6.4 Proving a Quadrilateral is a Parallelogram

Warm Up

Name 5 properties of parallelograms

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Essential Question

Which properties determine whether a quadrilateral is a parallelogram?

Goal: "I can...
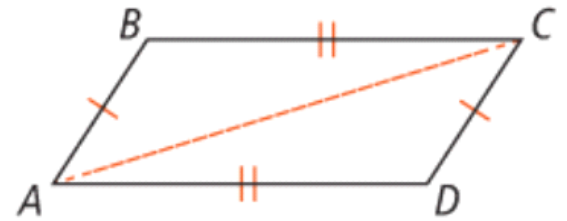**Use properties of sides, angles, ang diagonals to identify a parallelogram."**

Example 1

In quadrilateral $ABCD$, AC is a diagonal, $AB \cong CD$, and $\overline{AD} \cong \overline{BC}$. Is $ABCD$ a parallelogram? Explain.
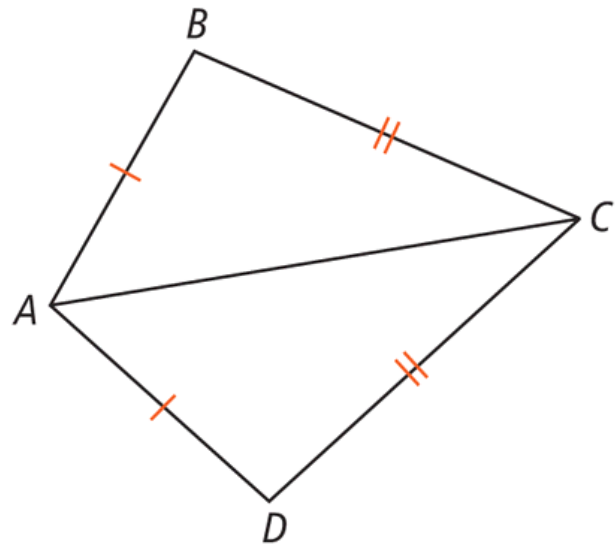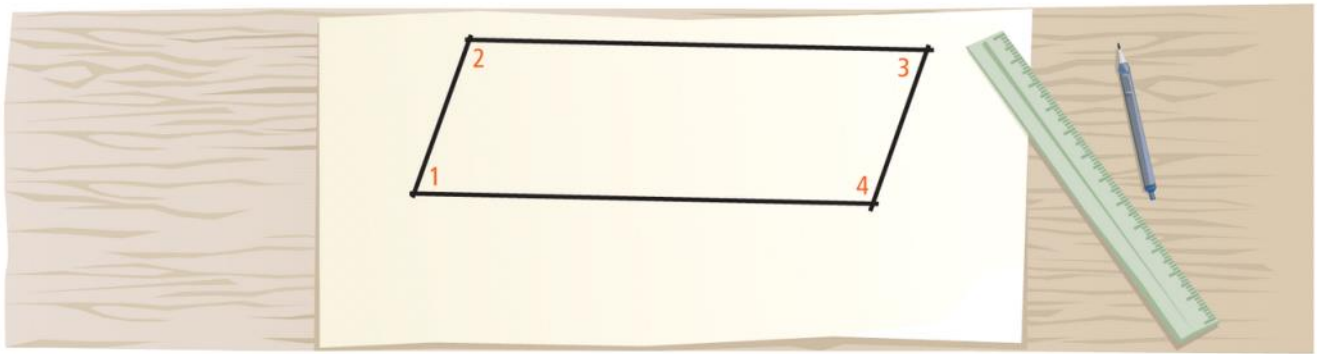
AD ≅ BC. Is **ABCD** a parallelogram? Explain.

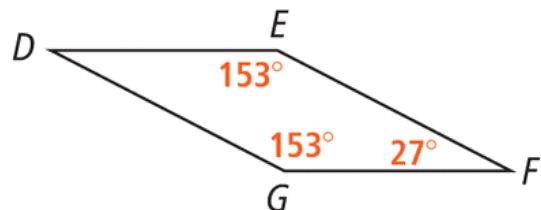What type of quadrilateral is this and how do you know?

EXAMPLE 2

A. Teo sketches a design of a quadrilateral-shaped building. If ∠1 is supplementary to ∠2 and ∠4, is his design a parallelogram?
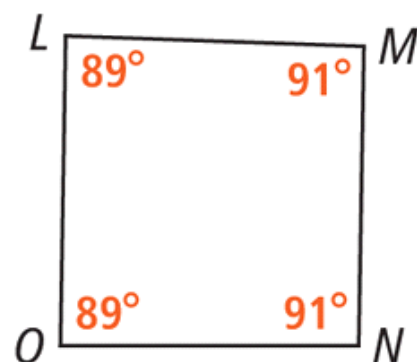
B. Teo sketches a second design in which ∠1 is congruent to ∠3, and ∠2 is congruent to ∠4. Is that design a parallelogram?

2. a. Is *DEFG* a parallelogram? Explain.

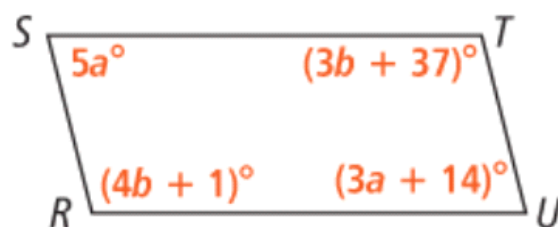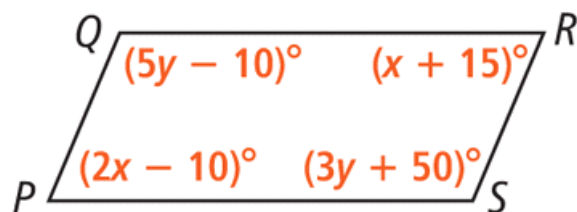**b.** Is *LMNO* a parallelogram? Explain.

