

Lesson 25-3: Properties of Special Parallelograms

A second type of special quadrilateral is a rectangle. A rectangle is a quadrilateral with four right angles.



Theorems Properties of Rectangles		
THEOREM	HYPOTHESIS	CONCLUSION
7-3-1 If a quadrilateral is a rectangle, then it is a parallelogram. (rect. \rightarrow \square)		$ABCD$ is a parallelogram.
7-3-2 If a parallelogram is a rectangle, then its diagonals are congruent. (rect. \rightarrow diag. \cong)		$\overline{AC} \cong \overline{BD}$

Since a rectangle is a parallelogram by Theorem 7-3-1, a rectangle "inherits" all the properties of parallelograms.

[Ex. 1] Craft Application

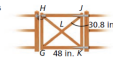
An artist connects stained glass pieces with lead strips. In this rectangular window, the strips are cut so that $FG = 24$ in. and $FH = 34$ in. Find JG .



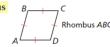
YOUR TURN Carpentry The rectangular gate has diagonal braces. Find each length.

1a. IJ

1b. HK



A rhombus is another special quadrilateral. A rhombus is a quadrilateral with four congruent sides.



Theorems Properties of Rhombuses		
THEOREM	HYPOTHESIS	CONCLUSION
7-3-3 If a quadrilateral is a rhombus, then it is a parallelogram. (rhombus \rightarrow \square)		$ABCD$ is a parallelogram.
7-3-4 If a parallelogram is a rhombus, then its diagonals are perpendicular. (rhombus \rightarrow diag. \perp)		$\overline{AC} \perp \overline{BD}$
7-3-5 If a parallelogram is a rhombus, then each diagonal bisects a pair of opposite angles. (rhombus \rightarrow each diag. bisects opp. \angle)		$\angle 1 \cong \angle 2$ $\angle 3 \cong \angle 4$ $\angle 5 \cong \angle 6$ $\angle 7 \cong \angle 8$

Like a rectangle, a rhombus is a parallelogram. So you can apply the properties of parallelograms to rhombuses.

[Ex. 2] Using Properties of Rhombuses to Find Measures

$RSTV$ is a rhombus. Find each measure.

A $\angle VT$



$RSTV$ is a rhombus. Find each measure.

B $m\angle W$



YOUR TURN $CDHG$ is a rhombus. Find each measure.

2a. $\angle D$

2b. $m\angle GCH$ if $m\angle GCD = (b + 3)^\circ$ and $m\angle CDF = (b - 4)^\circ$



Rectangles, rhombuses, and squares are sometimes referred to as special parallelograms.

A square is a quadrilateral with four right angles and four congruent sides. In the exercises, you will show that a square is a parallelogram, a rectangle, and a rhombus. So a square has the properties of all three.



[Ex. 3] Verifying Properties of Squares

Show that the diagonals of square $ABCD$ are congruent perpendicular bisectors of each other.

Step 1 Show that \overline{AC} and \overline{BD} are congruent.



Step 2 Show that \overline{AC} and \overline{BD} are perpendicular.

Step 3 Show that \overline{AC} and \overline{BD} bisect each other.

Since \overline{AC} and \overline{BD} have the same midpoint, they bisect each other. The diagonals are congruent perpendicular bisectors of each other.

YOUR TURN 3. The vertices of square $STVW$ are $S(-5, -4)$, $T(0, 2)$, $V(6, -3)$, and $W(1, -9)$. Show that the diagonals of square $STVW$ are congruent perpendicular bisectors of each other.