ACTIVITY

Mid-Point Theorem

Objective

To verify that in a triangle, the line joining the mid–points of any two sides is parallel to the third side and half of it by paper folding and pasting.

Material Required

Glazed papers, a pair of scissors, pencil, eraser, glue stick, white sheet.

Theory

1. Concept of angles, triangles and mid–points.
2. Concept of corresponding angles: If a transversal cuts two straight lines such that their corresponding angles are equal, then the lines are parallel.

Procedure

1. Draw ΔABC on the yellow glazed paper of any measurement and paste it is on a white sheet.
2. Find mid–points of the two sides (say AB and AC) of a triangle by paper folding. We obtain D and E as mid–points of AB and AC respectively in the 1st triangle.

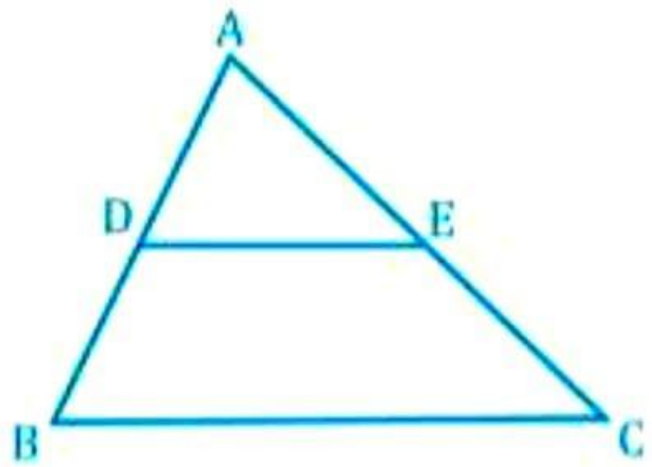


fig. (I)

3. Draw horizontal line DE. Similarly, find the mid–point of side BC and name its F as shown in fig. (ii).

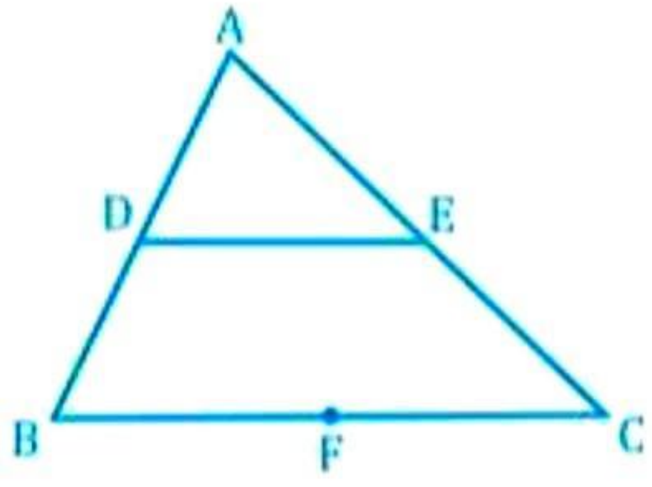


fig. (ii)

4. Trace the ΔABC on tracing paper and cut ΔABC along line DE as shown in fig. (iii).

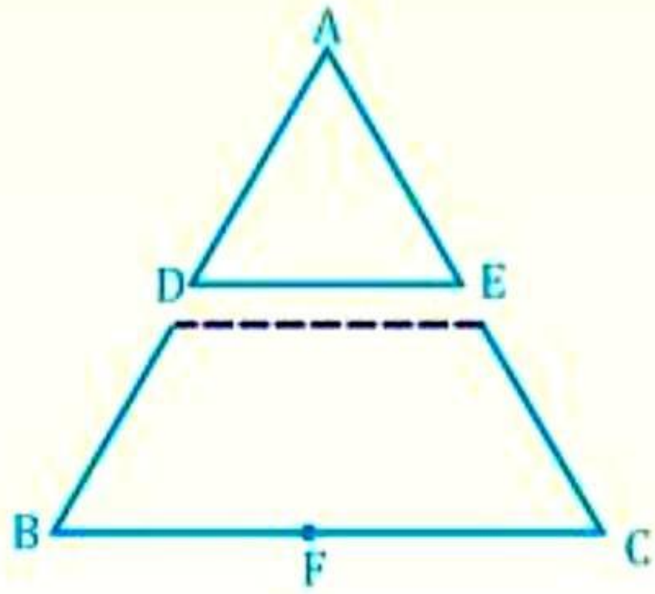


fig. (iii)

5. Paste this cut out of triangle ADE [fig. (iii)] on ΔABC of fig. (ii) such that AE coincides with EC and
6. ED lies on CB and point D coincides with F as shown in fig. (iv).

