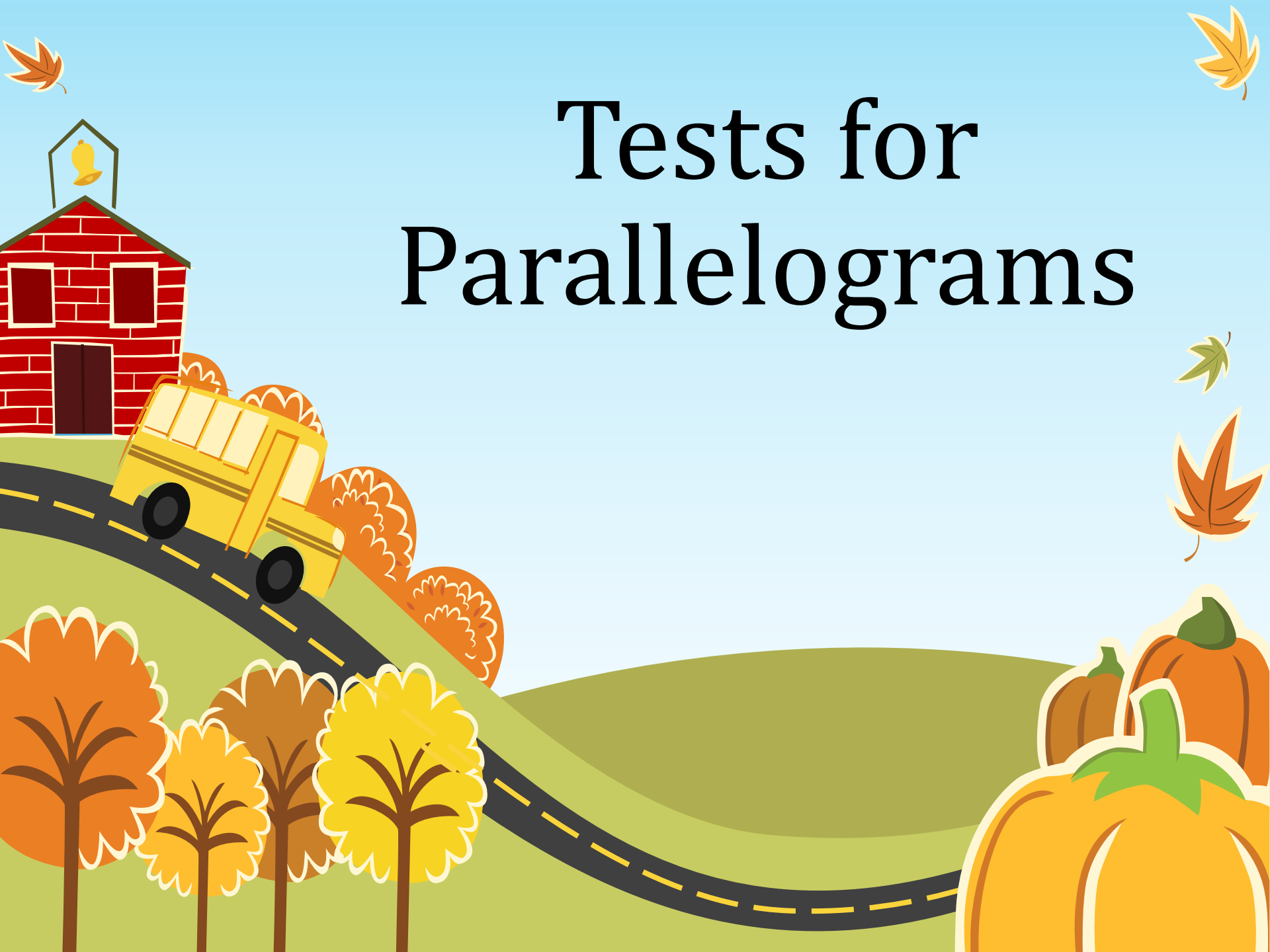
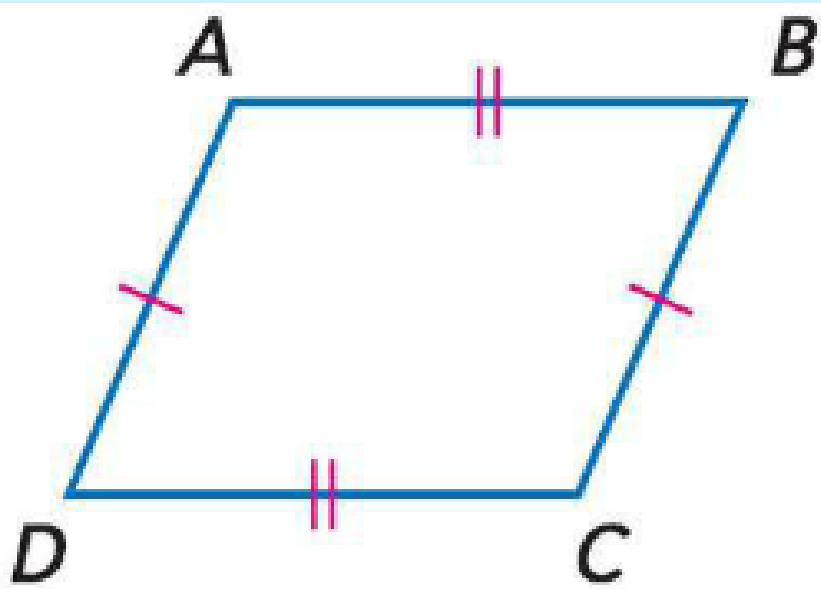


