CHAPTER TEST: AREAS OF PARALLELOGRAMS AND TRIANGLES

Mathematics | Class IX (2026/ARPARA/09/001)

Time: 1.5 Hours **Max. Marks: 40**

General Instructions:

- All questions are compulsory.
- Section A: 8 MCQs (1 mark each).
- Section B: 4 Very Short Answer Questions (2 marks each).
- Section C: 3 Short Answer Questions (3 marks each).
- Section D: 2 Long Answer Questions (5 marks each).
- Section E: 1 Case Study with 5 MCQs (1 mark each).

Section A: Multiple Choice Questions (1 Mark Each)

1. If a triangle and a parallelogram are on the same base and between the same parallels, then the ratio of the area of the triangle to the area of the parallelogram is:
   (a) 1 : 1
   (b) 1 : 2
   (c) 2 : 1
   (d) 1 : 4
2. In a parallelogram $ABCD$, E is any point on side CD. If $area(\triangle ADE) + area(\triangle BCE) = 15\,cm^2$, then $area(ABCD)$ is:
   (a) $15\,cm^2$
   (b) $20\,cm^2$
   (c) $30\,cm^2$
   (d) $45\,cm^2$
3. Two parallelograms are on equal bases and between the same parallels. The ratio of their areas is:
   (a) 1 : 1
   (b) 1 : 2
   (c) 2 : 1
   (d) Dependent on the height
4. In $\triangle ABC$, D, E, F are the mid-points of sides BC, CA, AB respectively. If $area(ABC) = 16\,cm^2$, then $area(DEF)$ is:
   (a) $8\,cm^2$
   (b) $4\,cm^2$

(c) $2\,cm^2$

(d) $12\,cm^2$

5. If the base of a parallelogram is doubled and the corresponding altitude is halved, the area of the parallelogram:

   (a) Becomes four times

   (b) Is halved

   (c) Remains same

   (d) Is doubled

6. A median of a triangle divides it into two:

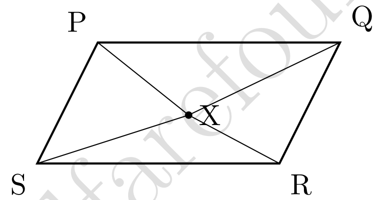
   (a) Congruent triangles

   (b) Isosceles triangles

   (c) Right triangles

   (d) Triangles of equal area

7. In the given figure, $PQRS$ is a parallelogram and X is a point in its interior. The sum of $area(\triangle PXQ)$ and $area(\triangle RXS)$ is:



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

   (b) $\frac{1}{4}area(PQRS)$

   (c) $area(PQRS)$

   (d) $\frac{1}{3}area(PQRS)$

8. If a rectangle and a rhombus are on the same base and between the same parallels, then the ratio of their areas is:

   (a) 1 : 1

   (b) 1 : 2

   (c) 2 : 1

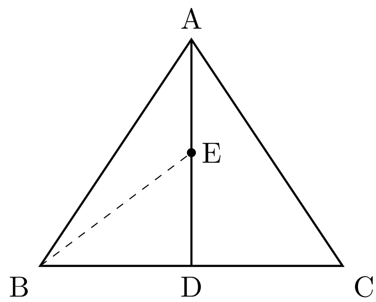
   (d) Cannot be determined

Section B: Very Short Answer Questions (2 Marks Each)

1. $ABCD$ is a quadrilateral. A line through D parallel to AC meets BC produced at E. Show that $area(\triangle ABE) = area(ABCD)$.

2. Show that a diagonal of a parallelogram divides it into two triangles of equal area.

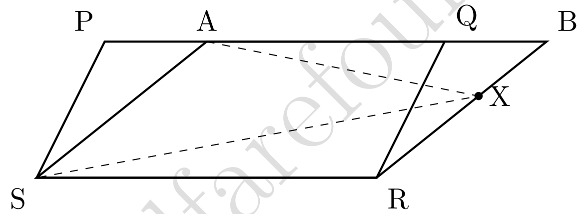
3. In the figure below, AD is a median of $\triangle ABC$. E is the mid-point of AD. Show that $area(\triangle BED) = \frac{1}{4}area(\triangle ABC)$.



4. If E, F, G, H are the mid-points of the sides of a parallelogram $ABCD$, prove that $area(EFGH) = \frac{1}{2}area(ABCD)$.