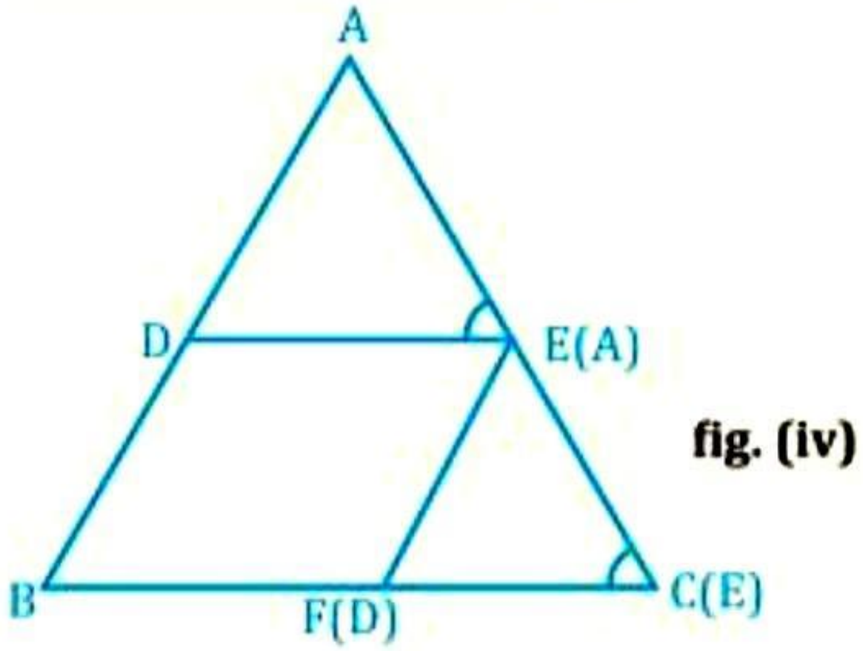


fig. (iv)

7. ΔADE completely covers ΔEFC.

Observation

We observe that ΔADE exactly overlaps ΔEFC.

$\therefore \angle 1 = \angle 2$(corresponding angles)

AC is any transversal line intersecting the lines DE and BC.

$\therefore$ DE ∥ BC.

By paper folding, we observe that, in fig (iv) F, the mid-point of BC coincides with D.

DE = FC (As DE superimposes on FC)

Or $DE = FC = \frac{BC}{2}$

Result

Hence, it is verified that the line joining the mid-points of two sides of a triangle is parallel to the third side and half of it.

Learning Outcome

Line segment joining the mid-points of any two sides of a triangle is parallel to the third side and is equal to half of it. This is true for all types of triangles like an acute-angled triangle, obtuse-angled triangle and right-angled triangle.

Activity Time

Students can verify this theorem in different triangles, e.g., obtuse-angled triangle, right-angled triangle, equilateral triangles, scalene triangles.

Viva Voce

Q1. State the mid-point theorem.

Ans: The line drawn through the mid-point of one side of a triangle and parallel to another side of the triangle, bisects the third side of the triangle.

Q2. What is the area of a triangle?

Ans: Area of triangle $= \frac{1}{2} \times$ base $\times$ height

Q3. Name the different triangles based on their sides.

Ans: Equilateral triangle, scalene triangle, isosceles triangle.

Q4. In a triangle, the line drawn through the mid-point of one side is parallel to another side, what is the ratio of the parallel line to the third side?

Ans: 1: 2.

Q5. Is the mid-point theorem applicable in any type of triangle?

Ans: Yes.

Q6. In a triangle, the line is drawn through the mid-points of two sides, then what will be the relation between the line and the third side?

Ans: The line will be parallel to the third side.

Q7. In ΔABC, D, E, F are the mid-points of the sides BC, CA, and AB respectively, and $\angle BAC = 70°$, what is the value of $\angle EDF$?

