

Use the points $A(-2, 5)$, $B(-5, 1)$, $C(3, 2)$, and $D(1, -2)$ to find the indicated slope or measure.

1. Find the slope of \overline{AB} .
2. Find the measure of \overline{AC} .
3. Find the slope of \overline{CD} .
4. Find the measure of \overline{BD} .
5. Find the slope of \overline{AC} .
6. Find the measure of \overline{AB} .

For the conditional statement, write the converse, the inverse, and the contrapositive. Then determine if each statement is true.

1. If a triangle is right, then it contains two acute angles.
2. If two lines have the same slope, then they are parallel.
3. If there is ice on the road, then I will not go shopping.

Essential Question

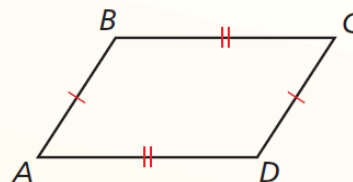
How can you prove that a quadrilateral is a parallelogram?

Theorems

Theorem 7.7 Parallelogram Opposite Sides Converse

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

If $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$, then $ABCD$ is a parallelogram.

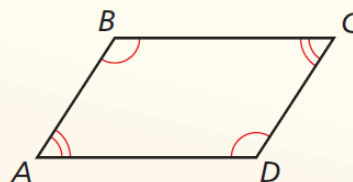


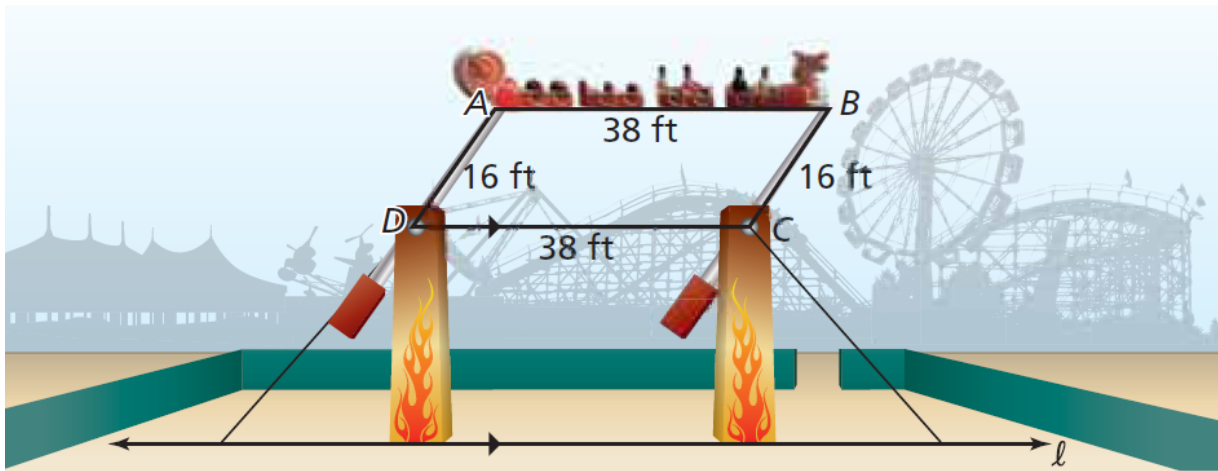
Theorem 7.8 Parallelogram Opposite Angles Converse

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

If $\angle A \cong \angle C$ and $\angle B \cong \angle D$, then $ABCD$ is a parallelogram.

Proof Ex. 39, p. 383





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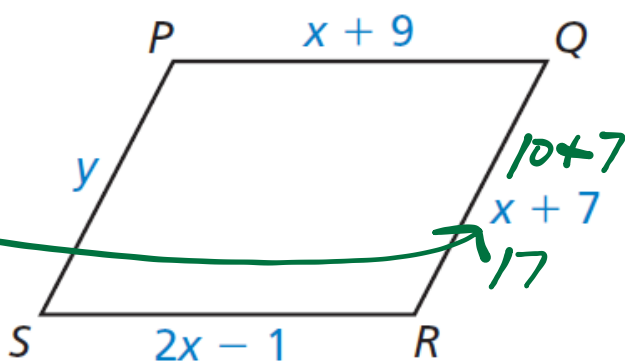
For what values of x and y is quadrilateral $PQRS$ a parallelogram?

