}(\parallel^{\text{gm}} DCFE) \dots(2)$$

Adding eqn. (1) and eqn. (2), we get

$$\text{ar}(\triangle ABP) + \text{ar}(\triangle DCP)$$

$$= \frac{1}{2} \text{ar}(\parallel^{\text{gm}} ABFE) + \frac{1}{2} \text{ar}(\parallel^{\text{gm}} DCFE)$$

$$\Rightarrow \text{ar}(\triangle ABP) + \text{ar}(\triangle DCP) = \frac{1}{2}$$

$$\{\text{ar}(\parallel^{\text{gm}} ABFE) + \text{ar}(\parallel^{\text{gm}} DCFE)\}$$

$$\Rightarrow \text{ar}(\triangle ABP) + \text{ar}(\triangle DCP) = \frac{1}{2} \text{ar}(\parallel^{\text{gm}} ABCD)$$

(ii) Through  $P$ , draw a line  $LM \parallel AD$ ,

Since  $\triangle APD$  and parallelogram  $ALMD$  are on the same base  $AD$  and between the same parallels  $AD$  and  $LM$ .

$$\therefore \text{ar}(\triangle APD) = \frac{1}{2} \text{ar}(\parallel^{\text{gm}} ALMD) \dots(3)$$

Similarly,

$$\text{ar}(\triangle PBC) = \frac{1}{2} \text{ar}(\parallel^{\text{gm}} BLMC) \dots(4)$$

Adding eqns. (3) and (4), we get

$$\text{ar}(\triangle APD) + \text{ar}(\triangle PBC)$$

$$= \frac{1}{2} \text{ar}(\parallel^{\text{gm}} ALMD) + \frac{1}{2} \text{ar}(\parallel^{\text{gm}} BLMC)$$

$$= \frac{1}{2} \{\text{ar}(\parallel^{\text{gm}} ALMD) + \text{ar}(\parallel^{\text{gm}} BLMC)\}$$

$$= \frac{1}{2} \text{ar}(\parallel^{\text{gm}} ABCD).$$

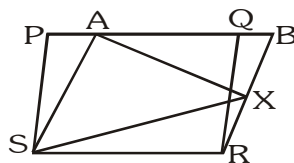
Hence,  $\text{ar}(\triangle APD) + \text{ar}(\triangle PBC)$

$$= \text{ar}(\triangle APB) + \text{ar}(\triangle PCD).$$

**Q5.** In fig,  $PQRS$  and  $ABRS$  are parallelograms and  $X$  is any point on side  $BR$ . Show that :

$$(i) \text{ar}(PQRS) = \text{ar}(ABRS)$$

$$(ii) \text{ar}(\triangle AXS) = \frac{1}{2} \text{ar}(PQRS)$$



**Sol.** (i) Parallelograms PQRS and ABRS are on the same base RS and between the same parallels RS and PB

$$\therefore \text{ar}(\parallel \text{gm PQRS}) = \text{ar}(\parallel \text{gm ABRS}).$$

(ii)  $\triangle AXS$  and parallelogram ABRS are on the same base AS and between the same parallels AS and BR.

$$\therefore \text{ar}(\triangle AXS) = \frac{1}{2} \text{ar}(\text{ABRS}) \quad \dots(1)$$

$$\text{But ar}(\text{PQRS}) = \text{ar}(\text{ABRS}) \quad [\text{Proved in (i)}] \quad \dots(2)$$

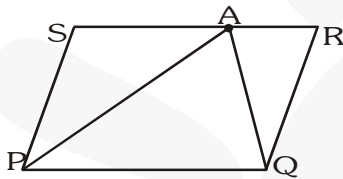
From (1) and (2), we have

$$\text{ar}(\triangle AXS) = \frac{1}{2} \text{ar}(\text{PQRS})$$

**Q6.** A farmer was having a field in the form of a parallelogram PQRS. She took any point A on RS and joined it to points P and Q. In how many parts the field is divided? What are the shapes of these parts? The farmer wants to sow wheat and pulses in equal portions of the field separately. How should she do it?

