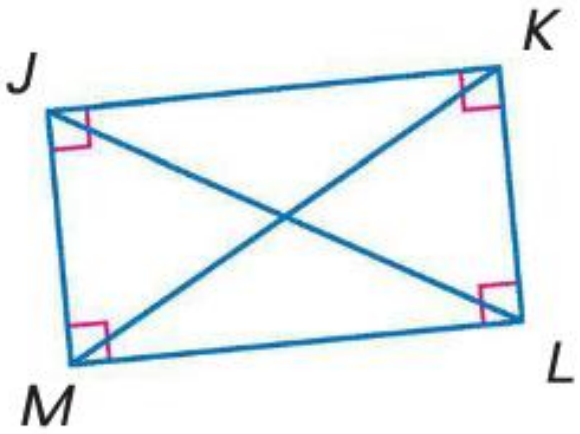
Rectangles, Rhombi and Squares

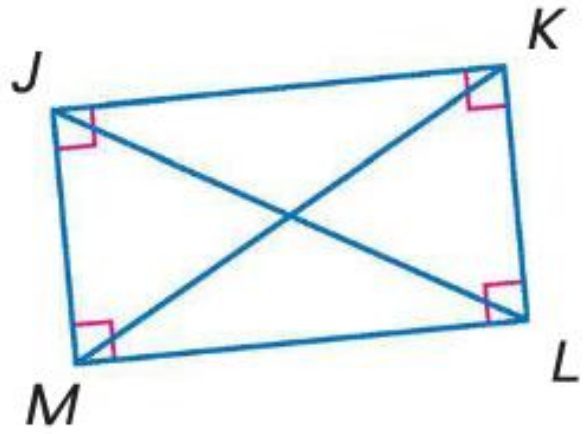
Rectangles

- 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.

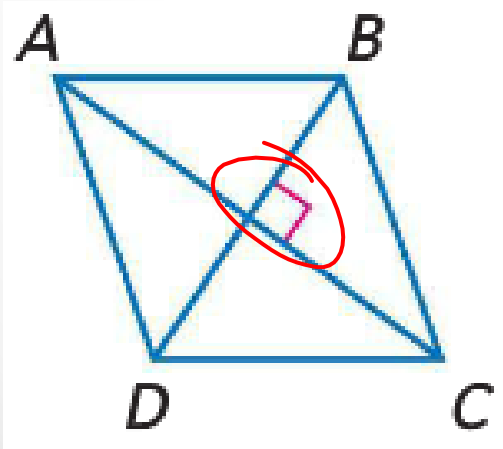
- JK ∥ LM → slope of JK = $(-6 - 2)/(-8 - (-10)) = -8/2 = -4$

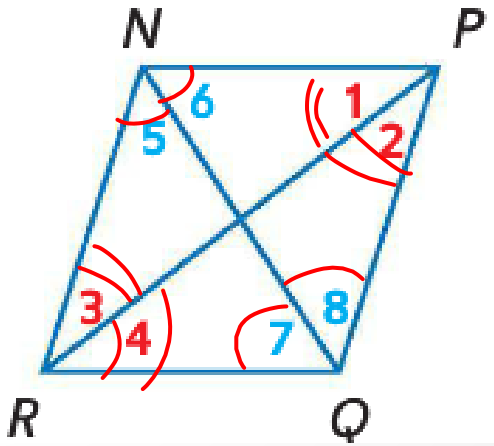
  slope of LM = $(3 - 5)/(5-2) = -2/3$

- 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.

