



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 $\triangle ABC$ on the yellow glazed paper of any measurement and paste it 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.

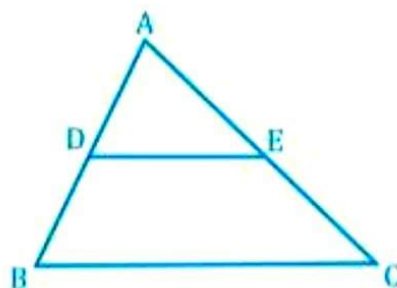


fig. (I)

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

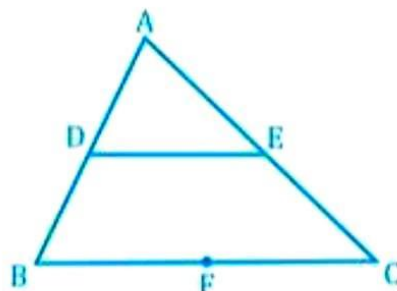


fig. (ii)

4. Trace the $\triangle ABC$ on tracing paper and cut $\triangle ABC$ along line DE as shown in fig. (iii).

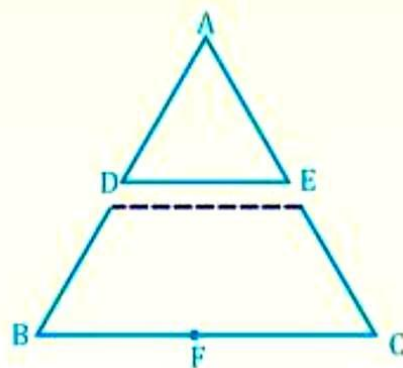


fig. (iii)

5. Paste this cut out of triangle ADE [fig. (iii)] on $\triangle ABC$ 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).

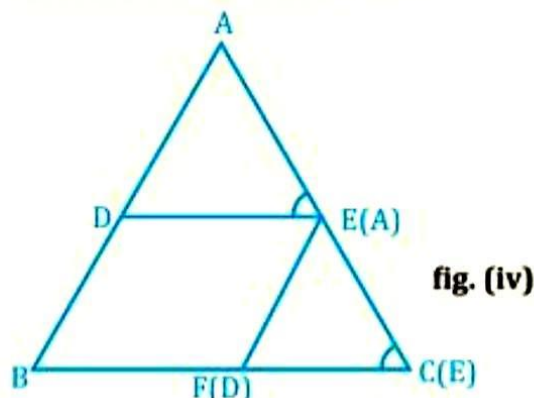


fig. (iv)

7. $\triangle ADE$ completely covers $\triangle EFC$.

Observation

We observe that $\triangle ADE$ exactly overlaps $\triangle EFC$.

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

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

$\therefore DE \parallel BC$.

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 = $\frac{1}{2} \times \text{base} \times \text{height}$

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 $\triangle ABC$, D, E, F are the mid-points of the sides BC, CA, and AB respectively, and $\angle BAC = 70^\circ$, what is the value of $\angle EDF$?

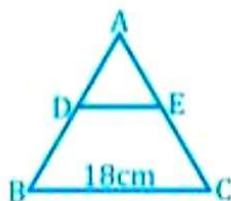
Ans: 70°

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 $DE \parallel BC$, $BC = 18$ cm and D and E are mid-points of AB and AC?



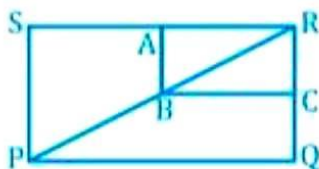
(a) 18 cm

(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 $\frac{AC}{PR}$?



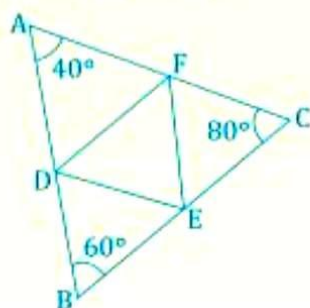
(a) $\frac{1}{2}$

(b) 2

(c) 1

(d) $\frac{5}{2}$

Q 3. Find the ratio of the angles $\angle D : \angle E : \angle F$ of $\triangle DEF$ formed by joining the mid-points of the sides of $\triangle ABC$.



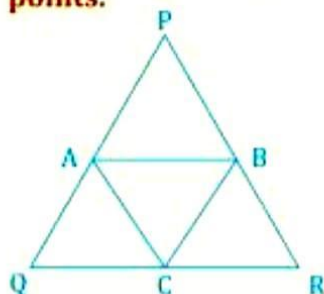
(a) 4:2:3

(b) 4:3:2

(c) 2:3:5

(d) 5:3:2

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



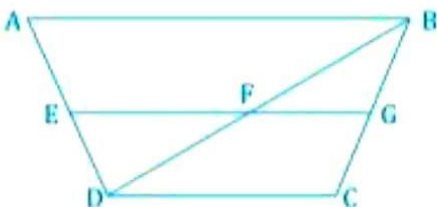
(a) 9 cm

(b) 18 cm

(c) 20 cm

(d) 36 cm

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



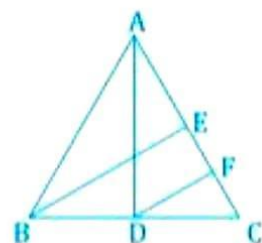
(a) 1

(b) $\frac{1}{2}$

(c) 2

(d) $\frac{3}{2}$

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



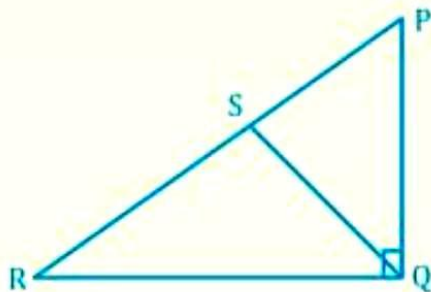
(a) 4

(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?



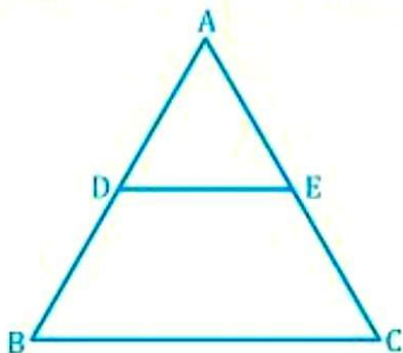
(a) $QS = PR$

(b) $QS = \frac{1}{2}PR$

(c) $QS = 2PR$

(d) $QS = \frac{1}{4}PR$

Q 8. From the diagram below, if D and E are mid-points of the lines AB and AC respectively and if $DE \parallel BC$, 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)
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