Tests for Parallelograms



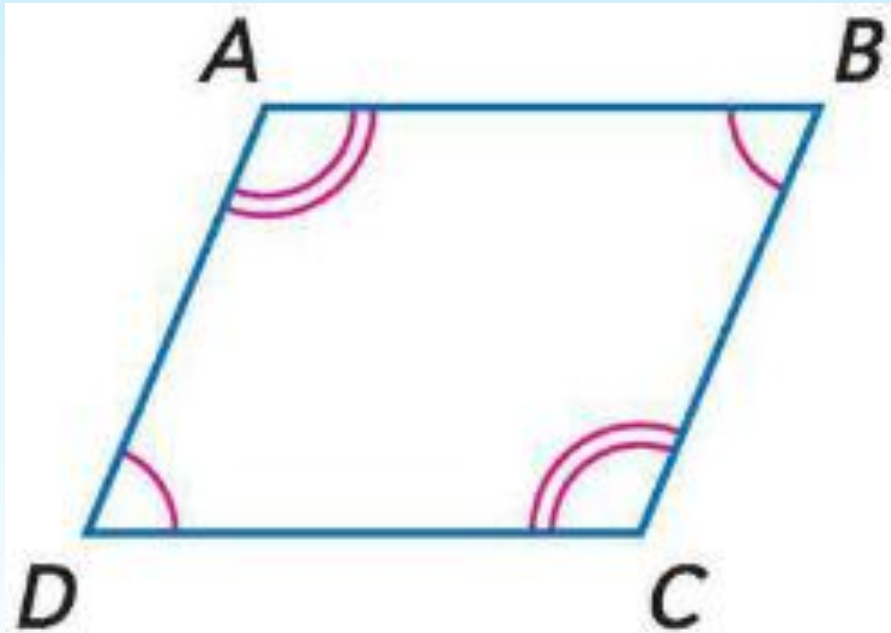
Conditions for Parallelograms

- If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.