**Sol.** The field is divided into three parts. The parts are:

$\triangle APS$ ,  $\triangle APQ$  and  $\triangle AQR$ .



$$\text{We have ar}(\triangle APQ) = \frac{1}{2} \text{ar}(\text{PQRS})$$

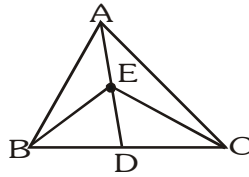
$$\text{Therefore, ar}(\triangle APS) + \text{ar}(\triangle AQR)$$

$$= \text{ar}(\triangle APQ) = \frac{1}{2} \text{ar}(\text{PQRS})$$

She can sow wheat in  $\triangle APQ$  and pulses in  $\triangle APS$  and  $\triangle AQR$  or vice-versa.

## Ex - 9.3

**Q1.** In fig, E is any point on median AD of a  $\triangle ABC$ . Show that  $\text{ar}(\triangle ABE) = \text{ar}(\triangle ACE)$ .



**Sol.** AD is a median of  $\triangle ABC$ .

Therefore, we have  $\text{ar}(\triangle ABD) = \text{ar}(\triangle ACD)$  ... (1)

ED is a median of  $\triangle EBC$

Therefore, we have  $\text{ar}(\triangle EBD) = \text{ar}(\triangle ECD)$  ... (2)

Subtracting (2) from (1),

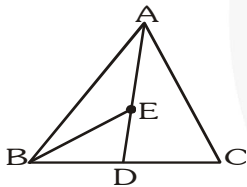
$$\text{ar}(\triangle ABD) - \text{ar}(\triangle EBD) = \text{ar}(\triangle ACD) - \text{ar}(\triangle ECD)$$

$$\Rightarrow \text{ar}(\triangle ABE) = \text{ar}(\triangle ACE).$$

**Q2.** In a triangle ABC, E is the mid-point of median AD. Show that  $\text{ar}(\triangle BED) = \frac{1}{4} \text{ar}(\triangle ABC)$ .

**Sol.** AD is a median of  $\triangle ABC$

$$\Rightarrow \text{ar}(\triangle ABD) = \frac{1}{2} \text{ar}(\triangle ABC) \quad \dots (1)$$



BE is a median of  $\triangle ABD$

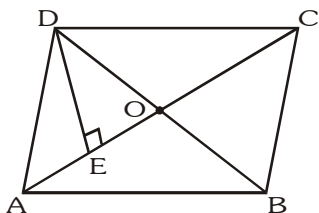
$$\Rightarrow \text{ar}(\triangle BED) = \frac{1}{2} \text{ar}(\triangle ABD) \quad \dots (2)$$

From (1) and (2),

$$\text{ar}(\triangle BED) = \frac{1}{2} \left\{ \frac{1}{2} \text{ar}(\triangle ABC) \right\} = \frac{1}{4} \text{ar}(\triangle ABC).$$

**Q3.** Show that the diagonals of a parallelogram divide it into four triangles of equal area.

**Sol.** We know, Diagonals of a ||gm bisect each other,



$$\Rightarrow AO = OC \text{ and } OB = OD$$

$$\text{ar}(\triangle AOD) = \frac{1}{2} \times AO \times DE$$

$$\text{ar}(\triangle DOC) = \frac{1}{2} \times OC \times DE$$

Since  $AO = OC$

$$\therefore \text{ar}(\triangle AOD) = \text{ar}(\triangle DOC) \quad \dots(1)$$

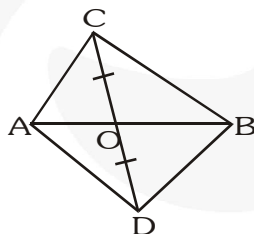
$$\text{ar}(\triangle DOC) = \text{ar}(\triangle BOC) \quad \dots(2)$$

$$\text{and } \text{ar}(\triangle AOB) = \text{ar}(\triangle BOC) \quad \dots(3)$$

From (1), (2) and (3) we have

$$\text{ar}(\triangle AOB) = \text{ar}(\triangle BOC) = \text{ar}(\triangle COD) = \text{ar}(\triangle AOD)$$

**Q4.** In fig, ABC and ABD are two triangles on the same base AB. If line- segment CD is bisected by AB at O, show that  $\text{ar}(\triangle ABC) = \text{ar}(\triangle ABD)$ .



**Sol.**  $CO = DO$  [Given]

Now, AO is a median of  $\triangle ACD$

$$\Rightarrow \text{ar}(\triangle AOC) = \text{ar}(\triangle AOD) \quad \dots(1)$$

$$\text{Similarly, } \text{ar}(\triangle BOC) = \text{ar}(\triangle BOD) \quad \dots(2)$$

Adding (1) and (2), we have  $\text{ar}(\triangle ABC) = \text{ar}(\triangle ABD)$ .

