GEOMETRY UNIT 6

5.4

Special Parallelograms

- **<u>Content Objective:</u>** Students will be able to apply the definitions and identify the properties of a rectangle, a rhombus, and a square.

- **<u>Language Objective:</u>** Students will be able to state the similarities and differences between the types of Parallelograms.
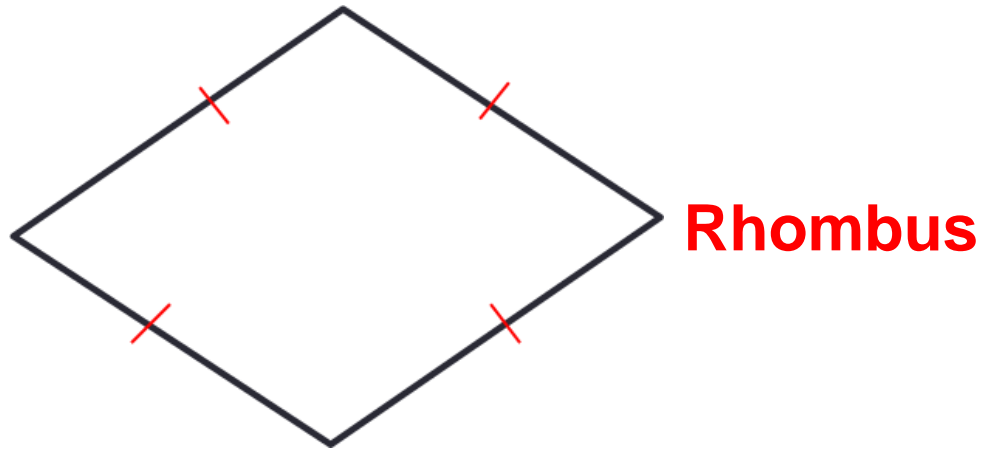
Rectangle

- A **Rectangle** is a quadrilateral with **4 Right Angles.**

- Why would a Rectangle also be considered a Parallelogram?
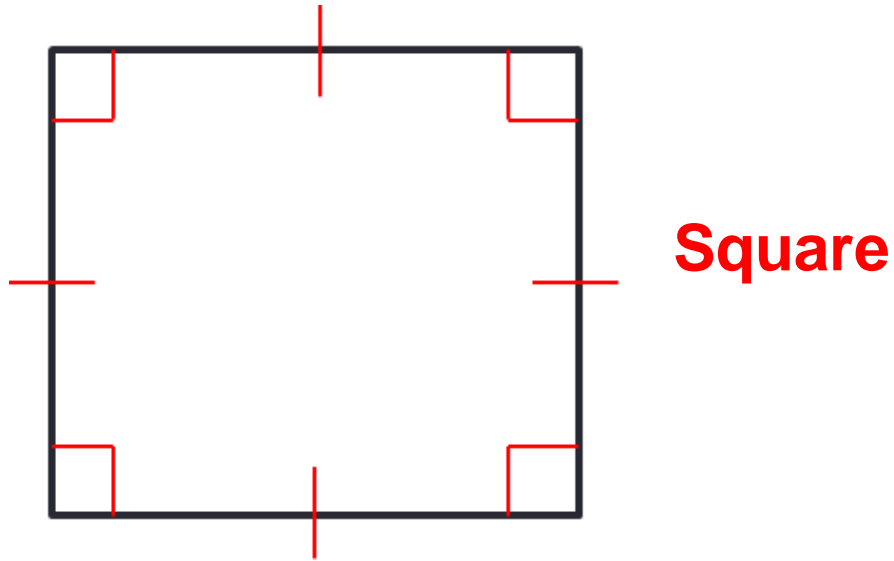
Rectangle

Rhombus

- A **Rhombus** is a quadrilateral with **4 Congruent Sides.**

- Why would a Rhombus also be considered a Parallelogram?

Rhombus

Square

- A **Square** is a quadrilateral with **4 Right Angles** and **4 Congruent Sides.**

Why would a Square also be considered a parallelogram?

Square

Shared and Unique Properties

- Since rectangles, rhombuses, and squares are all considered as parallelograms, they have all the properties of parallelograms.