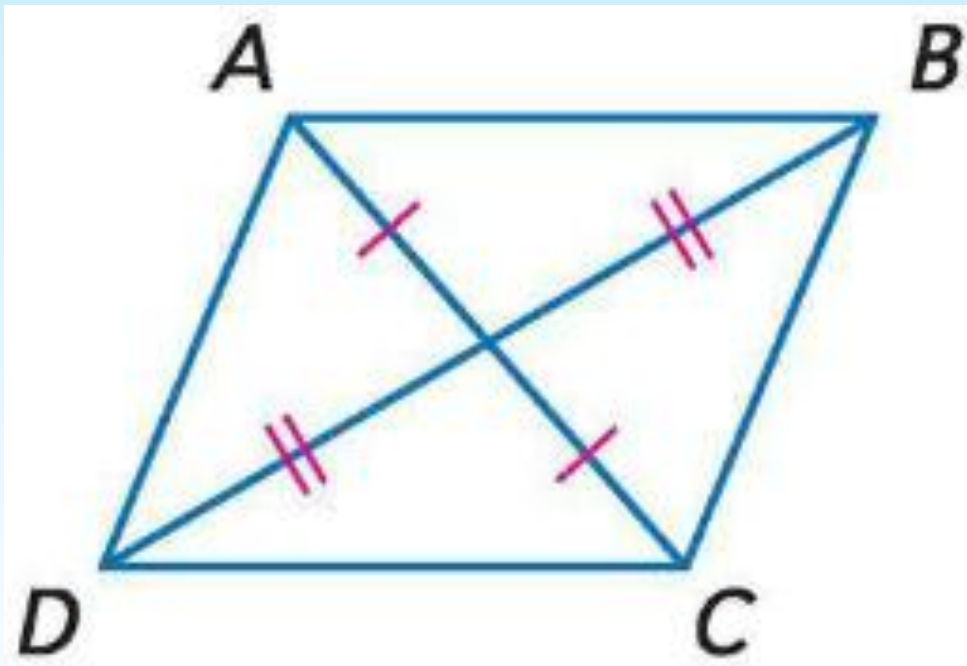
Conditions for Parallelograms

- If both pairs of opposite angles of quadrilaterals are congruent, then the quadrilateral is a parallelogram.



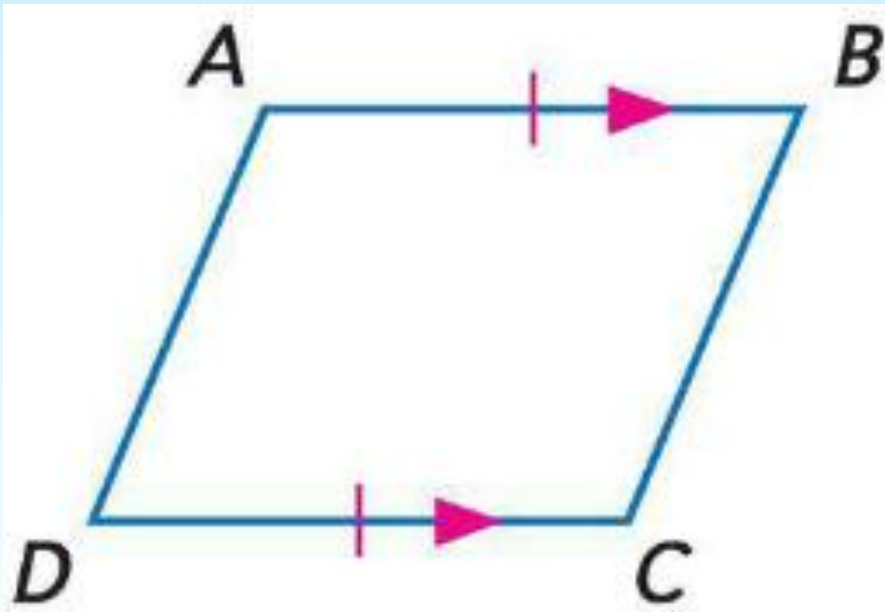
Conditions for Parallelograms

- If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.