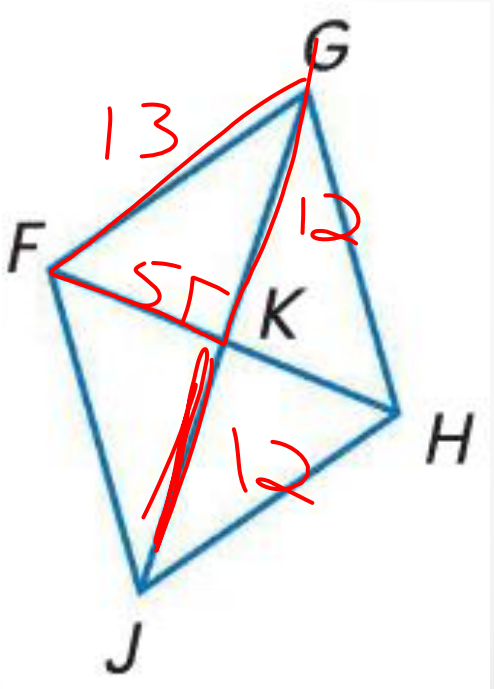




Examples

- The diagonals of rhombus *FGHJ* intersect at *K*. Use the given information to find each measure or value.

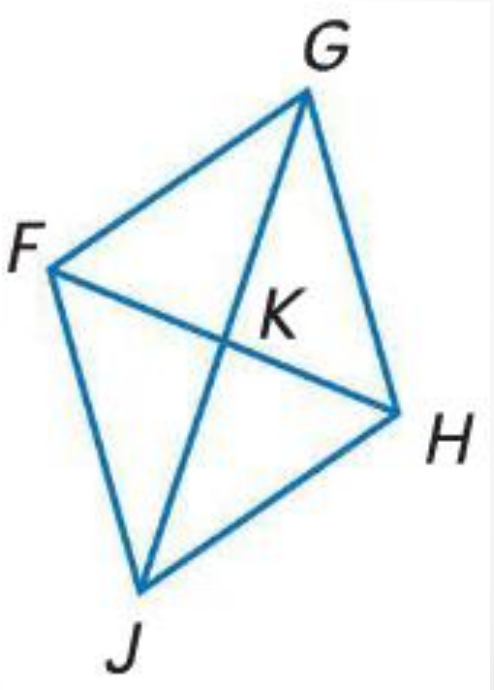
- If *FK* = 5 and *FG* = 13, find *KJ*. = 12



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

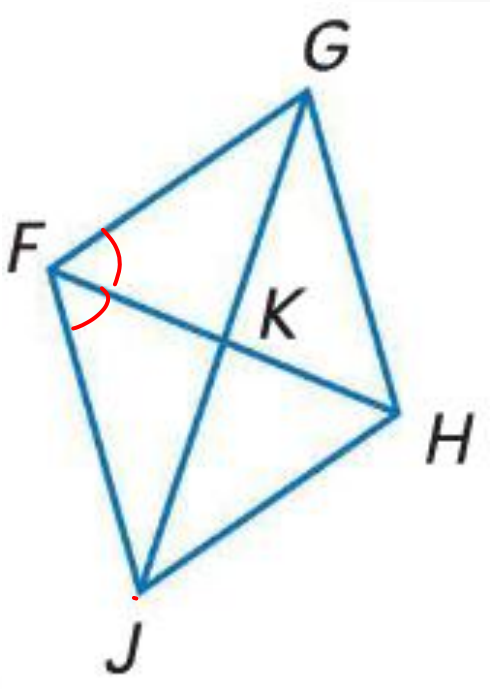


Examples

- 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*.

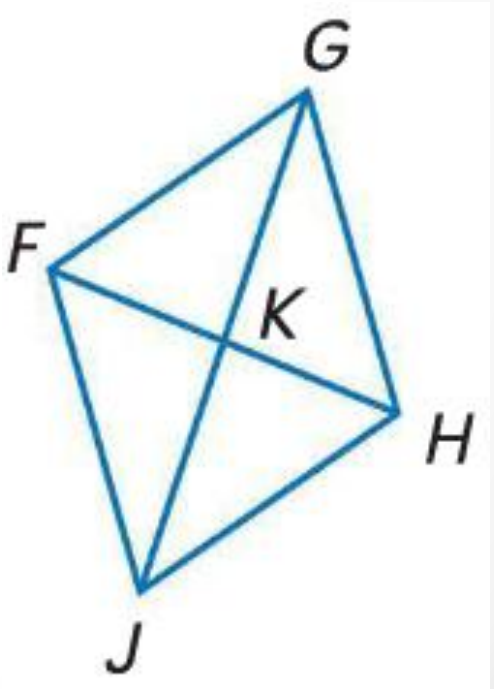
$6y + 7 = 9y - 5$



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 .
- $6y + 7 = 9y - 5$
- $-3y = -12$
- $y = 4$



