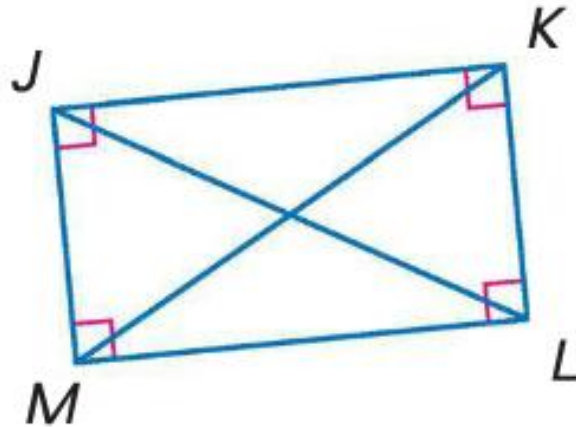


# Rectangles, Rhombi and Squares

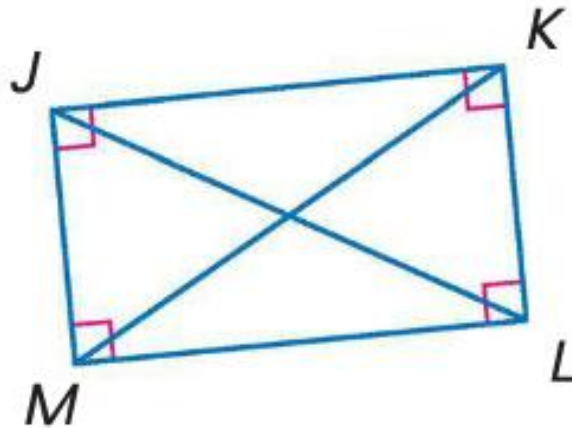
# Rectangles

- A rectangle is a parallelogram with four right angles. It has all of the properties of a parallelogram, with the diagonals also being congruent.



# Diagonals of a Rectangle

- If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.



# Coordinate Plane

- You can use the properties of rectangles to prove that a quadrilateral in a coordinate plane is a rectangle given the coordinates of the vertices.

# Examples

- Quadrilateral JKLM has vertices J(-10, 2), K(-8, -6), L(5, 3), and M(2, 5). Determine whether JKLM is a rectangle using the Slope Formula.

$$JK = 2,8$$

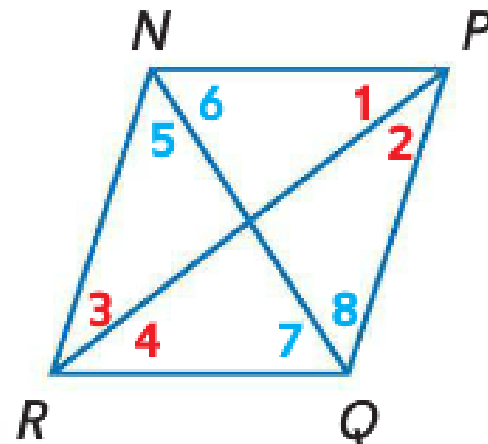
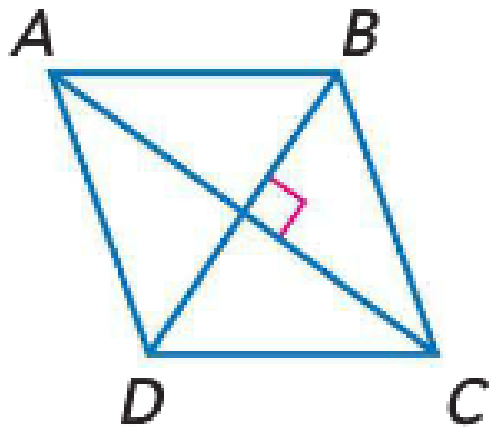
$$LM = 3,2$$

# Examples

- Quadrilateral JKLM has vertices J(-10, 2), K(-8, -6), L(5, 3), and M(2, 5). Determine whether JKLM is a rectangle using the Slope Formula.
- $JK \parallel LM \rightarrow \text{slope of JK} = \frac{-6 - 2}{-8 - (-10)} = \frac{-8}{2} = -4$   
 $\text{slope of LM} = \frac{3 - 5}{5 - 2} = \frac{-2}{3}$
- Since the slopes do not match, then this is not a rectangle