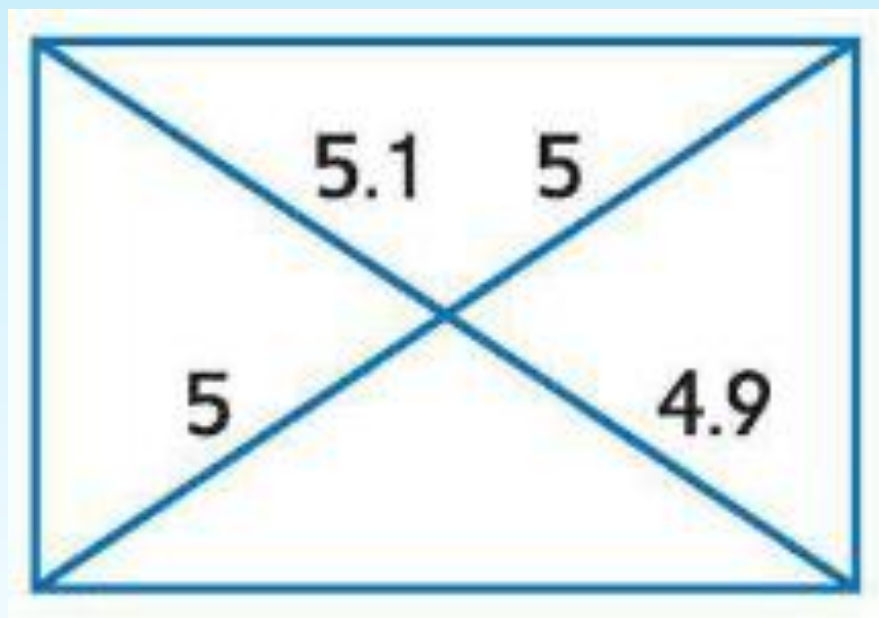
Conditions for Parallelograms

- If one pair of opposite sides of a quadrilateral is both parallel and congruent, then the quadrilateral is a parallelogram.



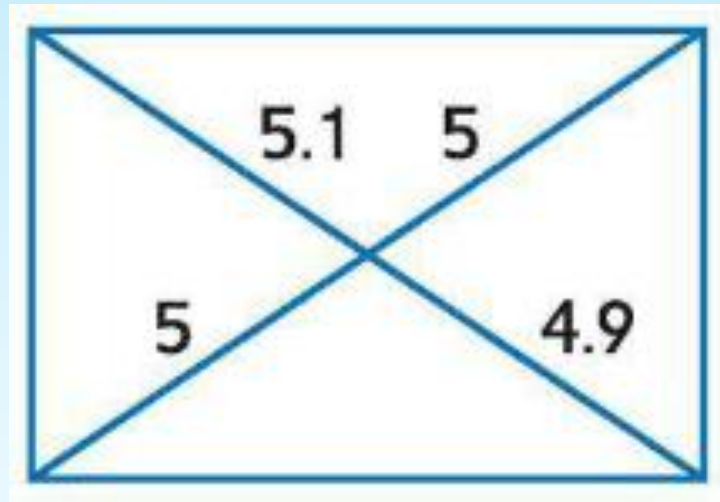
Examples

- Determine whether the quadrilateral is a parallelogram.



Examples

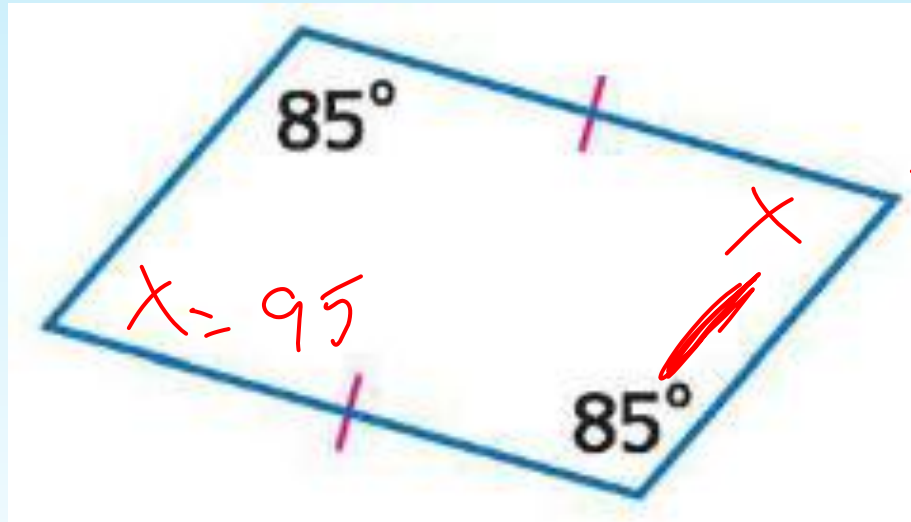
- Determine whether the quadrilateral is a parallelogram.



