# Edgenuity®

## Warm-Up | Proving a Quadrilateral Is a Parallelogram

**?**

**Lesson Question**

**Lesson Goals**

**Analyze** diagrams of _____ .

→

**Determine** when a quadrilateral is a _____ .

**Prove** that a _____ is a parallelogram.

**W2K**

## Words to Know

*Fill in this table as you work through the lesson. You may also use the glossary to help you.*

| bisect | to divide into two _____ parts |
|---|---|
| diagonal | the _____ joining nonconsecutive vertices in a _____ |
| parallelogram | a quadrilateral in which both _____ of opposite sides are _____ |
| quadrilateral | a polygon with _____ sides |

## Warm-Up | Proving a Quadrilateral Is a Parallelogram

### Properties of Parallelograms

If **quadrilateral** ABCD is a **parallelogram**, then:

- opposite sides are [          ] and congruent.

- opposite angles are [          ].

- **diagonals bisect** each [          ].
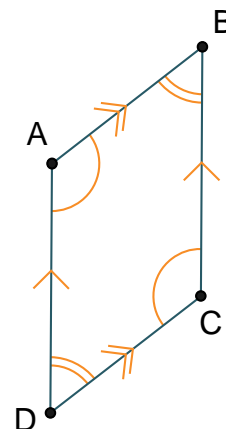
## Classifying a Quadrilateral as a Parallelogram Based on Congruent Sides
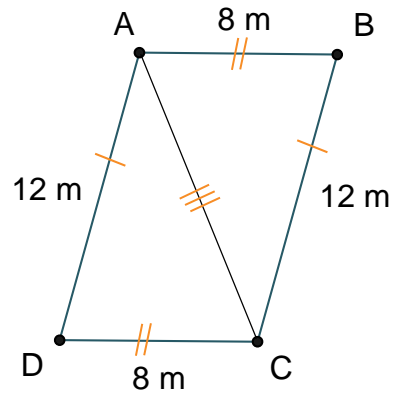
ABCD is a [                    ].

$\overline{AB} \cong \overline{DC}$

$\overline{AD} \cong \overline{BC}$
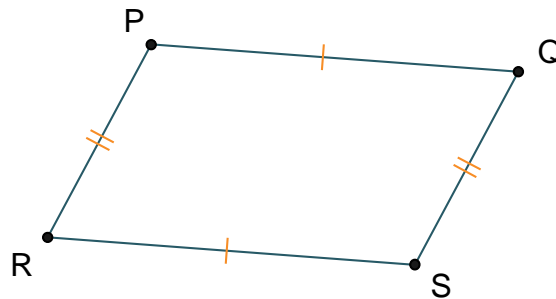
Is ABCD a parallelogram?

$\triangle ADC \cong$ [          ]



A    8 m    B

12 m    12 m

D    8 m    C

## The Converse of the Parallelogram Side Theorem

**Converse of the parallelogram side theorem:** If both pairs of [              ]

sides of a quadrilateral are congruent, then the quadrilateral is a

[                    ] .



P    Q

R

S

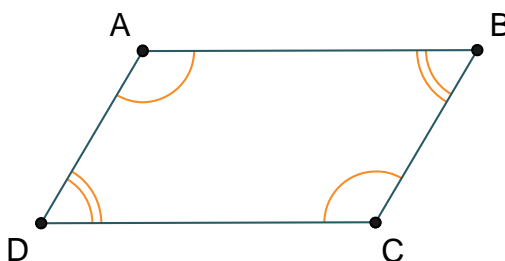If $PR = QS$, and $PQ = RS$, then PQRS is a [                    ] .

## Instruction | Proving a Quadrilateral Is a Parallelogram

### Converse of the Parallelogram Angle Theorem

**Converse of the parallelogram angle theorem:** If both pairs of [_____] angles of a quadrilateral are [_____] , then the quadrilateral is a parallelogram.
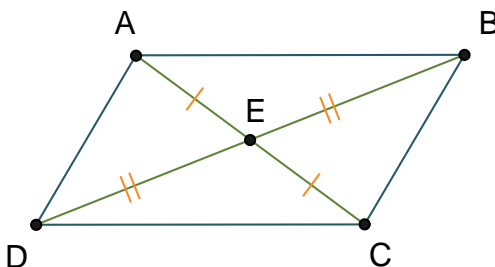


If ∠A ≅ ∠C, and ∠B ≅ ∠D, then ABCD is a [_____] .

### The Converse of the Parallelogram Diagonal Theorem

**Converse of the parallelogram diagonal theorem:** If the [_____] of a quadrilateral bisect each other, then the quadrilateral is a [_____] .
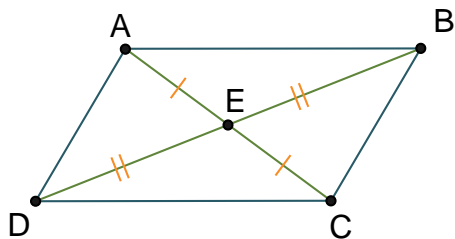
## Instruction | Proving a Quadrilateral Is a Parallelogram

### Converse of the Parallelogram Diagonal Theorem

Given: $\overline{AE} \cong \overline{CE}$; $\overline{DE} \cong \overline{BE}$

Prove: ABCD is a parallelogram.



We are given that $\overline{AE} \cong \overline{CE}$ and $\overline{DE} \cong \overline{BE}$.

We see that ∠AEB and ∠CED are

[    ] angles by definition of vertical

angles, which means that ∠AEB ≅ ∠CED

because vertical angles are congruent.

By [    ], we know △AEB ≅ △CED.
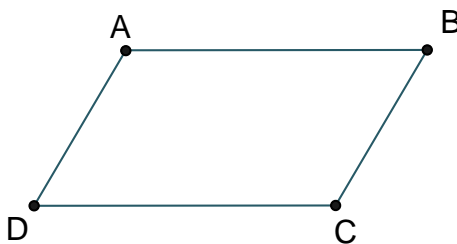
By CPCTC, we know that ∠CAB ≅ ∠ACD.

These are alternate interior angles by the

definition of alternate interior angles. By the

[    ] of the alternate interior

angles theorem, $\overline{AB} \parallel \overline{DC}$.

### The Single Opposite Side Pair Theorem

**Single opposite side pair theorem**: If one pair of [    ] sides of a

quadrilateral is both congruent and [    ], then the quadrilateral is a

parallelogram.



If $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$, then ABCD is a [    ].

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

## Summary | Proving a Quadrilateral Is a Parallelogram

**?**

| Lesson Question | How can you prove that a quadrilateral is a parallelogram. |
|---|---|

**✓**

**Answer**

**Review: Key Concepts**

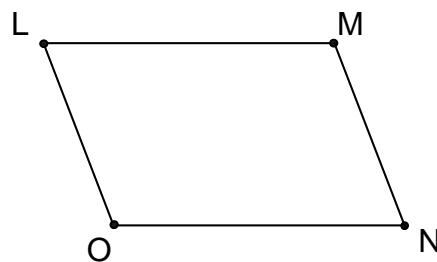There are several ways to prove a quadrilateral is a parallelogram.

- Both pairs of [          ] angles are congruent.

- Both pairs of opposite sides are [          ] .

- The diagonals [          ] each other.

- One pair of opposite sides is both [          ] and congruent.

*Use this space to write any questions or thoughts about this lesson.*