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L
  89°          91°  M
 O  89°          91°  N
```

Example 3

A. For what values of *r* and *s* is *WXYZ* a parallelogram?

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        X  ——— s + 5 ——— Y
   4r + 7                7r + 1
      W  ——— 2s − 2 ——— Z
```
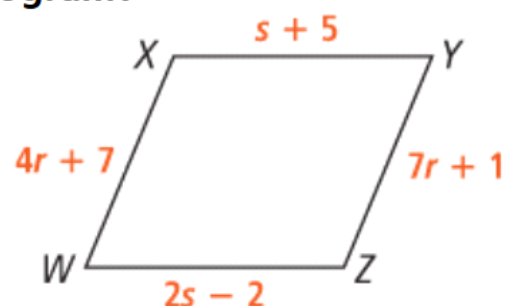
B. For what values of *a* and *b* is *RSTU* a parallelogram?

```
   S                        T
    5a°          (3b + 37)°
    (4b + 1)°    (3a + 14)°
   R                        U
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3. a. If $x = 25$ and $y = 30$, is *PQRS* a parallelogram?

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  Q                          R
   (5y − 10)°    (x + 15)°
   (2x − 10)°    (3y + 50)°
  P                          S
```

3. b. If $g = 14$ and $h = 5$, is *ABCD* a parallelogram?

```
       B  —— h + 1 ——  C
  2g − 11              g + 3
     A  —— 2h − 3 ——  D
```
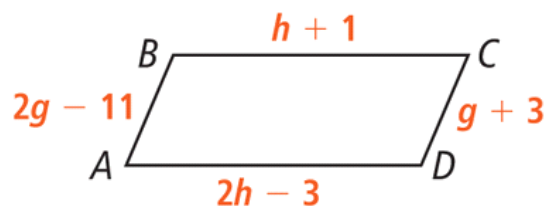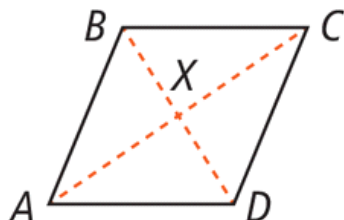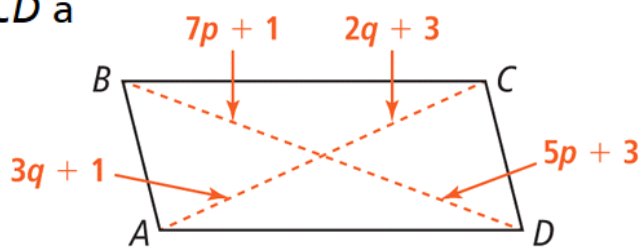
EXAMPLE 4

Given: $\overline{AX} \cong \overline{CX}$ and $\overline{BX} \cong \overline{DX}$
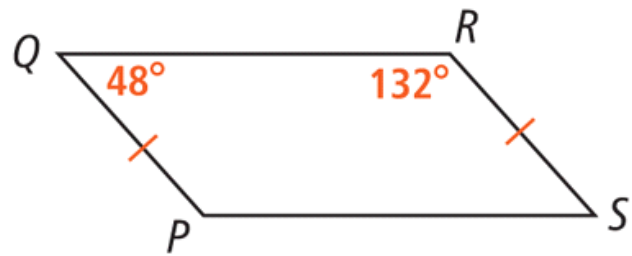
Prove: $ABCD$ is a parallelogram

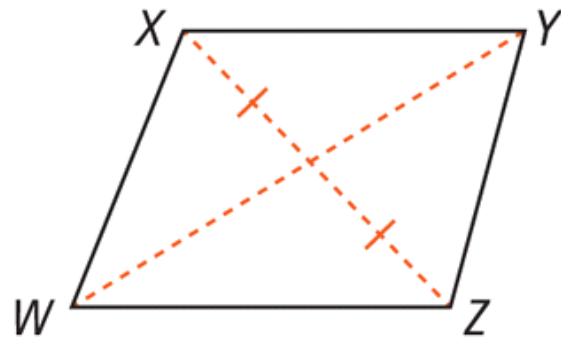
4. For what values of p and q is $ABCD$ a parallelogram?

$7p + 1$ $2q + 3$

$3q + 1$

$5p + 3$

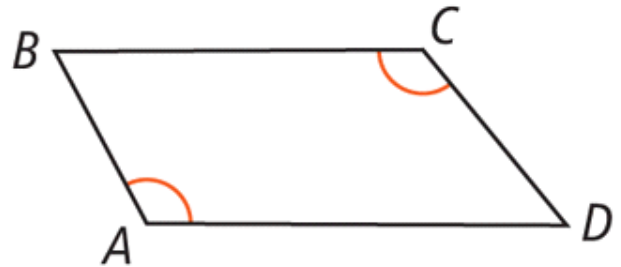## EXAMPLE 5

Is *PQRS* a parallelogram? Explain.
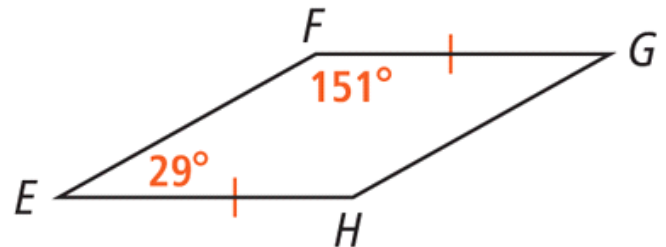

Is *WXYZ* a parallelogram? Explain.

5. a. Is *ABCD* a parallelogram? Explain.

b. Is *EFGH* a parallelogram? Explain.

Homework

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