- No; diagonals are not bisected.

Examples

- Determine whether the quadrilateral is a parallelogram.

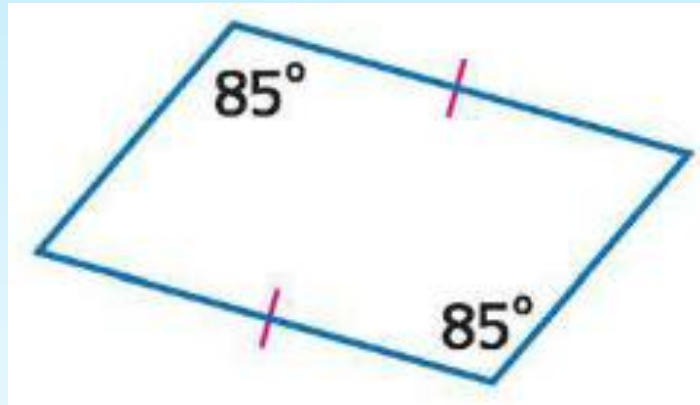


$$x = 95$$

$$x = 95$$

Examples

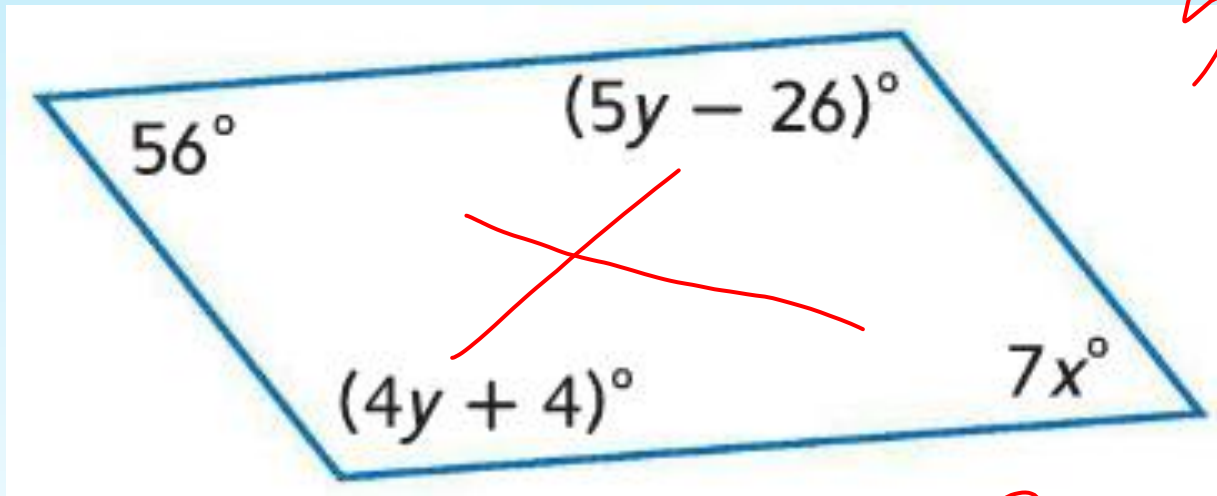
- Determine whether the quadrilateral is a parallelogram.