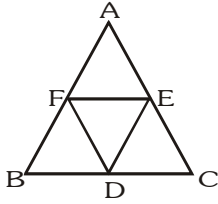
**Q5.** D, E and F are respectively the mid-points of the sides BC, CA and AB of a  $\triangle ABC$ . Show that

(i) BDEF is a parallelogram.                      (ii)  $\text{ar}(\triangle DEF) = \frac{1}{4} \text{ar}(\triangle ABC)$

(iii)  $\text{ar}(\triangle BDEF) = \frac{1}{2} \text{ar}(\triangle ABC)$



**Sol.** (i)



$$EF \parallel BC \quad [\text{Mid point theorem}]$$

$$\Rightarrow EF \parallel BD$$

$$\text{Also, } EF = \frac{1}{2} BC,$$

$$EF = BD$$

[ $\because$  D is the midpoint of BC]

$\therefore$  BDEF is a parallelogram.

$$(ii) \text{ ar (BDEF) = ar (DCEF)}$$

$$\Rightarrow \frac{1}{2} \text{ ar (BDEF)} = \frac{1}{2} \text{ ar (DCEF)}$$

$$\Rightarrow \text{ar}(\triangle BDF) = \text{ar}(\triangle CDE) \quad \dots(1)$$

$$\text{Similarly, ar}(\triangle CDE) = \text{ar}(\triangle DEF) \quad \dots(2)$$

$$\text{ar}(\triangle AEF) = \text{ar}(\triangle DEF) \quad \dots(3)$$

From (1), (2) and (3) we have

$$\begin{aligned} \text{ar}(\triangle AEF) &= \text{ar}(\triangle FBD) = \text{ar}(\triangle DEF) \\ &= \text{ar}(\triangle CDE) \end{aligned}$$

$$\begin{aligned} \therefore \text{ar}(\triangle ABC) &= \text{ar}(\triangle AEF) + \text{ar}(\triangle FBD) + \text{ar}(\triangle DEF) + \text{ar}(\triangle CDE) \\ &= 4 \text{ ar}(\triangle DEF) \end{aligned}$$

$$\Rightarrow \text{ar}(\triangle DEF) = \frac{1}{4} \text{ ar}(\triangle ABC).$$

$$(iii) \text{ ar (BDEF) = ar}(\triangle BDF) + \text{ar}(\triangle DEF)$$

$$= \text{ar}(\triangle DEF) + \text{ar}(\triangle DEF)$$

$$= 2 \text{ ar}(\triangle DEF).$$

$$= 2 \left[ \frac{1}{4} \text{ ar}(\triangle ABC) \right] = \frac{1}{2} \text{ ar}(\triangle ABC)$$

$$\therefore \text{ar (BDEF)} = \frac{1}{2} \text{ ar}(\triangle ABC)$$

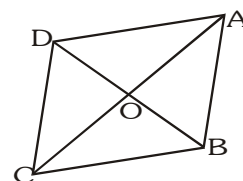
**Q6.** In fig, diagonals AC and BD of quadrilateral ABCD intersect at O such that OB = OD.

If AB = CD, then show that :

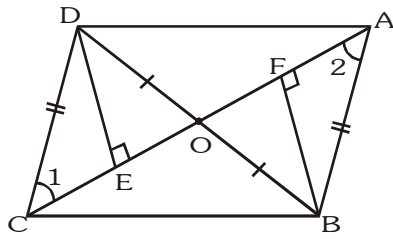
$$(i) \text{ ar (DOC) = ar (AOB)}$$

$$(ii) \text{ ar (DCB) = ar (ACB)}$$

$$(iii) DA \parallel CB \text{ or } ABCD \text{ is a parallelogram.}$$



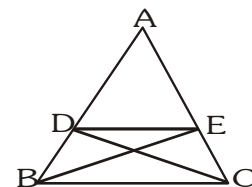
**Sol.** (i) In  $\triangle DEO$  and  $\triangle BFO$ ,



