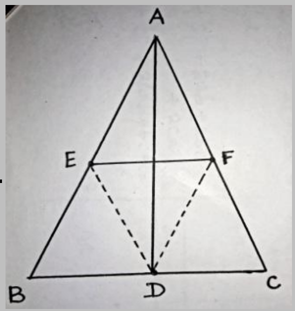
General instructions for Students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy.

$CLASS - IX$

$MATHEMATICS$

$11.$ $Mid-point\ Theorem\ (Part-II)$ $EXERCISE-11$

Q. No. 9 ABC is an isosceles triangle with $AB = AC$. D, E and F are mid-points of the sides BC, AB and AC respectively. Prove that the line segment AD is perpendicular to EF and is bisected by it.



Solution: We join DE and DF

In $\triangle ABC$, D and E are the mid-points of sides BC and AB respectively.

$\therefore \quad DE \parallel AC$ and $DE = \frac{1}{2} AC$ (mid-point theorem) ……………. (i)

Again, In $\triangle ABC$, D and F are the mid-points of sides BC and AC respectively.

$\therefore \quad DF \parallel AB$ and $DF = \frac{1}{2} AB$ (mid-point theorem) ……………. (ii)

From (i) and (ii), $\quad DE \parallel AC \Rightarrow DE \parallel AF$

And $DF \parallel AB \Rightarrow DF \parallel AE$

$\therefore \quad DEAF$ is a $\parallel gm$ …………………………….. (iii)

$AB = AC$ $\quad (Given)$

$\frac{1}{2} AB = \frac{1}{2} AC \Rightarrow DE = DF$ $\quad$ [Using (i) and (ii)] ……….. (iv)

From (iii) and (iv), $\quad DEAF$ is a rhombus.

The diagonals of a rhombus bisect each other at $90°$

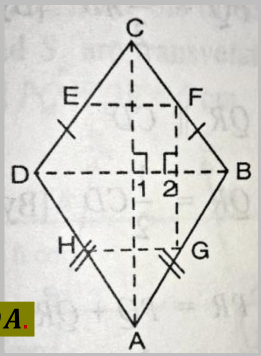
Hence, the line segment AD is perpendicular to EF and is bisected by it. **Proved.**

$Q.No.\ 11(b)$ *In the figure, ABCD is a kite in which $BC = CD,\ AB = AD$.*

$E,\ F$ and G are the mid − points of $CD,\ BC$ and AB respectively.

Prove that $(i)\ \angle EFG = 90°$

(ii) *The line drawn through G parallel to FE bisects DA.*



Given : *ABCD is a kite in which $BC = CD,\ AB = AD$.*

$E,\ F$ and G are the mid − points of $CD,\ BC$ and AB respectively.

To prove : $(i)\ \angle EFG = 90°$

(ii) *The line drawn through G parallel to FE bisects DA.*

(i) *Proof :* *Diagonals of a kite intersects at right angles.*

Construction : we join BD and AC.

In $\triangle ABC,\ FG \parallel CA$ [*F and G are the mid − points of BC and AB*]

$\therefore\ \angle 1 = \angle 2 = 90°$

In $\triangle BCD,\ EF \parallel BD$ [*Sum of consecutive int.* $\angle s$ *is* $180°$]

$\therefore\ \angle EFG = 90°$ ***Proved.***

(ii) *Construction : Draw* $GH \parallel EF$

Proof : $EF \parallel BD \implies GH \parallel BD$

In $\triangle ABD,\ GH \parallel BD$ *and G is the mid − point of AB*

$\therefore$ *H is the mid − point of AD.* ***Proved.***

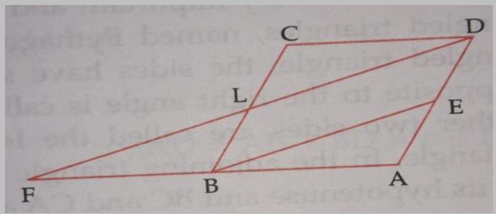
Chapter Test

$Q.No.\ 5$ *In the figure, ABCD is a parallelogram and E is mid − point of AD. $DL \parallel EB$*

meets AB produced at F. Prove that B is mid − point of AF and $EB = LF$.

Given : *ABCD is a parallelogram and E is mid − point of AD.*

$DL \parallel EB$ meets AB produced at F.



To rove : *B is mid − point of AF and $EB = LF$.*

Proof : *In* $\triangle ADF$, *E is mid − point of AD and* $EB \parallel DF$

$\therefore$ *B is the mid − point of AF* (*Converse of mid − point theorem*) ***Proved.***

$Again,\ In\ \triangle ADF,\ E\ and\ B\ are\ mid-points\ of\ AD\ and\ AF\ respectively.$

$$\therefore \quad EB = \frac{1}{2}\ DF \ldots\ldots\ldots\ldots\ldots\ldots\ldots.(i)$$

$$\because \quad EB \parallel DL\ and\ BL \parallel ED$$

$$\therefore \quad EBLD\ is\ a\ parallelogram.$$

$$EB = DL \qquad (opp.sides\ are\ equal\ in \parallel gm) \ldots\ldots\ldots\ldots\ldots(ii)$$

$From(i)and(ii),\quad DL = \frac{1}{2}\ DF \quad i.e.\quad L\ is\ the\ mid-point\ of\ DF$

$$\therefore \quad LF = DL = EB$$

$Hence,\ EB = LF$ **Proved.**

HOMEWORK

EXERCISE − 11

QUESTION NUMBERS : 10 (a), (b), (c) and 12

CHAPTER TEST : 1, 3 and 4