Section C: Short Answer Questions (3 Marks Each)

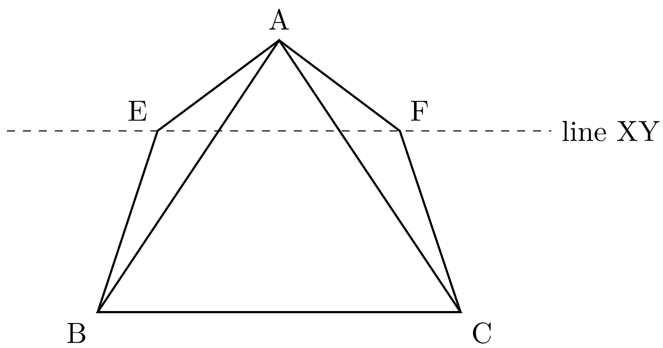
1. In $\triangle ABC$, D is the mid-point of AB and P is any point on BC. If line segment CQ is drawn parallel to PD to meet AB at Q, prove that $area(\triangle BPQ) = \frac{1}{2}area(\triangle ABC)$.
2. In the given figure, $PQRS$ and $ABRS$ are parallelograms and X is any point on side BR. Show that: (i) $area(PQRS) = area(ABRS)$ (ii) $area(\triangle AXS) = \frac{1}{2}area(PQRS)$



3. Diagonals AC and BD of a quadrilateral $ABCD$ intersect at O in such a way that $area(\triangle AOD) = area(\triangle BOC)$. Prove that $ABCD$ is a trapezium.

Section D: Long Answer Questions (5 Marks Each)

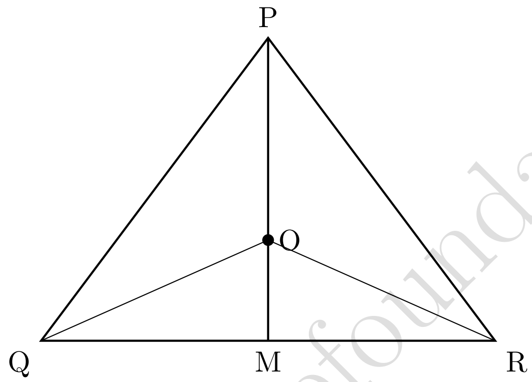
1. XY is a line parallel to side BC of $\triangle ABC$. If $BE \parallel AC$ and $CF \parallel AB$ meet XY at E and F respectively, show that $area(\triangle ABE) = area(\triangle ACF)$.



2. Parallelogram $ABCD$ and rectangle $ABEF$ are on the same base AB and have equal areas. Show that the perimeter of the parallelogram is greater than that of the rectangle. Provide a conceptual proof using the properties of altitudes and hypotenuse in a right-angled triangle.

Section E: Case Study Based Questions (5 Marks)

Case Study: Urban Park Planning
The Municipal Corporation of a smart city is planning to develop a triangular park $\triangle PQR$. To make the park more accessible and aesthetically pleasing, the architects have decided to divide the park into different zones. They identified the mid-point M of the base QR. A walking path is constructed along the median PM. To further enhance the design, they located a point O on the path PM such that $PO : OM = 2 : 1$. The area surrounding O is divided into smaller triangular sections $\triangle POQ$, $\triangle POR$, and $\triangle QOR$ for a fountain, a flower bed, and a seating area respectively. The planners know that the total area of the triangular plot PQR is $1200\,m^2$. They need to calculate the areas of these sub-sections to allocate the budget for landscaping materials and maintenance.



Questions (Choose the correct option):

1. What is the area of $\triangle PQM$?
   (a) $300\,m^2$
   (b) $400\,m^2$
   (c) $600\,m^2$
   (d) $800\,m^2$
2. The area of the seating zone $\triangle QOR$ is:
   (a) $300\,m^2$
   (b) $400\,m^2$
   (c) $600\,m^2$
   (d) $200\,m^2$
3. Which of the following relations is correct?
   (a) $area(\triangle POQ) = area(\triangle POR)$
   (b) $area(\triangle POQ) = area(\triangle QOR)$
   (c) $area(\triangle POR) = area(\triangle PQR)$
   (d) $area(\triangle QOM) = area(\triangle PQM)$
4. If the cost of laying grass in the fountain area $\triangle POQ$ is $Rs.50$ per m^2, the total cost for this area is:

(a) $Rs.15,000$
(b) $Rs.20,000$
(c) $Rs.30,000$
(d) $Rs.10,000$

5. The ratio of $area(\triangle POQ) : area(\triangle PQR)$ is:

(a) 1 : 2
(b) 1 : 3
(c) 1 : 4
(d) 1 : 6