We have  $DO = BO$  [given]  
 $\angle DOE = \angle BOF$  [Vertically opposite angles]  
 $\angle DEO = \angle BFO$  [each  $90^\circ$ ]  
 $\therefore \triangle DEO \cong \triangle BFO$  [By ASA congruency]  
 $\Rightarrow DE = BF$  [By CPCT]  
 and  $\text{ar}(\triangle DEO) = \text{ar}(\triangle BFO)$  ....(1)  
 Now, in  $\triangle DEC$  and  $\triangle BFA$ , we have  
 $\angle DEC = \angle BFA$  [each  $90^\circ$ ]  
 $DE = BF$  [proved above]  
 $DC = BA$  [given]  
 $\therefore \triangle DEC \cong \triangle BFA$  [By RHS congruency]  
 $\Rightarrow \text{ar}(\triangle DEC) = \text{ar}(\triangle BFA)$  ....(2)  
 Adding (1) and (2), we have  
 $\text{ar}(\triangle DEO) + \text{ar}(\triangle DEC)$   
 $= \text{ar}(\triangle BFO) + \text{ar}(\triangle BFA)$   
 $\Rightarrow \text{ar}(\triangle DOC) = \text{ar}(\triangle AOB)$ .  
 (ii)  $\therefore \text{ar}(\triangle DOC) = \text{ar}(\triangle AOB)$  [proved above]  
 Adding  $\text{ar}(\triangle BOC)$  on both the sides, we have  
 $\text{ar}(\triangle DCB) = \text{ar}(\triangle ACB)$   
 (iii) Since  $\triangle DCB$  and  $\triangle ACB$  are on the same base  $CB$  and having equal areas.  
 $\Rightarrow CB \parallel DA$  [ABCD is a ||gm]  
 Also  $\angle 1 = \angle 2$  [By c.p.c.t]  
 So,  $AB \parallel CD$  [alternate interior angles]  
 $\Rightarrow ABCD$  is a parallelogram.

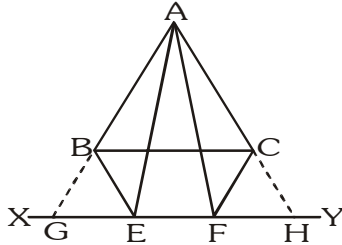
**Q7.** D and E are points on sides AB and AC respectively of  $\triangle ABC$  such that  $\text{ar}(\triangle DBC) = \text{ar}(\triangle ECB)$ .  
 Prove that  $DE \parallel BC$ .

**Sol.**  $\triangle DBC$  and  $\triangle ECB$  have equal areas and same base  $BC$ .  
 $\Rightarrow$  The two triangles are between the same parallels.  
 $\Rightarrow DE \parallel BC$



**Q8.** 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  $\text{ar}(\triangle ABE) = \text{ar}(\triangle ACF)$ .

**Sol.** In figure, AB (produced) and AC(produced) meet XY and G and H respectively.



Now, BGFC and BEHC are parallelograms.

$$\Rightarrow BC = GF \text{ and } BC = EH$$

$$\Rightarrow GF = EH \Rightarrow GE = FH$$

$$\Rightarrow \text{ar}(\triangle BGE) = \text{ar}(\triangle CFH) \quad \dots(1)$$

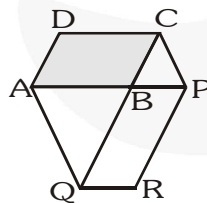
Also, we find that

$$\text{ar}(\triangle AGE) = \text{ar}(\triangle AHF) \quad \dots(2)$$

Subtracting (1) from (2), we have

$$\text{ar}(\triangle ABE) = \text{ar}(\triangle ACF).$$

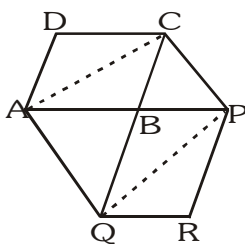
**Q9.** The side AB of a parallelogram ABCD is produced to any point P. A line through A and parallel to CP meets CB produced at Q and then parallelogram PBQR is completed. Show that  $\text{ar}(ABCD) = \text{ar}(PBQR)$ .



**Sol.** We join AC and PQ in figure.

we are given that  $AQ \parallel CP$ .

Now,  $\triangle ACQ$  and  $\triangle APQ$  have same base AQ. The two triangles are between same parallels.



