Objective 1  Define and Classify Special Types of Parallelograms

Name the three types of special Parallelograms that match the definitions below.

A(n) _________ is a parallelogram with four congruent sides.
A(n) _________ is a parallelogram with four right angles.
A(n) _________ is a parallelogram with four congruent sides and four right angles.

Work Video Exercise 1 with me.
Find the values of the variables. Then find the side lengths.

1. square

\[
\begin{array}{c}
2x - 7 \\
y - 1 \\
2y - 5 \\
3y - 9 \\
\end{array}
\]

Objective 2  Use Properties of Diagonals of Rhombuses, Rectangles, and Squares

Relationships Among Quadrilaterals

Quadrilaterals

No pairs of parallel sides

Other quadrilaterals

2 pairs of parallel sides

Parallelogram

Rectangle

Rhombus

Square
### Rhombus Diagonal Perpendicular Theorem

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

<table>
<thead>
<tr>
<th>$\square ABCD$ is a rhombus if and only if $\overline{AC \perp BD}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ABCD$</td>
</tr>
<tr>
<td>$A$</td>
</tr>
<tr>
<td>$B$</td>
</tr>
<tr>
<td>$C$</td>
</tr>
<tr>
<td>$D$</td>
</tr>
</tbody>
</table>

### Rhombus Diagonals Theorem

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

<table>
<thead>
<tr>
<th>$\square ABCD$ is a rhombus if and only if</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\angle 1 \cong \angle 2$</td>
</tr>
<tr>
<td>$\angle 3 \cong \angle 4$</td>
</tr>
<tr>
<td>$\angle 5 \cong \angle 6$</td>
</tr>
<tr>
<td>$\angle 7 \cong \angle 8$</td>
</tr>
</tbody>
</table>

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**Work Video Exercise 2 with me.**

Prove part of the Rhombus Diagonals Theorem.

2. **Given:** $ABCD$ is a rhombus.

   **Prove:** $\overline{AC}$ bisects $\angle BAD$ and $\angle BCD$.

| Statement | Reasons |
Rectangle Diagonals Theorem

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

\[ \square ABCD \text{ is a rectangle if and only if } \overline{AC} \cong \overline{BD} \]

**Work Video Exercise 3 with me.**

3. \( LMNP \) is a rectangle. Find the value of \( x \) and the length of each diagonal.

\[ LN = 3x + 1 \text{ and } MP = 8x - 4 \]

**Objective 3** Use Properties of Diagonals to Form Rhombuses, Rectangles, and Squares

**Work Video Exercise 4 with me.**

4. For what value of \( x \) is the figure the given special parallelogram?