- Yes; opposite angles are congruent

Examples

- Find x and y so that each quadrilateral is a parallelogram.

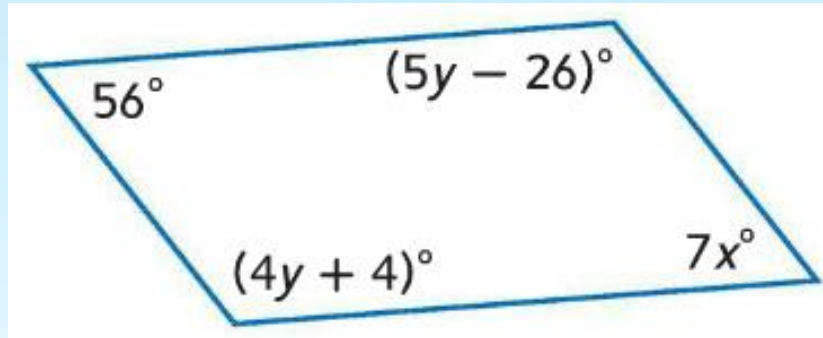


$$56 = 7x$$
$$8 = x$$

$$5y - 26 = 4x + 4$$
$$y = 30$$

Examples

- Find x and y so that each quadrilateral is a parallelogram.



- $7x = 56; x = 8$
- $4y + 4 = 5y - 26; y = 30$



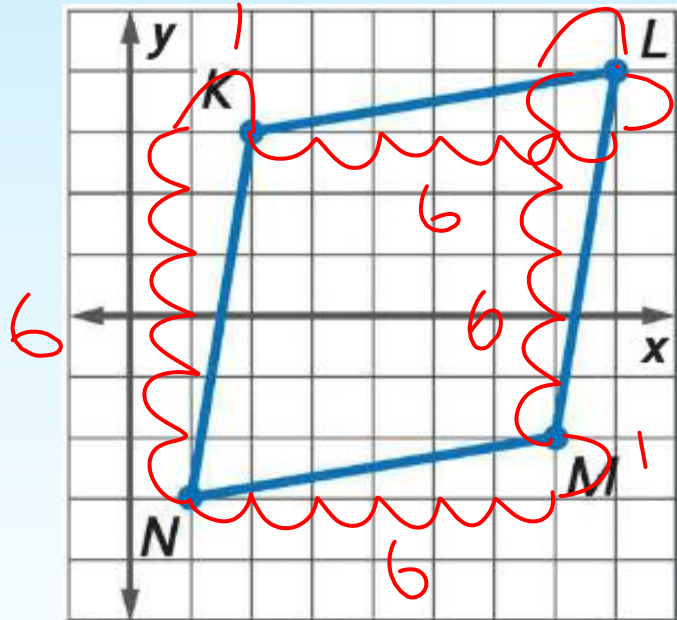
Coordinate Plane

- You can use the Distance, Slope, and Midpoint Formulas to determine whether a quadrilateral in the coordinate plane is a parallelogram.



Examples

- Graph quadrilateral $KLMN$ with vertices $K(2,3)$, $L(8,4)$, $M(7,-2)$, and $N(1,-3)$. Determine whether the quadrilateral is a parallelogram. Use the Slope Formula.



Examples

If the opposite sides of a quadrilateral are parallel, then it is a parallelogram.

$$\text{slope of } \overline{KL} = \frac{4 - 3}{8 - 2} \text{ or } \frac{1}{6}$$

$$\text{slope of } \overline{NM} = \frac{-2 - (-3)}{7 - 1} \text{ or } \frac{1}{6}$$

$$\text{slope of } \overline{KN} = \frac{-3 - 3}{1 - 2} = \frac{-6}{-1} \text{ or } 6$$

$$\text{slope of } \overline{LM} = \frac{-2 - 4}{7 - 8} = \frac{-6}{-1} \text{ or } 6$$



Examples

- Since opposite sides have the same slope, they are parallel, and the polygon is a parallelogram by definition.

