

8 - 3

Test for Parallelograms



Theorem 8.9:

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

Theorem 8.10:

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



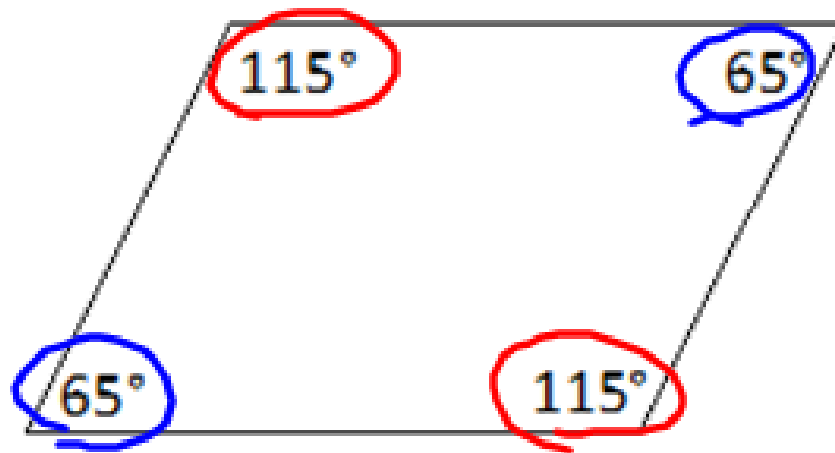
Theorem 8.11:

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

Theorem 8.12:

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

Ex: Is this a parallelogram?



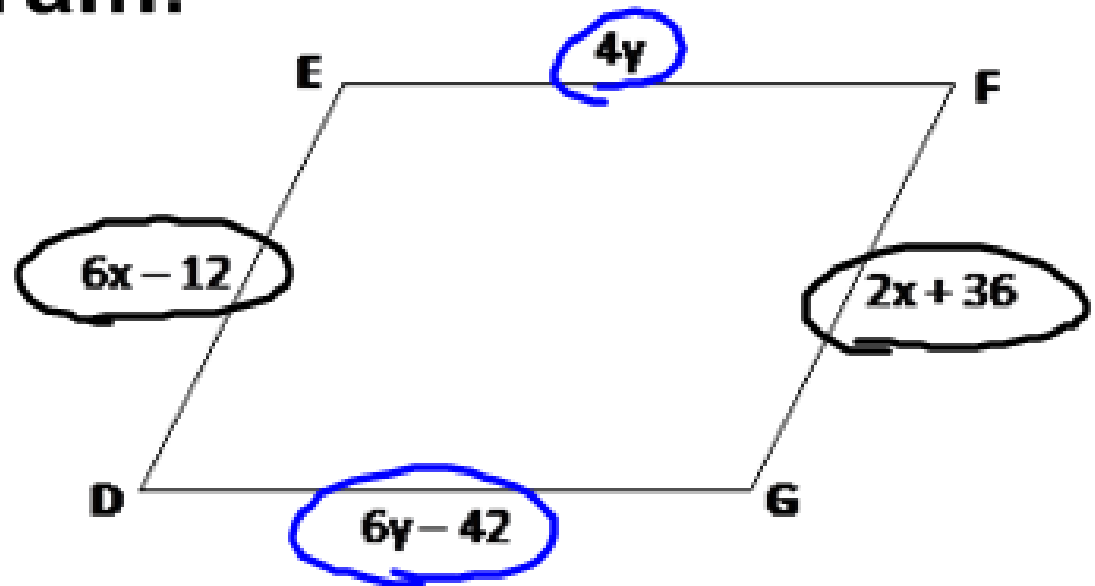
yes

Ex: Find x and y so that DEFG is a parallelogram.