# Rhombus

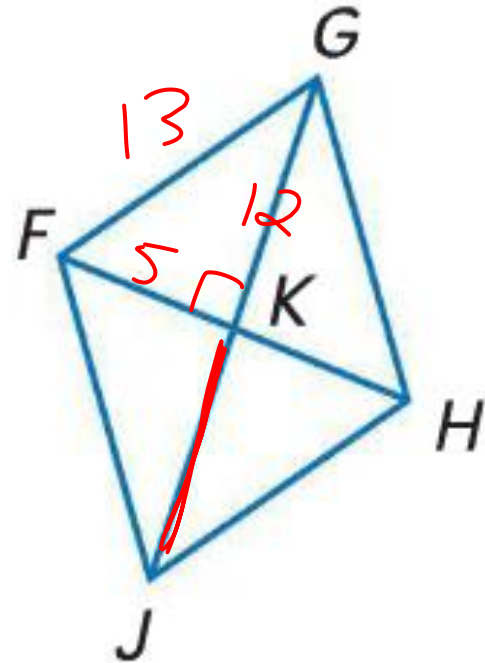
- A rhombus is a parallelogram with all four sides congruent. A rhombus has all the properties of a parallelogram in addition to having perpendicular diagonals, and the diagonals bisect the opposite angles.



# Examples

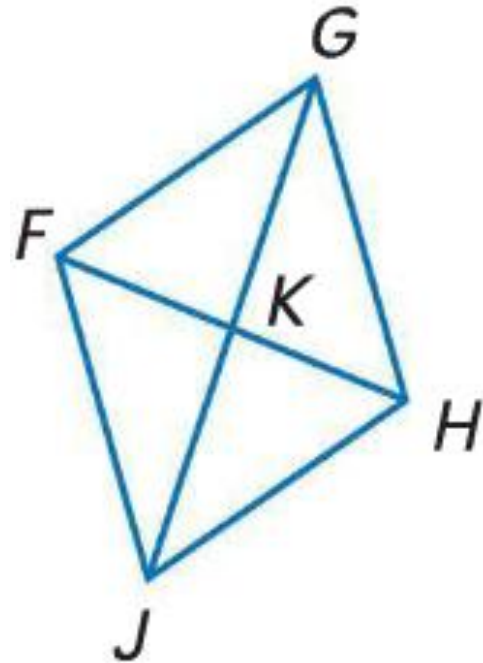
- The diagonals of rhombus  $FGHJ$  intersect at  $K$ . Use the given information to find each measure or value.
- If  $FK = 5$  and  $FG = 13$ , find  $KJ$ .

12



# Examples

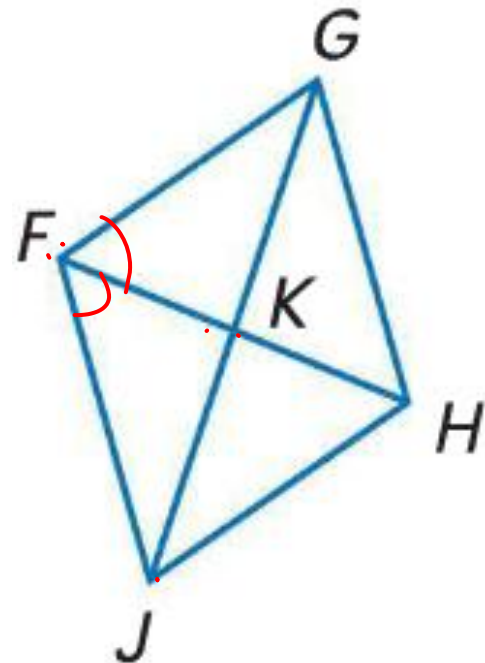
- The diagonals of rhombus  $FGHJ$  intersect at  $K$ . Use the given information to find each measure or value.
- If  $FK = 5$  and  $FG = 13$ , find  $KJ$ .
- $GK = 12, KJ = 12$



# Examples

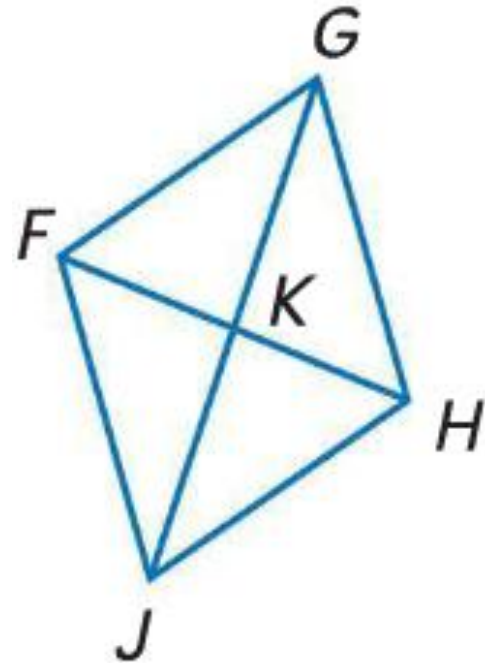
- The diagonals of rhombus  $FGHJ$  intersect at  $K$ . Use the given information to find each measure or value.
- If  $m\angle JFK = 6y + 7$  and  $m\angle KFG = 9y - 5$ , find  $y$ .