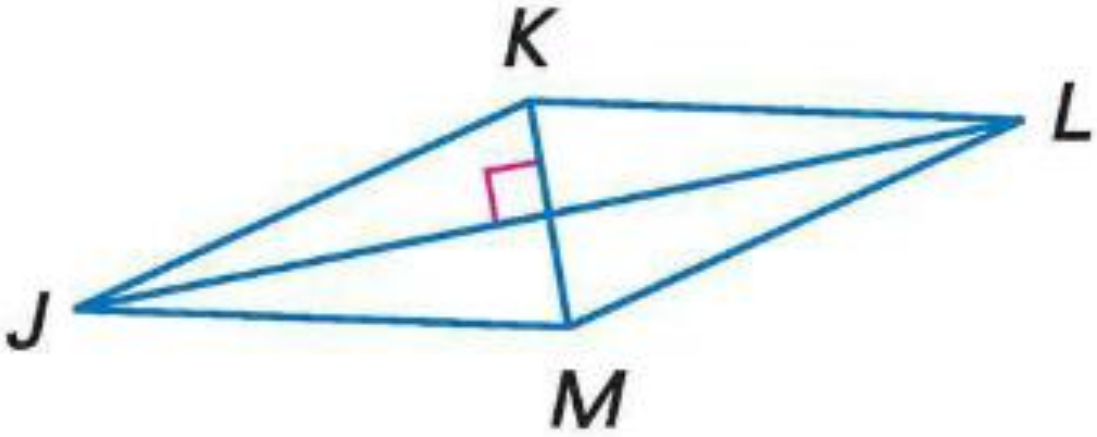
Square

- 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.