$$\begin{array}{r} 6x - 12 = 2x + 36 \\ -2x \quad -2x \\ \hline 4x - 12 = 36 \end{array}$$

$$\begin{array}{r} 4x - 12 = 36 \\ +12 \quad +12 \\ \hline 4x = 48 \end{array}$$

$$\begin{array}{r} 4x = 48 \\ \hline x = 12 \end{array}$$



$$\begin{array}{r} 4y = 6y - 42 \\ -6y \quad -6y \\ \hline -2y = -42 \end{array}$$

$$\begin{array}{r} -2y = -42 \\ \hline y = 21 \end{array}$$

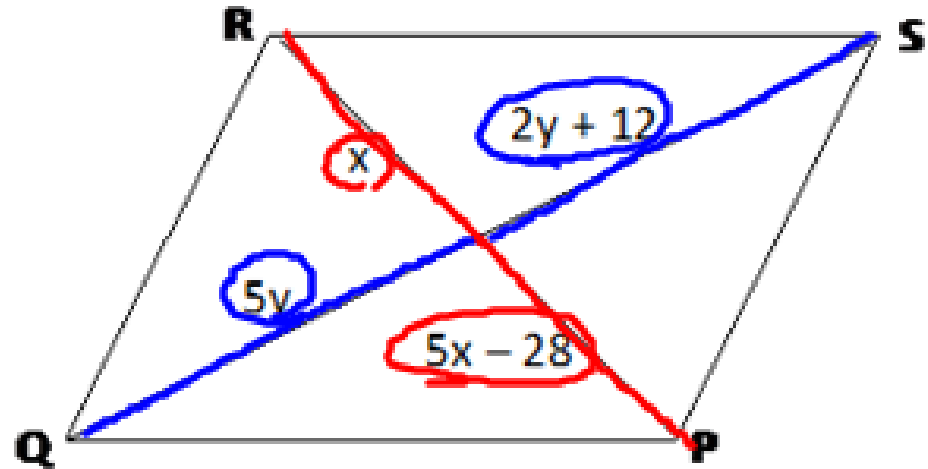
$$y = 21$$

Ex: Find x and y so that PQRS is a parallelogram.

$$\begin{aligned} 5y &= 2y + 12 \\ -2y & \quad -2y \end{aligned}$$

$$3y = 12$$

$$y = 4$$



$$\begin{aligned} x &= 5x - 28 \\ -5x & \quad -5x \end{aligned}$$

$$-4x = -28$$

$$x = 7$$

Ex: Determine whether the figure with the given vertices is a parallelogram.

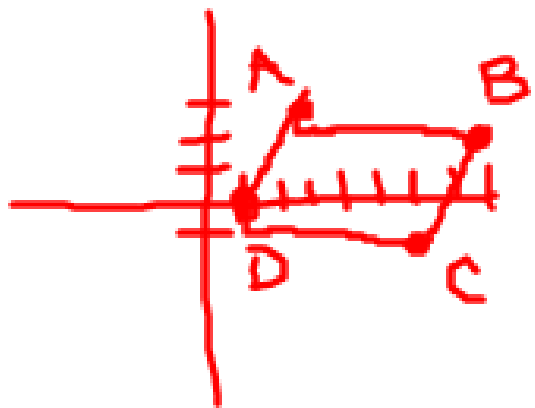
A(3, 3) B(8, 3) C(6, - 1) D(1, 0)

Three options:

- 1.) Use slope formula to determine if opposite sides are parallel.**
- 2.) Use distance formula to determine if opposite sides are congruent.**
- 3.) Use midpoint formula to determine if diagonals bisect each other.**

Ex: Determine whether the figure with the given vertices is a parallelogram.

A(3, 3) B(8, ~~3~~²) C(6, -1) D(1, 0)



yes

mid AC $\left(\frac{3+6}{2}, \frac{3+(-1)}{2}\right)$

$\star \left(\frac{9}{2}, 1\right)$

mid BD

$\left(\frac{8+1}{2}, \frac{2+0}{2}\right)$

$\star \left(\frac{9}{2}, 1\right)$



Homework:

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