$$6y + 7 = 9y - 5$$
$$y = 4$$



# Examples

- The diagonals of rhombus  $FGHJ$  intersect at  $K$ . Use the given information to find each measure or value.
- If  $m\angle JFK = 6y + 7$  and  $m\angle KFG = 9y - 5$ , find .
- $6y + 7 = 9y - 5$
- $-3y = -12$
- $y = 4$

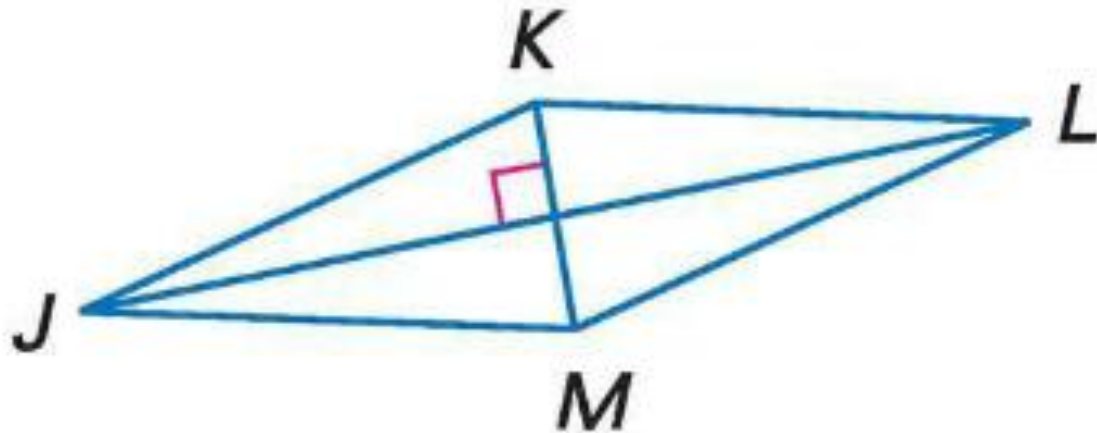


# Square

- A square is a parallelogram with four congruent sides and four right angles.
- A parallelogram with four right angles is a rectangle, and a parallelogram with four congruent sides is a rhombus. Therefore, a parallelogram that is both a rectangle and a rhombus is also a square.

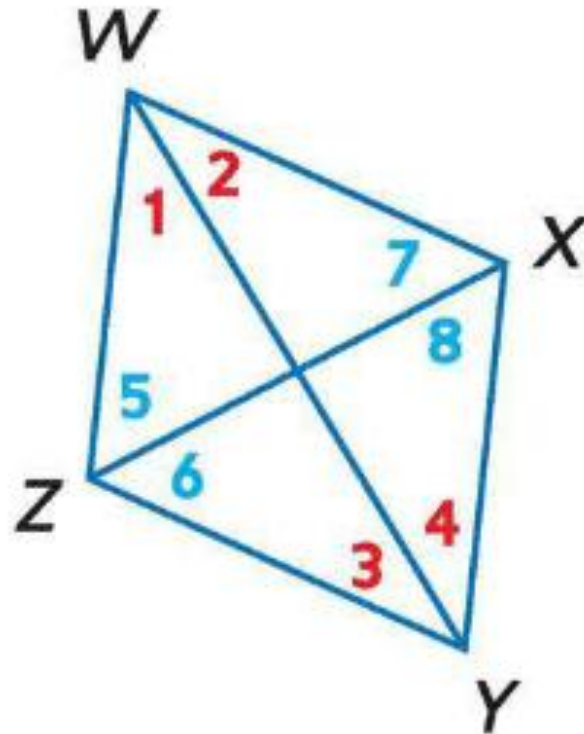
# Conditions for Rhombi and Squares

- If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus.



