# ACTIVITY

## Quadrilateral Formed By Joining Mid-point Of Sides Of A Quadrilateral

### Objective

To show that the quadrilateral formed by joining the mid-points of the adjacent sides of a quadrilateral is a parallelogram by paper folding.

### Material Required

Glazed papers, pencil, a pair of scissors, glue stick and tracing paper.

### Theory

1. Concept of finding mid-point of a line segment by performing a paper folding activity.
2. Properties of a parallelogram.

### Procedure

1. Take any colored glazed paper.
2. Draw a quadrilateral of any dimensions on glazed paper and name it as ABCD.
3. Cut that quadrilateral from the glazed paper.
4. Now, find the mid-point of each side AB, BC, CD, DA by paper folding and name them E, F, G, H respectively as shown in fig. (i).

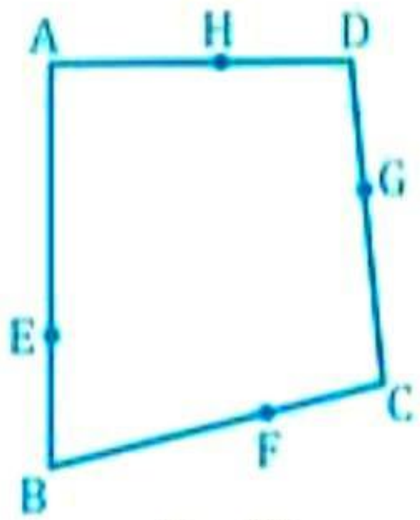


**fig. (i)**

5. Now, fold the figure along with EF, GF, GH and EH. Press it and then unfold it as shown in fig. (ii).

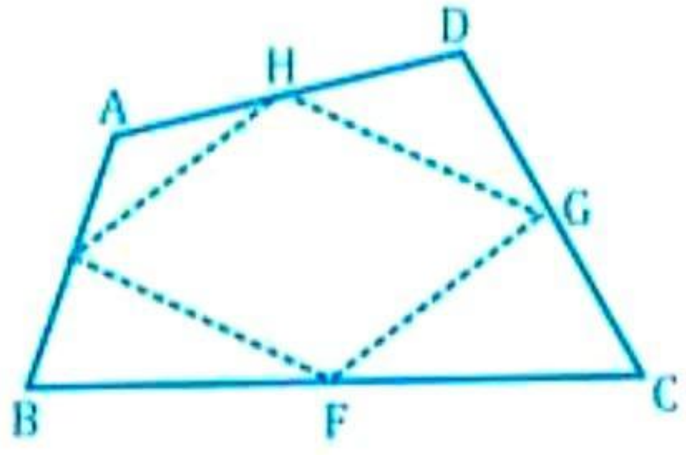


**fig. (ii)**

6. We will get creases along with EF, GF, GH, HE.
7. Make a replica (true copy) of EFGH (say PQRS) by using tracing paper fig. (iii)

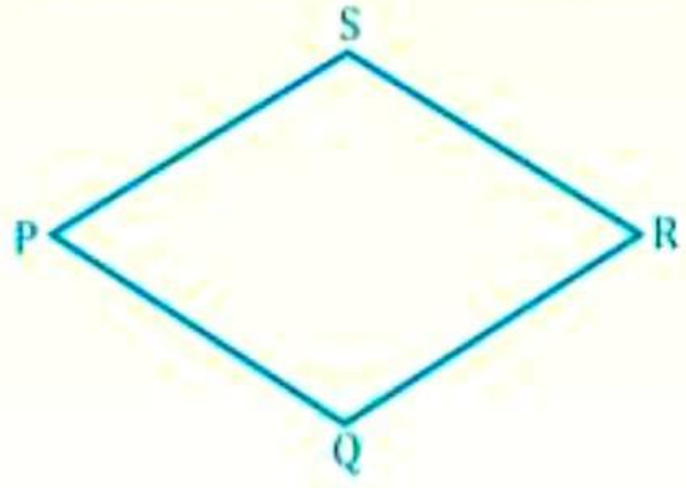


**fig. (iii)**

1. Cut the quadrilateral PQRS along any diagonal (say RP) [fig. (iv)].

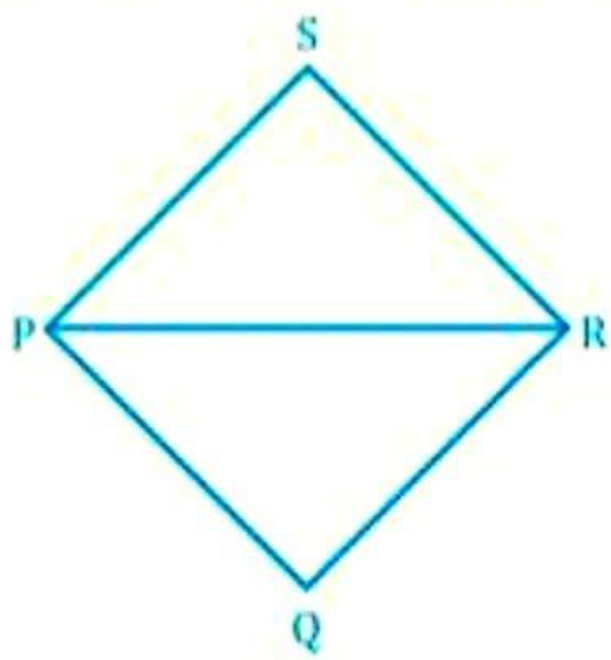


**fig. (iv)**

2. We will get two triangles ΔPSR and ΔPQR.
3. Now, overlap these two triangles. Two triangles coincide with each other[fig. (v)] such that side PS overlaps with QR and PQ with SR.