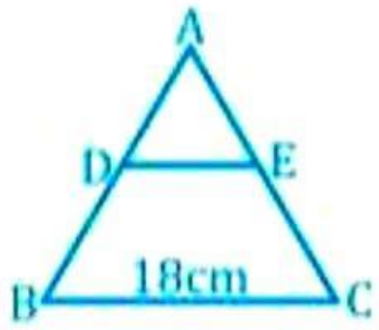
Ans: $70°$

Q8. Name the different triangles based on their angles.

Ans: Acute angled triangle, obtuse-angled triangle and right-angled triangle.

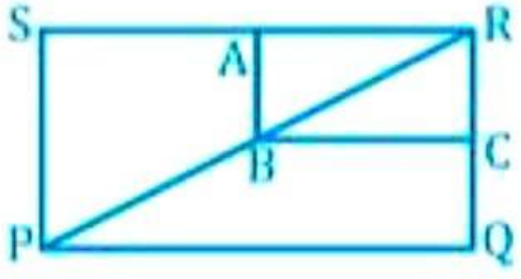
Multiple Choice Questions

Q 1. What is the length of DE if DE || BC, BC = 18 cm and D and E are mid-points of AB and AC?



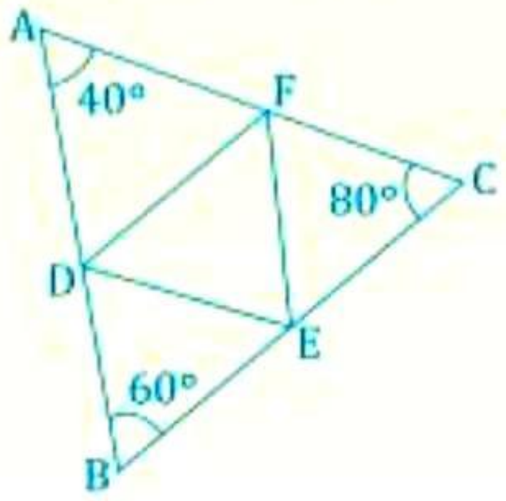
(a) 18 cm (b) 15 cm (c) 9 cm (d) 20 cm

Q 2. If ABCR and PQRS are rectangles and B is the mid-point of PR, find the ratio of $\frac{AC}{PR}$?



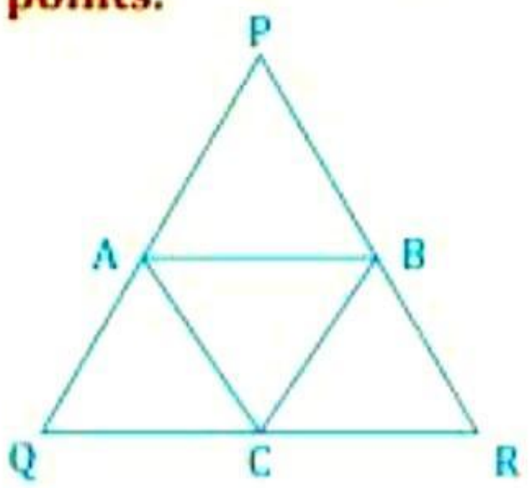
(a) $\frac{1}{2}$ (b) 2 (c) 1 (d) $\frac{5}{2}$

Q 3. Find the ratio of the angles ∠D: ∠E: ∠F of △ DEF formed by joining the mid-points of the sides of △ ABC.



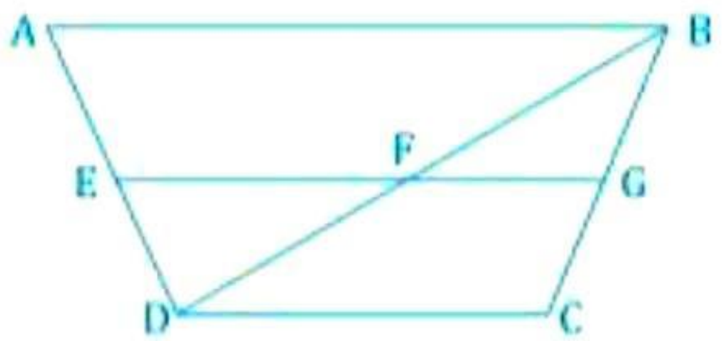
(a) 4: 2: 3 (b) 4: 3: 2 (c) 2: 3: 5 (d) 5: 3: 2

Q 4. Find the perimeter of △ ABC, if the perimeter of △ PQR is 36 cm and A, B and C are mid-points.



