6.3

Proofs with Parallel Lines

For use with Exploration 6.3

Essential Question For which of the theorems involving parallel lines and transversals is the converse true?



EXPLORATION: Exploring Converses

Work with a partner. Write the converse of each conditional statement. Draw a diagram to represent the converse. Determine whether the converse is true. Justify your conclusion.

a. Corresponding Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.

Converse

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b. Alternate Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.

Converse



c. Alternate Exterior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.

Converse



6.3 Proofs with Parallel Lines (continued)

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EXPLORATION: Exploring Converses (continued)

d. Consecutive Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.

Converse



Communicate Your Answer

2. For which of the theorems involving parallel lines and transversals is the converse true?

3. In Exploration 1, explain how you would prove any of the theorems that you found to be true.

6.3 Practice For use after Lesson 6.3

Theorems

Corresponding Angles Converse

If two lines are cut by a transversal so the corresponding angles are congruent, then the lines are parallel.

Notes:

Alternate Interior Angles Converse

If two lines are cut by a transversal so the alternate interior angles are congruent, then the lines are parallel.

Notes:

Alternate Exterior Angles Converse

If two lines are cut by a transversal so the alternate exterior angles are congruent, then the lines are parallel.

Notes:

Consecutive Interior Angles Converse

If two lines are cut by a transversal so the consecutive interior angles are supplementary, then the lines are parallel.

Notes:





 $j \parallel k$



 $j \parallel k$



If $\angle 3$ and $\angle 5$ are supplementary, then $j \parallel k$.

Transitive Property of Parallel Lines

If two lines are parallel to the same line, then they are parallel to each other.

Notes:



If $p \parallel q$ and $q \parallel r$, then $p \parallel r$.

Date

Date

6.3 Practice (continued)

Worked-Out Examples

Example #1

Find the value of x that makes m || n. Explain your reasoning.



Lines m and n are parallel when the marked consecutive interior angles are supplementary.

 $180^{\circ} = 150^{\circ} + (3x - 15)^{\circ}$ 180 = 135 + 3x45 = 3x $\frac{45}{3} = \frac{3x}{3}$ x = 15

Example #2

Find the value of x that makes m || n. Explain your reasoning.



Lines m and n are parallel when the marked alternate exterior angles are congruent.

$$x^{\circ} = (180 - x)^{\circ}$$
$$2x = 180$$
$$\frac{2x}{2} = \frac{180}{2}$$
$$x = 90$$

Name

6.3 Practice (continued)

Practice A

In Exercises 1 and 2, find the value of x that makes $m \parallel n$. Explain your reasoning.



In Exercises 3–6, decide whether there is enough information to prove that $m \parallel n$. If so, state the theorem you would use.



Practice B

Name

In Exercises 1 and 2, find the value of x that makes $s \parallel t$. Explain your reasoning.



In Exercises 3 and 4, decide whether there is enough information to prove that $p \parallel q$. If so, state the theorem you would use.



- **5.** The map of the United States shows the lines of latitude and longitude. The lines of latitude run horizontally and the lines of longitude run vertically.
 - **a.** Are the lines of latitude parallel? Explain.
 - **b.** Are the lines of longitude parallel? Explain.
- 6. Use the diagram to answer the following. 7. Given: $\angle 1 \cong$



- a. Find the values of x, y, and z that makesp || q and q || r. Explain your reasoning.
- **b.** Is $p \parallel r$? Explain your reasoning.