$$\begin{array}{r} x + 9 = 2x - 1 \\ -x \quad -x \\ \hline 9 = x - 1 \end{array}$$

$$9 = x - 1$$

$$x = 10$$

$$y = 17$$



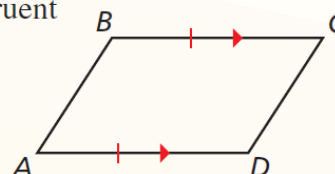
Theorems

Theorem 7.9 Opposite Sides Parallel and Congruent Theorem

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

If $\overline{BC} \parallel \overline{AD}$ and $\overline{BC} \cong \overline{AD}$, then $ABCD$ is a parallelogram.

Proof Ex. 40, p. 383

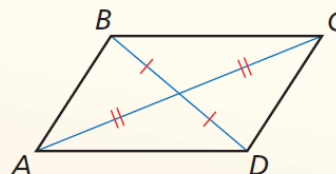


Theorem 7.10 Parallelogram Diagonals Converse

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

If \overline{BD} and \overline{AC} bisect each other, then $ABCD$ is a parallelogram.

Proof Ex. 41, p. 383

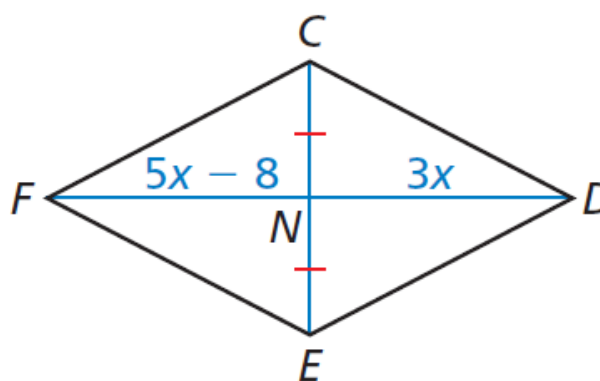


The doorway shown is part of a building in England. Over time, the building has leaned sideways. Explain how you know that $SV = TU$.

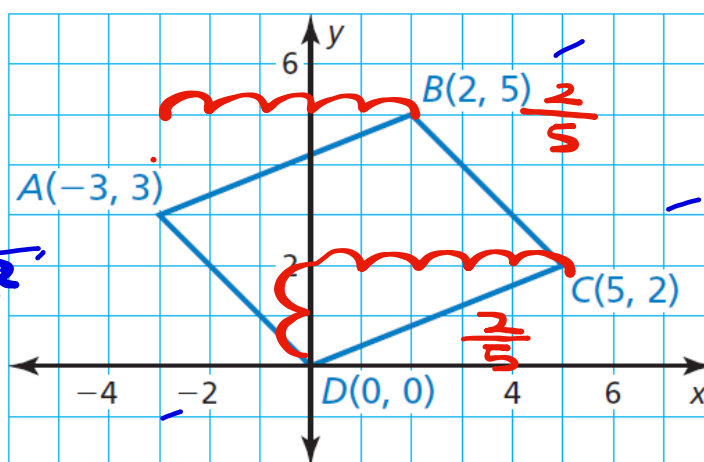


For what value of x is quadrilateral $CDEF$ a parallelogram?

$$\begin{aligned} 5x - 8 &= 3x \\ -5x &\quad -5x \\ \hline -8 &= -2x \\ \frac{-8}{-2} &= \frac{-2x}{-2} \\ x &= 4 \end{aligned}$$



Show that quadrilateral
 $ABCD$ is a parallelogram.



$$\begin{aligned}\overline{AB} &= \sqrt{(-3-2)^2 + (3-5)^2} \\ &= \sqrt{(-5)^2 + (-2)^2}\end{aligned}$$

$$= \sqrt{25 + 4} = \sqrt{29}$$

$$\begin{aligned}\overline{CD} &= \sqrt{(5-0)^2 + (2-0)^2} \\ &= \sqrt{5^2 + 2^2} = \sqrt{29}\end{aligned}$$

$$\overline{AB} \cong \overline{CD}$$

$$\overline{AB} \parallel \overline{CD}$$

