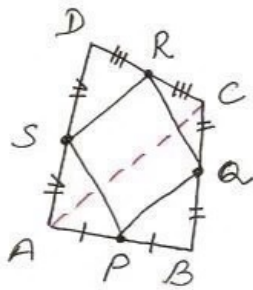


①



To show $SR \parallel AC$, $SR = \frac{1}{2} AC$

$PQ = SR$

$PQRS$ is a $\parallel gm$

Const - join AC

Proof PQ joins midpts of sides AB and BC resp. of ΔABC

$PQ \parallel AC \dots (i)$

$PQ = \frac{1}{2} AC \dots (ii)$
[midpoint theorem]

Similarly

$SR \parallel AC \dots (iii)$

$SR = \frac{1}{2} AC \dots (iv)$

From (i) and (iii)

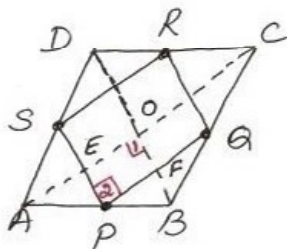
$PQ \parallel SR$

From (ii) and (iv)

$PQ = SR$

$\square PQRS$ is a $\parallel gm$ [$PQ \parallel SR$, $PQ = SR$]

②



To prove - $\square PQRS$ is a rect.

Proof -

$\square ABCD$ is a $\parallel gm$
[proof same as a.1]

$PQ \parallel AC$ (proved)

$\Rightarrow PF \parallel EO$

PS joins midpts of sides AB and AD resp. of ΔABD

$PS \parallel BD$ [Midpoint theorem]

$\Rightarrow PE \parallel FO$

$\square PFOE$ is a $\parallel gm$ [$PF \parallel EO$, $PE \parallel FO$]

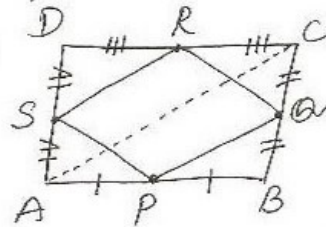
$\angle 1 = \angle 2$ (opp. angles of a $\parallel gm$)

But $\angle 1 = 90^\circ$
[diagonals of a \square rhombus are \perp to each other]

$\therefore \angle 2 = 90^\circ$

$\parallel gm PQRS$ is a rect.

③



To prove - $\square PQRS$ is a rhombus

Proof Same as a.1
 $\square PQRS$ is a $\parallel gm$.

In ΔSAP and ΔQBP

$AP = BP$ [$\because P$ is midpt. of AB]

$\angle SAP = \angle QBP = 90^\circ$ [each angle of rect.]

$SA = QB$ [$DA = CB$ opp. sides of rect, S is midpt of DA, Q is midpt of BC]

$\therefore \Delta SAP \cong \Delta QBP$ by SAS prop.

$SP = QP$ (cpct)

$\therefore \parallel gm PQRS$ is a rhombus.