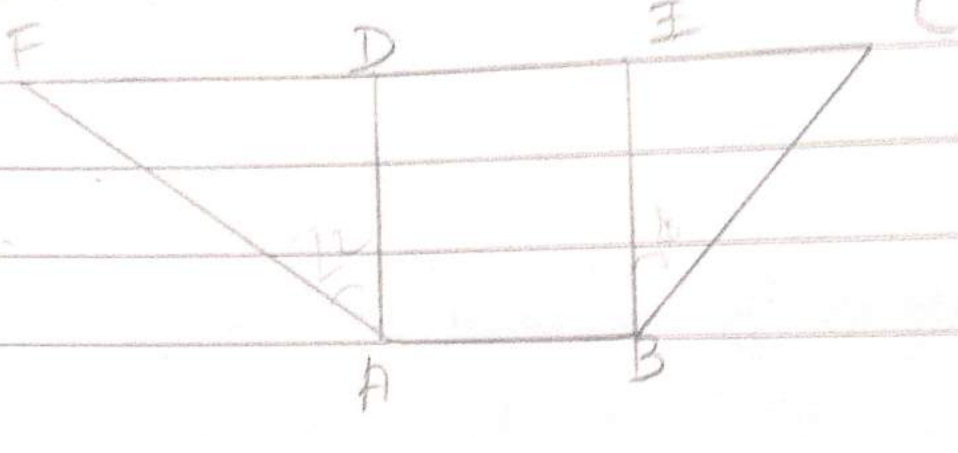
Chapter - 12
Area of Parallelograms and Triangles

Notes:

* A Diagonal of a parallelogram divides into two triangles of equal area.
* Two congruent figures have equal area but the converse is always not true.
* Parallelograms on the same base and between the same parallels are equal in area.
* Triangles on the same base and between the same parallels are equal in ~~length~~ area.
* If a triangle and a parallelogram are on the same base and between the same parallel, then the area of triangle is equal to half the area of parallelogram
* The Diagonals of a parallelogram divides it into four triangles of equal area

Theorem : 1

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



Given,
Two ||gm ABCD and ABEF are on the same base AB and between the parallels AB and FC.

To prove: ar (||gm ABCD) = ar (||gm ABEF)

Proof:

In $\triangle$ ADF and $\triangle$ BCE

AD = BC (gn)

AF = BE (gn)

$\angle 1 = \angle 2$ ($\because$ AD || BC and AF || BE)

$\therefore \triangle ADF \cong \triangle BCE$ (By SAS)

$\Rightarrow$ ar ($\triangle$ ADF) = ar ($\triangle$ BCE) $\rightarrow$ ①

Now,

ar (||gm ABCD) = ar ($\square$ ABED) + ar ($\triangle$ BEC)

= ar ($\square$ ABED) + ar ($\triangle$ ADF) (using ①)

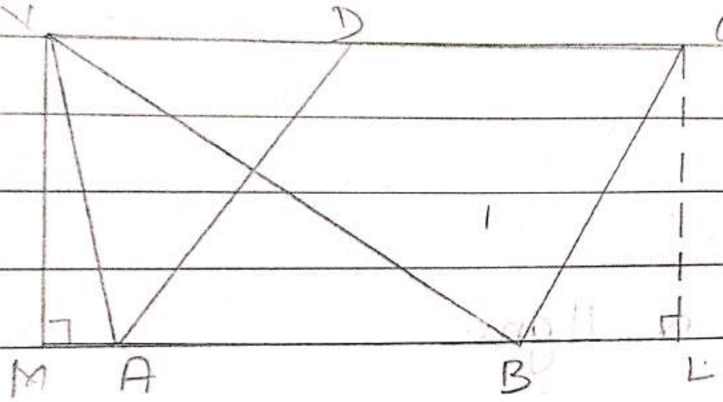
= ar (||gm ABEF)

$\therefore$ ar (||gm ABCD) = ar (||gm ABEF)

Hence proved.....

Theorem: 2

If a triangle and a parallelogram are on the same base and between the same parallel then the area of triangle is equal to half the area of parallelogram.



Given,

|| gm ABCD and ΔVAB

are on the same base AB and between the

Same parallels AB and VC

To prove :

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

Construction:

Draw $VM \perp AB$

Extend AB upto L

Draw $CL \perp AL$ and $AL \parallel VC$

Proof:

$$ar(\triangle VAB) = \frac{1}{2} \times AB \times VM \quad (\because VM = CL)$$

$$= \frac{1}{2} \times AB \times CL$$

$$ar(\triangle VAB) = \frac{1}{2} ar(\| ABCD)$$

Hence proved.