- However, they each posses their own, individual properties as well, as seen in the following theorems.
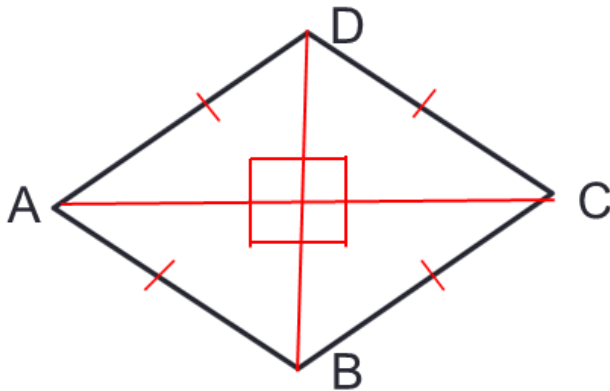
Diagonals Properties

- **<u>Theorem 5-12:</u>** The diagonals of a rectangle are **<u>Congruent</u>**.
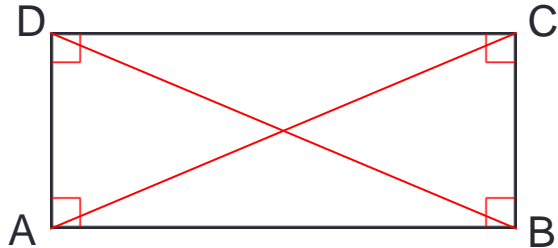
In Rectangle ABCD,

$$\overline{AC} \cong \overline{DB}$$

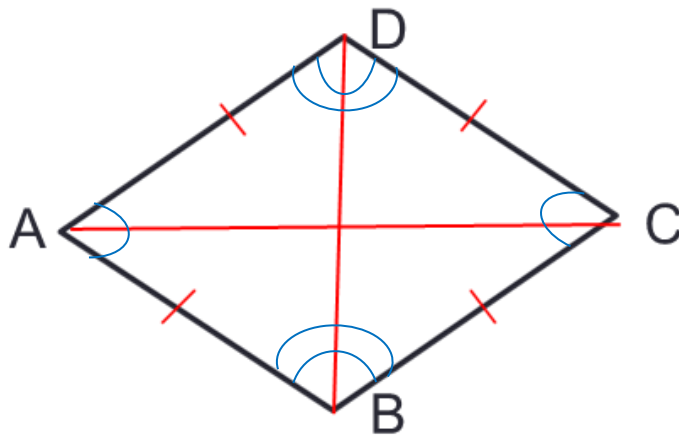- **<u>Theorem 5-13:</u>** The diagonals of a rhombus are **<u>Perpendicular</u>**.

In Rhombus ABCD,

$$\overline{AC} \perp \overline{DB}$$

Diagonals Properties

- **Theorem 5-14:** Each diagonal of a rhombus **bisects** two angles of the rhombus.

In Rhombus ABCD,

$\overline{AC}$ bisects $< A$ and $< C$

$\overline{BD}$ bisects $< B$ and $< D$

Properties Linked To Parallelograms

- **Theorem 5-16:** If an angle of a parallelogram is a right angle, then the parallelogram is a **Rectangle** .

Given: Parallelogram ABCD; $< A$ **is a right angle**
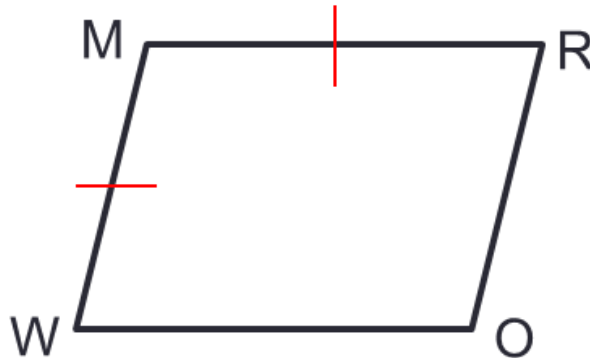
Prove: ABCD is a Rectangle

Properties Linked To Parallelograms

- **Theorem 5-17:** If two consecutive sides of a parallelogram are congruent, then the parallelogram is a **Rhombus** .

Given: Parallelogram WORM; $\overline{WM} \cong \overline{MR}$

Prove: WORM is a Rhombus
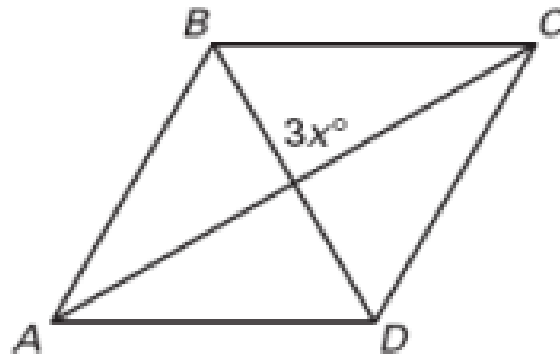
Using the Properties

Use the properties of special parallelograms to solve for the value of the variable.