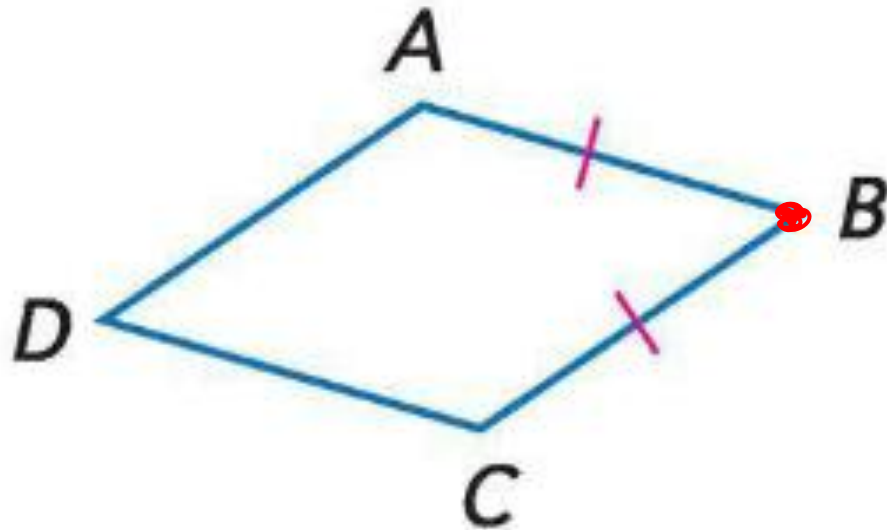
# Conditions for Rhombi and Squares

- If one diagonal of a parallelogram bisects a pair of opposite angles, then the parallelogram is a rhombus.



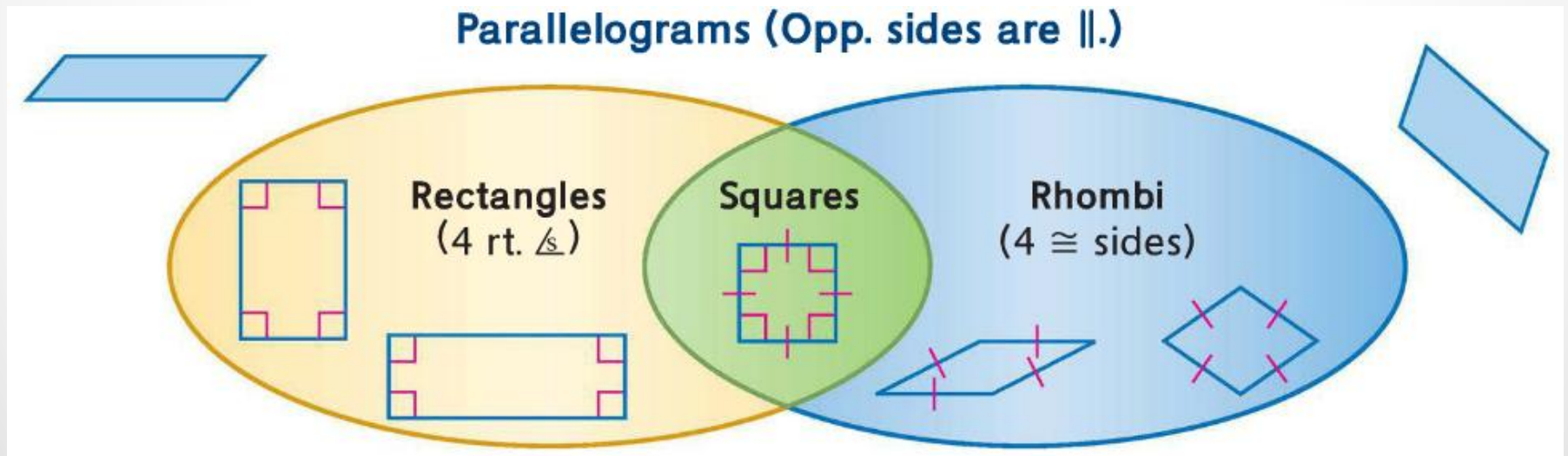
# Conditions for Rhombi and Squares

- If one pair of consecutive sides of a parallelogram are congruent, the parallelogram is a rhombus.



# Conditions for Rhombi and Squares

- If a quadrilateral is both a rectangle and a rhombus, then it is a square.



# Coordinate Plane

- Coordinate geometry can be used to classify quadrilaterals.
- Step 1: Use the Distance Formula to find the length of the diagonals. If they are congruent, then it is either a rectangle or square.
- Step 2: Use the Slope Formula to determine if the diagonals are perpendicular. If so, then it is either a rhombus or square.