Therefore, we have

$$\text{ar}(\triangle ACQ) = \text{ar}(\triangle APQ)$$

$$\Rightarrow \text{ar}(\triangle ABC) + \text{ar}(\triangle ABQ)$$

$$= \text{ar}(\triangle BPQ) + \text{ar}(\triangle ABQ)$$

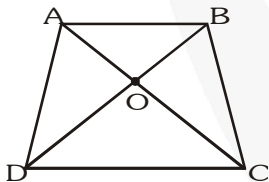
$$\Rightarrow \text{ar}(\triangle ABC) = \text{ar}(\triangle BPQ)$$

$$\Rightarrow \frac{1}{2} \text{ar}(ABCD) = \frac{1}{2} \text{ar}(PBQR)$$

$$\Rightarrow \text{ar}(ABCD) = \text{ar}(PBQR).$$

**Q10.** Diagonals AC and BD of a trapezium ABCD with  $AB \parallel DC$  intersect each other at O. Prove that  $\text{ar}(\triangle AOD) = \text{ar}(\triangle BOC)$ .

**Sol.**  $\because \text{ar}(\triangle ABD) = \text{ar}(\triangle ABC)$

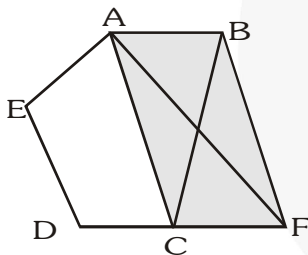


Subtracting  $\text{ar}(\triangle AOB)$  from both sides, we get

$$\Rightarrow \text{ar}(\triangle ABD) - \text{ar}(\triangle AOB) = \text{ar}(\triangle ABC) - \text{ar}(\triangle AOB)$$

$$\Rightarrow \text{ar}(\triangle AOD) = \text{ar}(\triangle BOC)$$

**Q11.** In fig, ABCDE is a pentagon. A line through B parallel to



AC meets DC produced at F. Show that

$$(i) \text{ar}(\triangle ACB) = \text{ar}(\triangle ACF)$$

$$(ii) \text{ar}(\triangle AEDF) = \text{ar}(ABCDE)$$

**Sol.** (i)  $\triangle ACB$  and  $\triangle ACF$  in figure, have same base AC and also, between the same parallels.

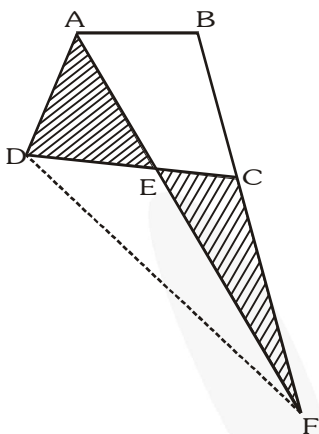
$$\text{Therefore, } \text{ar}(\triangle ACB) = \text{ar}(\triangle ACF)$$

$$(ii) \text{ar}(\triangle ACDE) + \text{ar}(\triangle ACB) = \text{ar}(\triangle ACDE) + \text{ar}(\triangle ACF)$$

$$\Rightarrow \text{ar}(ABCDE) = \text{ar}(AEDF).$$

**Q12.** 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 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 this proposal will be implemented.

**Sol.** Let us draw  $DF \parallel AC$  and join A and F.  
 $\therefore \text{ar}(\triangle DAF) = \text{ar}(\triangle DCF)$ .



Subtracting  $\text{ar}(\triangle DEF)$  from both sides, we get

$$\text{ar}(\triangle DAF) - \text{ar}(\triangle DEF)$$

$$= \text{ar}(\triangle DCF) - \text{ar}(\triangle DEF)$$

$$\Rightarrow \text{ar}(\triangle ADE) = \text{ar}(\triangle CEF)$$

Let us prove that  $\text{ar}(\triangle ABF) = \text{ar}(\text{ABCD})$ ,

We have:

$$\text{ar}(\triangle CEF) = \text{ar}(\triangle ADE) \quad [\text{proved above}]$$

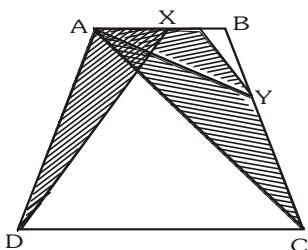
Adding  $\text{ar}(\text{ABCE})$  to both sides, we get :

$$\text{ar}(\triangle CEF) + \text{ar}(\text{ABCE}) = \text{ar}(\triangle ADE) + \text{ar}(\text{ABCE})$$

$$\Rightarrow \text{ar}(\triangle ABF) = \text{ar}(\text{ABCD})$$

**Q13.** ABCD is a trapezium with  $AB \parallel DC$ . A line parallel to AC intersects AB at X and BC at Y. Prove that  $\text{ar}(\triangle ADX) = \text{ar}(\triangle ACY)$ .