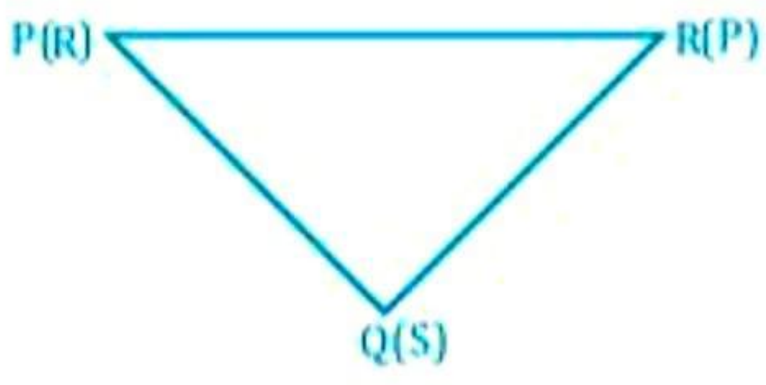


**fig. (v)**

## Observation

We observe that two triangles coincide with each other which means two triangles are congruent to each other. In a quadrilateral, two triangles cover each other completely along any diagonal, then the quadrilateral will be a parallelogram.

∴ △ PQR =△ PSR

i.e., a r(△ PQR) = a r(ΔPSR)

∴ PQRS is a parallelogram.

## Result

As the replica of ΔPQR exactly covers the replica of ΔPSR

∴ PQ = RS, QR = SP

∴ PQRS is a parallelogram.

## Learning Outcome

We have verified by paper folding that the quadrilateral formed by joining mid-points of adjacent sides of a quadrilateral will be a parallelogram. We also learnt that a diagonal always divides the parallelogram into two triangles of equal areas.

## Activity Time

What type of figures do you obtain?

1. If you join mid-points of the sides of a rectangle (Do it by paper folding).
2. If you join the mid-points of the sides of a square (Do it by paper folding).

# Viva Voce

**Q1. Name the quadrilateral in which one pair of opposite sides are equal and parallel.**

**Ans:** Parallelogram

**Q2. Name the quadrilateral formed by joining the mid-points of the sides of a quadrilateral in order.**

**Ans:** Parallelogram

**Q3. If ABCD is a rectangle, then name the quadrilateral formed by joining the mid-points of its sides in:**

**Ans:** Rhombus (But, if ABCD is a square, then the name of the quadrilateral formed by joining the mid-points of its sides is also a square.)

**Q4. What do you mean by rhombus?**

**Ans:** A rhombus is a parallelogram with four equal sides and opposite equal angles.

**Q5. Define parallelogram?**

**Ans:** A parallelogram is a two-dimensional geometrical shape; whose sides are parallel to each other.

**Q6. What do you mean by a quadrilateral?**

**Ans:** A quadrilateral is a plane closed figure bounded by four-line segments.

# Multiple Choice Questions

**Q 1. In △ PQR, if S is the mid-point of PR, T lies on QR and ST = PQ then:**

(a) $ST = \frac{1}{3}PQ$ (b) $ST = \frac{1}{2}PQ$ (c) $ST = PQ$ (d) None of these

**Q 2. In a quadrilateral ABCD, equal diagonals AC and BD intersect at P, such that AP = PC, BP = PD and ∠BPC = 90°. The quadrilateral is exactly:**

(a) A parallelogram (b) A square (c) A rhombus (d) A rectangle

**Q 3. Diagonals of a parallelogram ABCD intersect at O. If ∠BOC = 90° and ∠BDC = 50°, the ∠OAB is:**

(a) 90° (b) 50° (c) 40° (d) 10°

**Q 4. The triangle formed by joining the mid-points of the sides of an equilateral triangle is:**

(a) An equilateral triangle (b) An isosceles triangle

(c) A right-angled triangle (d) None of these

**Q 5. The diagonals of a rectangle ABCD intersect each other at O. If $\angle BOC = 44^\circ$, then $\angle OAD = ?$**

(a) $58^\circ$ (b) $68^\circ$ (c) $64^\circ$ (d) $62^\circ$

**Q 6. If bisectors of $\angle A$ and $\angle B$ of a quadrilateral ABCD intersect each other at P, that of $\angle B$ and $\angle C$ at Q, that of $\angle C$ and that $\angle D$ at R and of $\angle D$ and $\angle A$ at S, then PQRS is a:**

(a) Rectangle

(b) Rhombus

(c) Parallelogram

(d) quadrilateral whose opposite angles are Supplementary

**Q 7. The triangle formed by joining the mid-points of the sides of a right triangle is:**

(a) A right triangle. (b) An obtuse-angled triangle.

(c) An isosceles triangle. (d) None of these.

**Q 8. The diagonals AC and BD of a parallelogram ABCD intersect each other at the point O. If $\angle DAC = 32^\circ$ and $\angle AOB = 70^\circ$, then $\angle DBC$ is equal to:**

(a) $24^\circ$ (b) $86^\circ$ (c) $38^\circ$ (d) $32^\circ$

**Q 9. In a square, diagonals are:**

(a) Equal (b) Not equal (c) $\frac{1}{2}$ of each other (d) None of these

## ANSWER KEY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.(b) | 2.(a) | 3.(a) | 4.(a) | 5.(b) | 6.(c) | 7.(a) | 8.(c) | 9.(a) |