A. *ABCD* is a rhombus.

Solution:

$3x = 90$

$x = 30$

Using the Properties

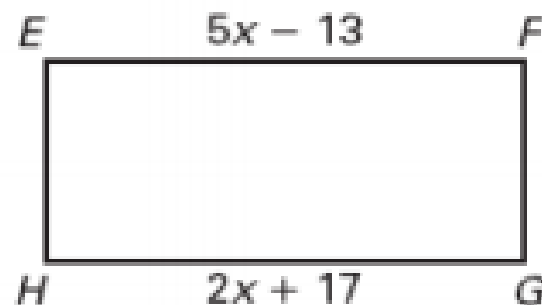Use the properties of special parallelograms to solve for the value of the variable.

Solution:

$$5x - 13 = 2x + 17$$

$$3x = 30$$

$$x = 10$$

B. EFGH is a rectangle.

E   5x − 13   F

H   2x + 17   G

Using the Properties
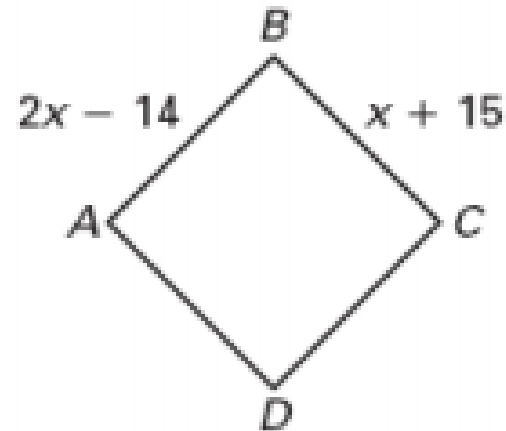
Use the properties of special parallelograms to solve for the value of the variable.

Solution:

$2x - 14 = x + 15$

$x = 29$

C. ABCD is a square.

Using the Properties

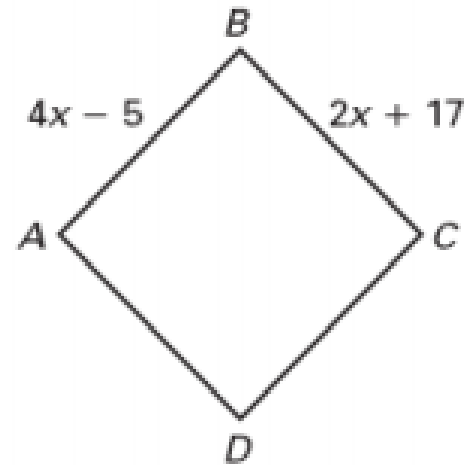Use the properties of special parallelograms to solve for the value of the variable.

D. ABCD is a Rhombus

Solution:

$$4x - 5 = 2x + 17$$

$$2x = 22$$

$$x = 11$$

Using the Properties

Use the properties of special parallelograms to solve for the value of the variable.

E. ABCD is a Square

Solution:

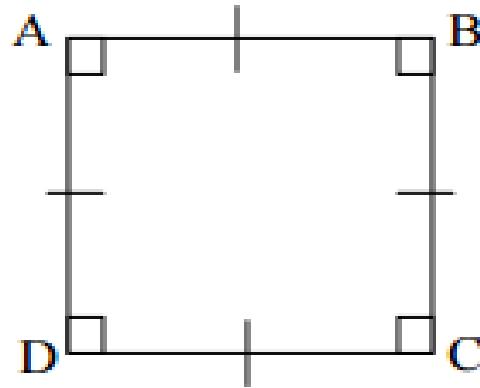$3x + 15 = 90$

$3x = 75$

$x = 25$

1. $m\angle CAB = 3x + 15$

Using the Properties

Use the properties of special parallelograms to solve for the value of variable.
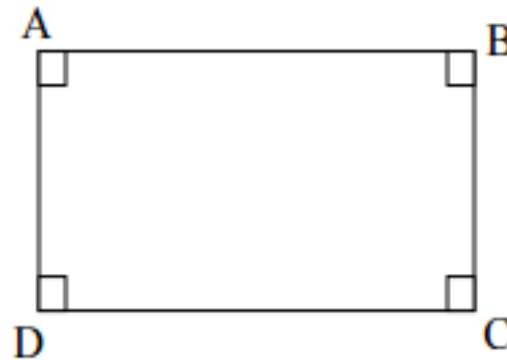
Solution:

$$15y + 10 = 18y - 2$$

$$-3y = -12$$

$$y = 4$$

F. ABCD is a Square

$$AC = 15y + 10, \quad BD = 18y - 2$$

Exit Ticket

Complete the chart by places check marks in the appropriate places.

	Property	Parallelogram	Rectangle	Rhombus	Square
1)	Opposite sides are parallel				
2)	Opposite sides are congruent				
3)	Opposite angles are congruent				
4)	A diagonal forms two congruent angles				
5)	Diagonals bisect each other				
6)	Diagonals are congruent				
7)	Diagonals are perpendicular				
8)	A diagonal bisects two angles				
9)	All angles are right angles				
10)	All sides are congruent				