**Sol.** We have a trapezium ABCD such that  $AB \parallel DC$ .



$$AB \parallel DC$$

[Given]

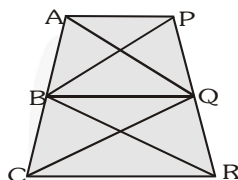
$$\therefore \text{ar}(\triangle ADX) = \text{ar}(\triangle ACX) \quad \dots(1)$$

$$\text{ar}(\triangle ACX) = \text{ar}(\triangle ACY) \quad \dots(2)$$

From (1) and (2), we have

$$\text{ar}(\triangle ADX) = \text{ar}(\triangle ACY)$$

**Q14.** In fig,  $AP \parallel BQ \parallel CR$ . Prove that  $\text{ar}(\triangle AQC) = \text{ar}(\triangle PBR)$ .



**Sol.** In figure,  $AP \parallel BQ$  and  $BQ \parallel CR$

$$\Rightarrow \text{ar}(\triangle ABQ) = \text{ar}(\triangle PBQ) \quad \dots(1)$$

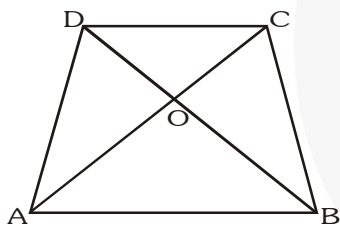
$$\text{and } \text{ar}(\triangle BQC) = \text{ar}(\triangle BQR) \quad \dots(2)$$

Adding (1) and (2), we have

$$\text{ar}(\triangle AQC) = \text{ar}(\triangle PBR)$$

**Q15.** Diagonals AC and BD of a quadrilateral ABCD intersect at O in such a way that  $\text{ar}(\triangle AOD) = \text{ar}(\triangle BOC)$ . Prove that ABCD is a trapezium.

**Sol.**



$$\text{ar}(\triangle AOD) = \text{ar}(\triangle BOC)$$

Adding  $\text{ar}(\triangle AOB)$  to both the sides, we have

$$\Rightarrow \text{ar}(\triangle AOD) + \text{ar}(\triangle AOB) = \text{ar}(\triangle BOC) + \text{ar}(\triangle AOB)$$

$$\text{ar}(\triangle ABD) = \text{ar}(\triangle ABC)$$

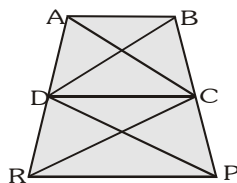
Since, they are on the same base AB,

$$\therefore AB \parallel DC$$

Now, ABCD is quadrilateral having a pair of opposite sides parallel.

$\therefore$  ABCD is trapezium.

**Q16.** In fig,  $\text{ar}(\triangle DRC) = \text{ar}(\triangle DPC)$  and  $\text{ar}(\triangle BDP) = \text{ar}(\triangle ARC)$ . Show that both the quadrilaterals ABCD and DCPR are trapeziums.



**Sol.**  $\text{ar}(\triangle DRC) = \text{ar}(\triangle DPC)$ . [Given]  
 $\therefore \triangle DRC$  and  $\triangle DPC$  must lie between the same parallels.

So,  $DC \parallel RP$ .

$\therefore$  Quadrilateral DCPR is a trapezium.

Again, we have

$$\text{ar}(\triangle BDP) = \text{ar}(\triangle ARC) \quad [\text{Given}] \quad \dots(1)$$

$$\text{Also, ar}(\triangle DPC) = \text{ar}(\triangle DRC) \quad [\text{Given}] \quad \dots(2)$$

Subtracting (2) from (1) we get :

$$\text{ar}(\triangle BDP) - \text{ar}(\triangle DPC) = \text{ar}(\triangle ARC) - \text{ar}(\triangle DRC)$$

$$\text{ar}(\triangle BDC) = \text{ar}(\triangle ADC).$$

Since, they are on the same base DC

$\therefore \triangle BDC$  and  $\triangle ADC$  must lie between the same parallels

So,  $AB \parallel DC$ .

$\therefore$  Quadrilateral ABCD is a trapezium.