Quadrilaterals

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Comprehensive study notes for

Quadrilaterals

by

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(Math King of Katargam). Master every concept with clear explanations, solved examples, and practice problems.

Key Concepts

Types of Quadrilaterals

A

quadrilateral

has 4 sides, 4 angles, and 2 diagonals. Types: Parallelogram (opposite sides parallel), Rectangle (parallelogram with right angles), Rhombus (all sides equal), Square (all sides equal, all right angles), Trapezium (one pair of parallel sides), Kite (two pairs of adjacent equal sides).

Angle Sum Property

The sum of all interior angles of a quadrilateral is

360?

.

Properties of a Parallelogram

In a parallelogram: (i) Opposite sides are equal and parallel. (ii) Opposite angles are equal. (iii) Diagonals bisect each other. (iv) Adjacent angles sum to 180?.

Midpoint Theorem

The line segment joining the midpoints of two sides of a triangle is

parallel

to the third side and

half

its length. Conversely, a line through the midpoint of one side parallel to another side bisects the third side.

Special Parallelograms

Rectangle:

Diagonals are equal.

Rhombus:

Diagonals are perpendicular bisectors.

Square:

Diagonals are equal and perpendicular bisectors.

Important Formulas

Angle Sum

?A + ?B + ?C + ?D = 360?

Parallelogram

AB = CD, AD = BC, AB ∣ CD, AD ∣ BC

Parallelogram Diagonals

Diagonals bisect each other: AO = OC, BO = OD

Midpoint Theorem

If M and N are midpoints of AB and AC, then MN ∣ BC and MN = BC/2

Rectangle Diagonal

AC = BD = ?(AB2 + BC2)

Solved Examples

Example 1:

Three angles of a quadrilateral are 75?, 90?, and 105?. Find the fourth angle.

Solution:

Sum = 360?. Fourth angle = 360 - (75+90+105) =

90?

Example 2:

In a parallelogram ABCD, ?A = 70?. Find ?B, ?C, ?D.

Solution:

?C = ?A = 70? (opposite). ?B = ?D = 180 - 70 =

110?

(adjacent).

Example 3:

Show that the diagonals of a rhombus are perpendicular to each other.

Solution:

In rhombus ABCD, AB = BC = CD = DA. Triangles AOB and COB are congruent (SSS). So ?AOB = ?COB = 90?.

Hence proved.

Practice Questions

Find the sum of exterior angles of a quadrilateral.

In a parallelogram, one angle is 40? more than its adjacent angle. Find all angles.

Prove that the diagonals of a rectangle are equal.

In ?ABC, D and E are midpoints of AB and AC. If BC = 10 cm, find DE.

Name the quadrilateral whose diagonals are equal and perpendicular bisectors.

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