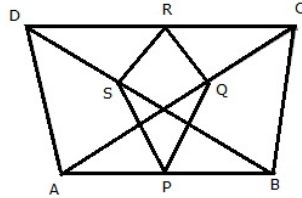




Exercise 4A

Question 13:



Given: ABCD is a quadrilateral in which $AD = BC$. P, Q, R, S are the midpoints of AB, AC, CD and BD.

To prove: PQRS is a rhombus

Proof: In $\triangle ABC$,

Since P and Q are mid points of AB and AC

$$PQ = \frac{1}{2} BC = \frac{1}{2} DA \quad (\text{Mid-point theorem})$$

Therefore, $PQ \parallel BC$ and $PQ = \frac{1}{2} BC$

Similarly,

In $\triangle CDA$,

Since R and Q are mid points of CD and AC

Therefore, $RQ \parallel DA$ and $RQ = \frac{1}{2} DA$

In $\triangle BDA$,

Since S and P are mid points of BD and AB

Therefore, $SP \parallel DA$ and $SP = \frac{1}{2} DA$

In $\triangle CDB$,

Since S and R are mid points of BD and CD

Therefore, $SR \parallel BC$ and $SR = \frac{1}{2} BC = \frac{1}{2} DA$

Therefore $SP \parallel RQ$ and $PQ \parallel SR$ and $PQ = RQ = SP = SR$

Hence, PQRS is a rhombus.

Question 14:

Given: ABC is a triangle in which $AB = AC$. D and E are points on AB and AC respectively such that $AD = AE$

To prove: The points B, C, E and D are concyclic.

Proof: $AB = AC$ (given)

$$\Rightarrow (AB - AD) = (AC - AE)$$

$$\Rightarrow DB = EC$$

$$\Rightarrow \frac{AD}{AE} = \frac{DB}{EC} \text{ (each equal to 1)}$$

$$\Rightarrow DE \parallel BC$$

(by the converse of Thale's theorem)

$$\Rightarrow \angle DEC + \angle ECB = 180^\circ$$

$$\Rightarrow \angle DEC + \angle CBD = 180^\circ [\because AB = AC \Rightarrow \angle C = \angle B]$$

Quad BCEA is cyclic

Hence, the point B, C, E, D are concyclic.

***** END *****