

4-gons (Quadrilaterals)

CBSE Class 9 Maths · Knowledge organiser

KEY DEFINITIONS

Parallelogram

A quadrilateral with both pairs of opposite sides parallel.

Mid-point theorem

The segment joining the mid-points of two sides of a triangle is parallel to the third side and half its length.

Diagonal

A line segment joining two opposite vertices.

KEY FORMULAS

Parallelogram: opposite sides/angles equal, diagonals bisect; rhombus diagonals $\perp$; rectangle diagonals equal

Mid-point theorem $DE \parallel BC, DE = \frac{1}{2}BC$

Centroid divides each median 2 : 1 $AG = \frac{2}{3}AD,$
 $G = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3} \right)$

Joining mid-points of any quadrilateral gives a parallelogram, perimeter $AC + BD$, half the area

YOU SHOULD BE ABLE TO...

- Use the angle and side properties of parallelograms, the mid-point theorem and the centroid ratio.
- Find unknown sides and angles and prove short results about parallelograms and mid-points.
- Prove the mid-point theorem and work with the mid-point quadrilateral in coordinates and in words.
- Use the converse of the mid-point theorem in trapeziums and classify mid-point quadrilaterals.

WORKED EXAMPLE

In parallelogram $PQRS$, $\angle P = (3x + 10)^\circ$ and $\angle Q = (2x + 20)^\circ$. Find x .

Adjacent angles: $5x + 30 = 180 \Rightarrow x = 30$; $\angle P = 100^\circ$, $\angle Q = 80^\circ$.

COMMON MISTAKES

- ✗ Taking adjacent angles of a parallelogram as equal: they are supplementary.
- ✗ Assuming the diagonals of every parallelogram are equal or perpendicular.
- ✗ Using the ratio 1 : 2 for the centroid from the vertex: it is 2 : 1.
- ✗ Using the mid-point theorem when only one point is a mid-point: use the converse, with the parallel line.