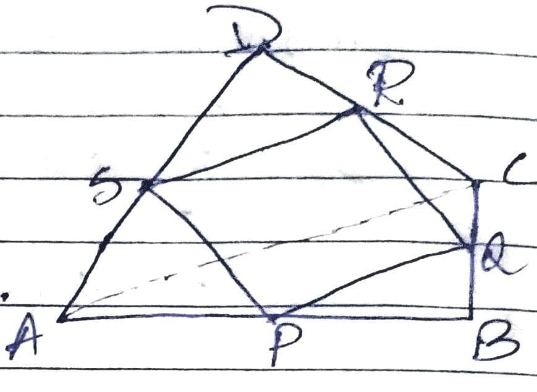
31.07.21 ch-8 Quadrilaterals

Ex - 8.2



1Ans. (i) In ΔACD, we have

$\therefore$ S is the mid-point of AD and R is the mid-point of CD.

$SR = \frac{1}{2} AC$ and $SR \parallel AC$ .... (1)

[By mid-point theorem].

(ii) In ΔABC, P is the mid-point of AB and Q is the mid-point of BC.

$PQ = \frac{1}{2} AC$ and $PQ \parallel AC$ .... (2)

[By mid-point theorem].

From (1) and (2), we get.

$PQ = \frac{1}{2} AC = SR$ and $PQ \parallel AC \parallel SR$

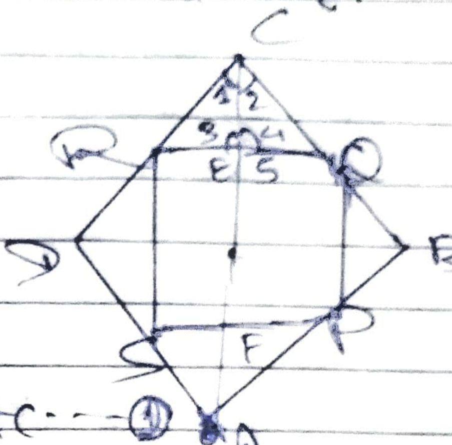
$\Rightarrow PQ = SR$ and $PQ \parallel SR$

~~PQ = SR and~~ .

(iii) In a quadrilateral PQRS,
PQ = SR and $PQ \parallel SR$ [Proved]

$\therefore$ PQRS is a parallelogram.

2Ans. we have a rhombus ABCD and P, Q, R and S are the mid-points of the sides AB, BC, CD and DA respectively. I joined AC.



In Δ ABC, P and Q are the mid-points of AB and BC respectively.

$\therefore$ $PQ = \frac{1}{2} AC$ and $PQ \parallel AC$ --- (1)
[By Mid-point theorem].

In Δ ADC, R and S are the mid-points of CD and DA respectively.

$\therefore$ $SR = \frac{1}{2} AC$ and $SR \parallel AC$ --- (2)
[By mid-point theorem].

From (1) and (2), we get

$PQ = \frac{1}{2} AC = SR$ and $PQ \parallel AC \parallel SR$
$\Rightarrow PQ = SR = PQ \parallel SR$.
$\therefore$ PQRS is a $\parallel$gm --- (3)

Now In ΔERC and ΔEQC,
$\angle 1 = \angle 2$ [diagonals of a rhombus bisect the opp.]

$CR = CQ$ $\left[\because \frac{CD}{2} = \frac{BC}{2}\right]$

$CE = CE$ [common]
$\therefore$ $\Delta ERC \cong \Delta EQC$ ~~[]~~ [SAS].

$\Rightarrow \angle 3 = \angle 4$ ---- (4) [CPCT]

But

$\angle 3 + \angle 4 = 180°$ ---- (5) [Linear pair]

∴ From (4) and (5), we get

$\Rightarrow \angle 3 = \angle 4 = 90°$

Now, $\angle RQP = 180° - \angle 6$ [∵ co-interior angles b/w PQ ∥ R and EQ is transversal]

But $\angle 5 = \angle 3$ [∵ vert. opp. ∠s]

$\therefore \angle 5 = 90°$

So,

$\angle RQP = 180° - \angle 5 = 90°$

∴ One angle of ∥gm PQRS is 90°.

Thus, PQRS is a Rectangle.

Also, we have,

Now, in ΔABC, we have.

$PQ = \frac{1}{2} AC$ and $PQ \parallel AC$ ...... (1)

[By mid-point theorem].

Similarly, in ΔADC, we have.

$SR = \frac{1}{2} AC$ and $SR \parallel AC$ ..... (2)

From (1) and (2), we have

$PQ = SR$ and $PQ \parallel SR$

$\therefore$ PQRS is a ||gm.

Now, in ΔPAS and ΔPBQ, we have

$\angle A = \angle B$ [Each $90°$].

$AP = BP$ [P is the mid-point of AB]

$AS = BQ$ [$\because \frac{1}{2} AD = \frac{1}{2} BC$]

$\therefore \Delta PAS \cong \Delta PBQ$ [SAS]

$\Rightarrow PS = PQ$ [CPCT]

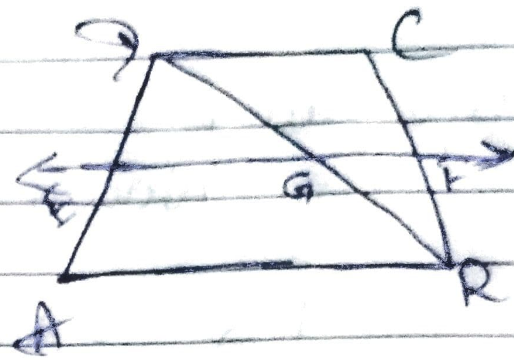
Also, $PS = QR = PQ = SR$

[Opp. sides of a ||gm are equal].

So, $PQ = QR = RS = SP$ i.e., PQRS is a ||gm having all of its sides equal.

Hence, PQRS is a rhombus.

Ans,



In ΔDAB,

we know that E is the mid-point of AD and $EG \parallel AB$ [$\because EF \parallel AB$]

Using the converse of mid-point theorem, we get,

G is the mid-point of BD.

Again in ΔBDC, we have G is the mid-point of BD and $GF \parallel DC$.

[$\because AB \parallel DC$ and $EF \parallel AB$ and GF is a part of EF].

Using the converse of the mid-point theorem, we get, F is the mid-point of BC.