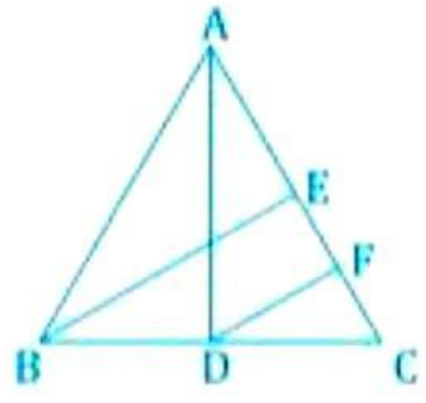
(a) 9 cm (b) 18 cm (c) 20 cm (d) 36 cm

Q 5. Find the ratio of $\frac{(AB+CD)}{EG}$ if EG || AB and AB || DC and E and G are the mid-points.



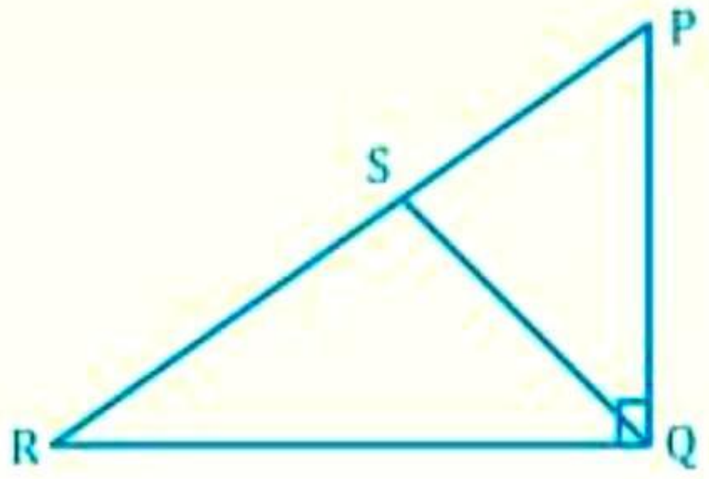
(a) 1 (b) $\frac{1}{2}$ (c) 2 (d) $\frac{3}{2}$

Q 6. What is the ratio of $\frac{AC}{CF}$ if AD and BE are the median?



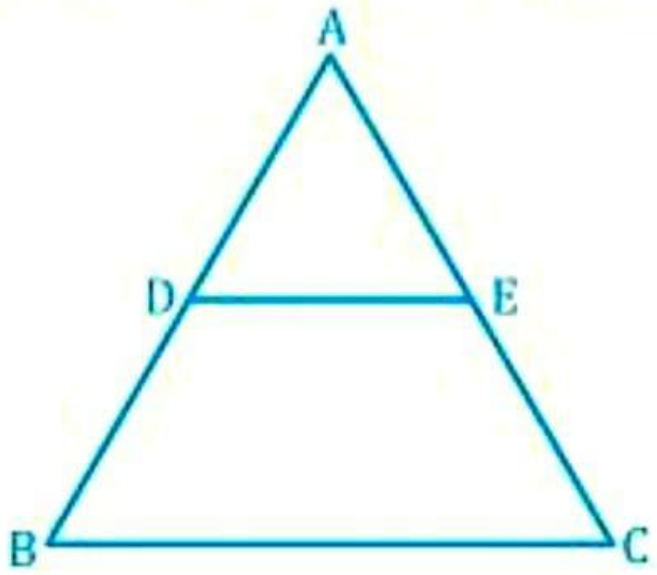
(a) 4 (b) 1 (c) $\frac{1}{4}$ (d) $\frac{1}{2}$

Q 7. Which of the following relation is correct if S is the mid-point of PR?



(a) QS = PR (b) $QS = \frac{1}{2PR}$ (c) QS = 2PR (d) $QS = \frac{1}{4PR}$

Q 8. From the diagram below, if D and E are mid-points of the lines AB and AC respectively and if DE ∥ BC, then what is the relation between DE and BC?



(a) DE = BC
(b) 3DE = BC
(c) 2DE = BC
(d) There is no definite relation between DE and BC

ANSWER KEY

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