Name_____ Date _____

7.3 Proving That a Quadrilateral Is a Parallelogram

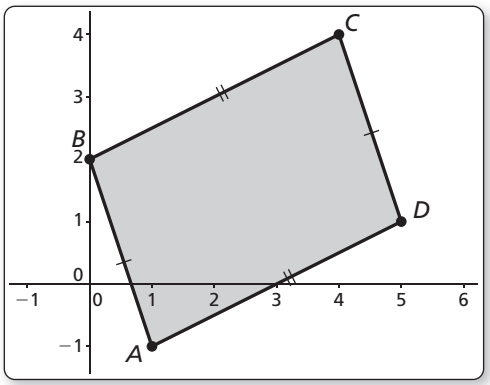
For use with Exploration 7.3

Essential Question How can you prove that a quadrilateral is a parallelogram?

1 EXPLORATION: Proving That a Quadrilateral Is a Parallelogram

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software.



Sample

Points

$A(1, -1)$

$B(0, 2)$

$C(4, 4)$

$D(5, 1)$

Segments

$AB = 3.16$

$BC = 4.47$

$CD = 3.16$

$DA = 4.47$

a. Construct any quadrilateral $ABCD$ whose opposite sides are congruent.

b. Is the quadrilateral a parallelogram? Justify your answer.

c. Repeat parts (a) and (b) for several other quadrilaterals. Then write a conjecture based on your results.

d. Write the converse of your conjecture. Is the converse true? Explain.

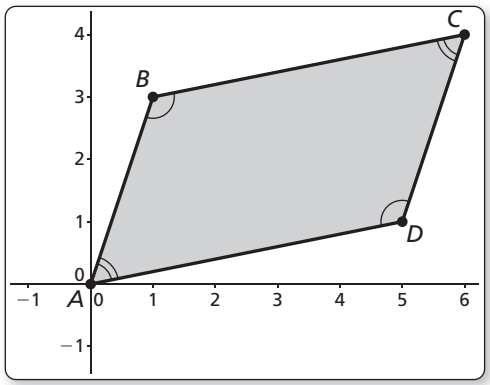
2 EXPLORATION: Proving That a Quadrilateral Is a Parallelogram

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software.

a. Construct any quadrilateral $ABCD$ whose opposite angles are congruent.

b. Is the quadrilateral a parallelogram? Justify your answer.



Sample

Points	Angles
$A(0, 0)$	$\angle A = 60.26°$
$B(1, 3)$	$\angle B = 119.74°$
$C(6, 4)$	$\angle C = 60.26°$
$D(5, 1)$	$\angle D = 119.74°$

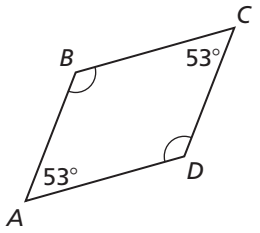
c. Repeat parts (a) and (b) for several other quadrilaterals. Then write a conjecture based on your results.

d. Write the converse of your conjecture. Is the converse true? Explain.

Communicate Your Answer

3. How can you prove that a quadrilateral is a parallelogram?

4. Is the quadrilateral at the right a parallelogram? Explain your reasoning.



Name_____ Date _____

7.3 Notetaking with Vocabulary

For use after Lesson 7.3

In your own words, write the meaning of each vocabulary term.

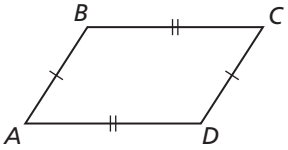
diagonal

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.

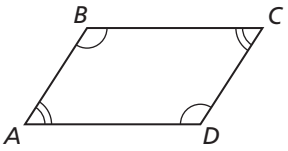


If $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$, then $ABCD$ is a parallelogram.

Notes:

Theorem 7.8 Parallelogram Opposite Angles Converse

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

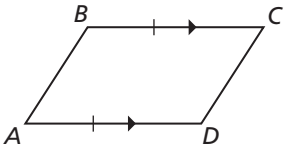


If $\angle A \cong \angle C$ and $\angle B \cong \angle D$, then $ABCD$ is a parallelogram.

Notes:

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.

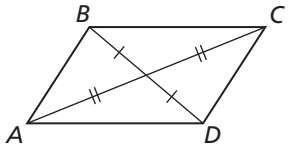
Notes:

Name _____ Date _____

7.3 Notetaking with Vocabulary (continued)

Theorem 7.10 Parallelogram Diagonals Converse

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

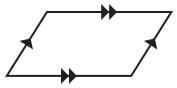
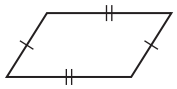
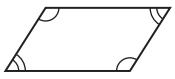
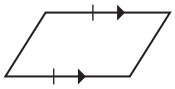
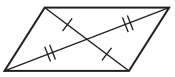


If $\overline{BD}$ and $\overline{AC}$ bisect each other, then $ABCD$ is a parallelogram.

Notes:

Core Concepts

Ways to Prove a Quadrilateral Is a Parallelogram

1. Show that both pairs of opposite sides are parallel. *(Definition)*	
2. Show that both pairs of opposite sides are congruent. *(Parallelogram Opposite Sides Converse)*	
3. Show that both pairs of opposite angles are congruent. *(Parallelogram Opposite Angles Converse)*	
4. Show that one pair of opposite sides are congruent and parallel. *(Opposite Sides Parallel and Congruent Theorem)*	
5. Show that the diagonals bisect each other. *(Parallelogram Diagonals Converse)*	

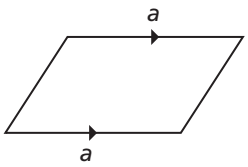
Name_____ Date _____

7.3 Notetaking with Vocabulary (continued)

Extra Practice

In Exercises 1–3, state which theorem you can use to show that the quadrilateral is a parallelogram.

1.



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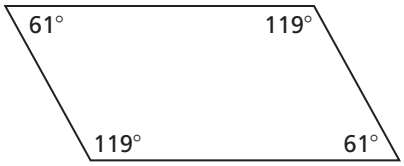

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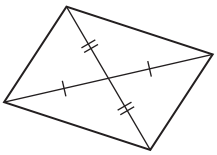
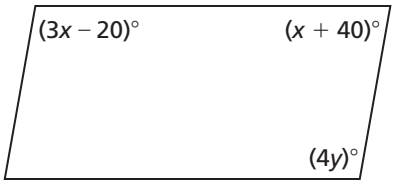


In Exercises 4–7, find the values of *x* and *y* that make the quadrilateral a parallelogram.

4.



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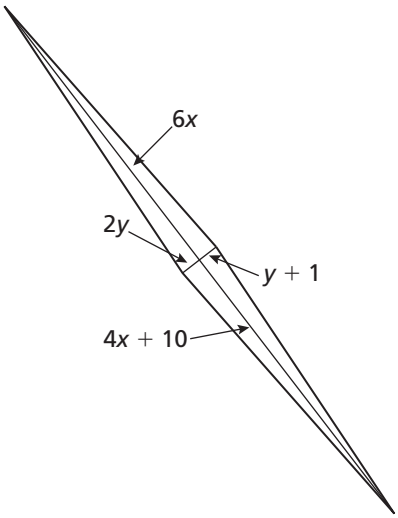

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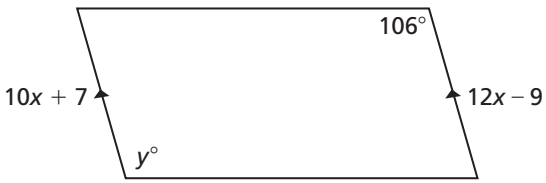

7.