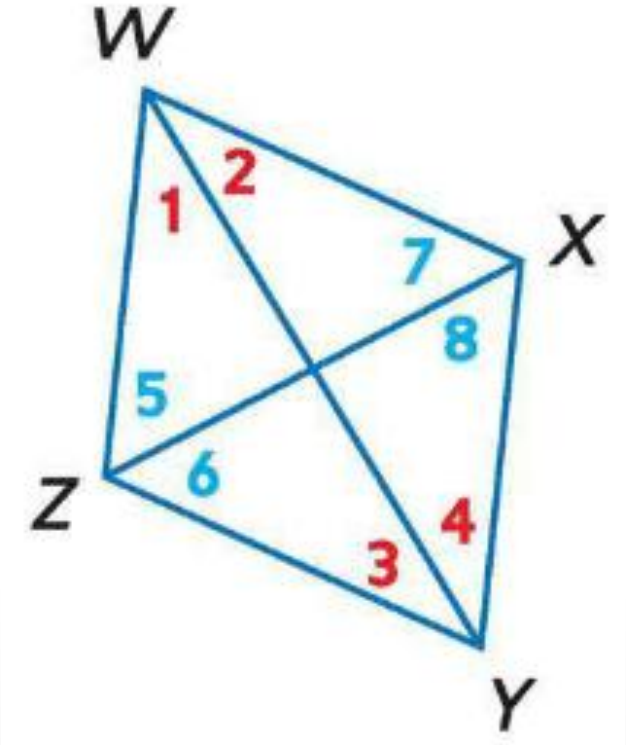
Conditions for Rhombi and Squares

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



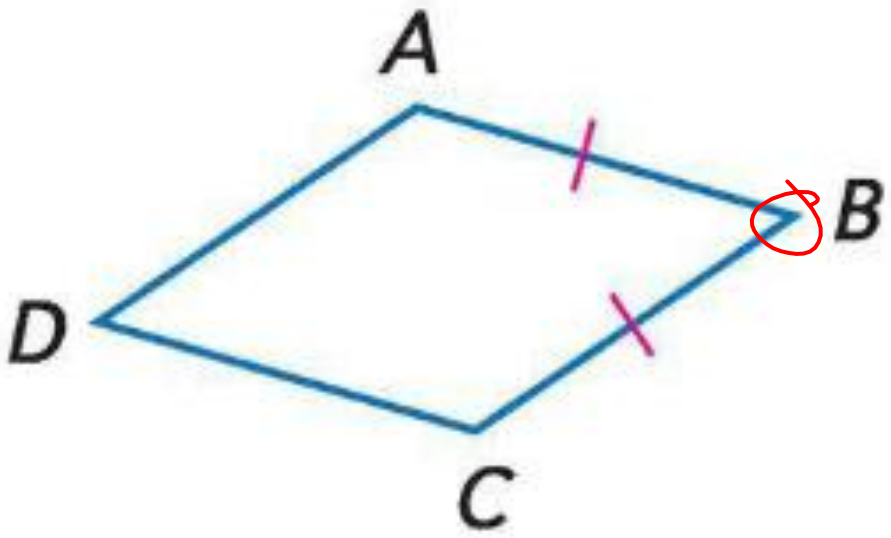
Conditions for Rhombi and Squares

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



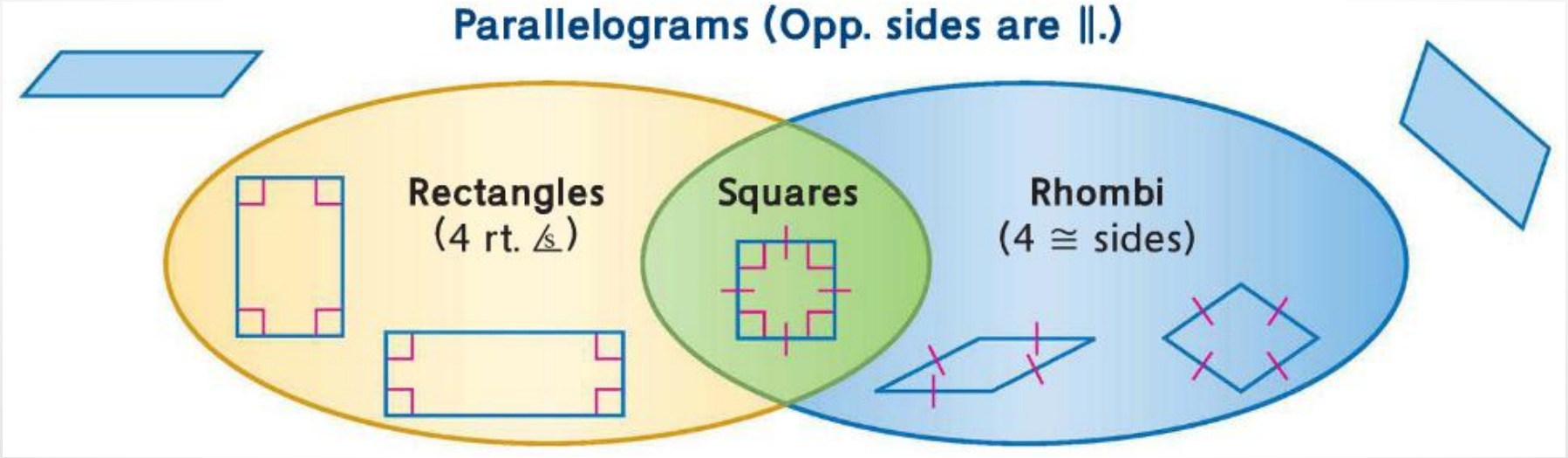
Conditions for Rhombi and Squares

- 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.