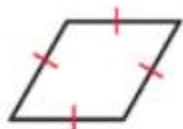# 8.5 Properties of Rhombuses, Rectangles, and Squares
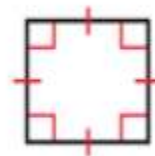
In this lesson, you will learn about three special types of parallelograms: *rhombuses*, *rectangles*, and *squares*.

A **rhombus** is a parallelogram with four congruent sides.

A **rectangle** is a parallelogram with four right angles.
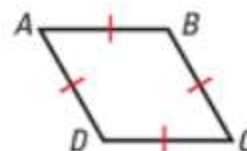
A **square** is a parallelogram with four congruent sides and four right angles.

RHOMBUS COROLLARY

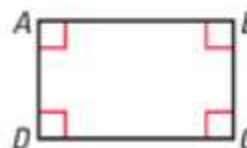A quadrilateral is a rhombus if and only if it has four congruent sides.

ABCD is a rhombus if and only if $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$.

RECTANGLE COROLLARY

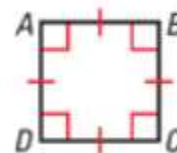A quadrilateral is a rectangle if and only if it has four right angles.

ABCD is a rectangle if and only if $\angle A$, $\angle B$, $\angle C$, and $\angle D$ are right angles.
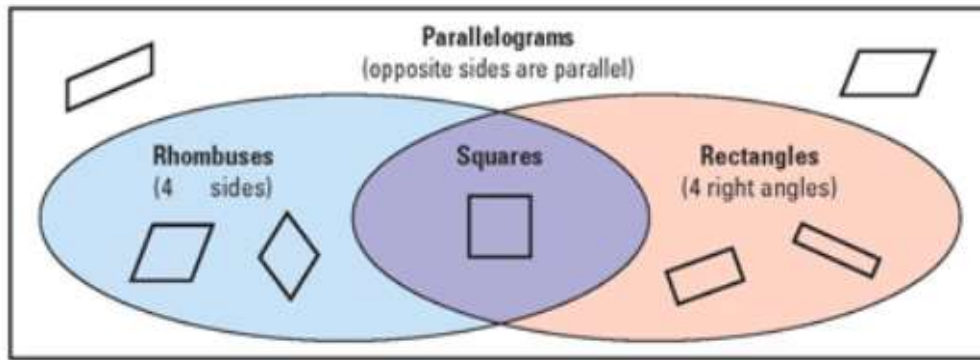
SQUARE COROLLARY

A quadrilateral is a square if and only if it is a rhombus and a rectangle.

ABCD is a square if and only if $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$ and $\angle A$, $\angle B$, $\angle C$, and $\angle D$ are right angles.

The diagram shows a Venn diagram with the outer rectangle labeled **Parallelograms** (opposite sides are parallel), containing overlapping ovals: **Rhombuses** (4 sides) and **Rectangles** (4 right angles), with **Squares** in the overlap.
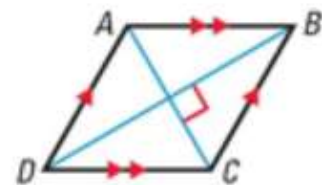
THEOREM 8.11

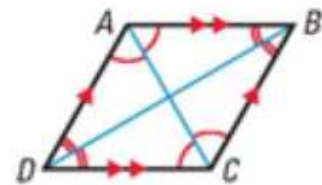A parallelogram is a rhombus if and only if its diagonals are perpendicular.

$\square ABCD$ is a rhombus if and only if $\overline{AC} \perp \overline{BD}$.

THEOREM 8.12

A parallelogram is a rhombus if and only if each diagonal bisects a pair of opposite angles.

$\square ABCD$ is a rhombus if and only if $\overline{AC}$ bisects $\angle BCD$ and $\angle BAD$ and $\overline{BD}$ bisects $\angle ABC$ and $\angle ADC$.

THEOREM 8.13

A parallelogram is a rectangle if and only if its diagonals are congruent.

$\square ABCD$ is a rectangle if and only if $\overline{AC} \cong \overline{BD}$.