

CLASS 9 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

Chapter 12: HOTS: Quadrilaterals (Class 9)

Topic-wise short notes with solved examples

Higher order thinking questions on quadrilaterals for Class 9: angles and diagonals of parallelograms, rectangles and rhombuses, the midpoint theorem and the quadrilateral formed by joining midpoints, each with a full solution.

1 Solved HOTS questions

- Facts: in a parallelogram opposite sides and opposite angles are equal, adjacent angles add up to 180° , and the diagonals bisect each other. A rectangle has equal diagonals. A rhombus has diagonals that bisect each other at right angles. The midpoint theorem: the segment joining the midpoints of two sides of a triangle is parallel to the third side and half as long.

Example 1.1 In a parallelogram ABCD, $\angle A = 70^\circ$. Find the other three angles.

SOLUTION

Opposite angles are equal: $\angle C = 70^\circ$.

Adjacent angles add up to 180° : $\angle B = \angle D = 110^\circ$.

$\angle B = 110^\circ$, $\angle C = 70^\circ$, $\angle D = 110^\circ$

Example 1.2 The diagonals of a parallelogram ABCD meet at O. If $OA = 3x - 1$ and $OC = x + 5$, find AC.

SOLUTION

The diagonals bisect each other, so $OA = OC$: $3x - 1 = x + 5$ and $x = 3$.

$OA = 8$, so $AC = 2 \times 8$.

16

Example 1.3 D, E and F are the midpoints of the sides BC, CA and AB of triangle ABC with $AB = 10$ cm, $BC = 12$ cm and $CA = 16$ cm. Find the perimeter of triangle DEF.

SOLUTION

By the midpoint theorem each side of DEF is half of the opposite side of ABC.

The perimeter of DEF is half of $10 + 12 + 16 = 38$.

19 cm

Example 1.4 The diagonal of a rectangle is 13 cm and one side is 5 cm. Find the other side and the area.

SOLUTION

The other side = $\sqrt{13^2 - 5^2} = \sqrt{144} = 12$ cm.

Area = 5×12 .

12 cm and 60 square cm

Example 1.5 The diagonals of a quadrilateral PQRS are 6 cm and 8 cm and they are perpendicular. The midpoints of its sides are joined to form a quadrilateral. What is this quadrilateral and what is its area?

SOLUTION

The midpoint quadrilateral is a parallelogram, with sides parallel to the diagonals and half as long: 3 cm and 4 cm.

The diagonals are perpendicular, so the angles of this parallelogram are 90° and it is a rectangle.

Area = 3×4 .

A rectangle of area 12 square cm