LESSON 3-3 Practice A
Proving Lines Parallel

1. The Converse of the Corresponding Angles Postulate states that if two coplanar lines are cut by a transversal so that a pair of corresponding angles is congruent, then the two lines are _________________.

Use the figure for Exercises 2 and 3. Given the information in each exercise, state the reason why lines \( b \) and \( c \) are parallel.

2. \( \angle 4 \cong \angle 8 \)

3. \( m\angle 3 = 68^\circ, m\angle 7 = (5x + 3)^\circ, x = 13 \)

Fill in the blanks to complete these theorems about parallel lines.

4. If two coplanar lines are cut by a ________________ so that a pair of alternate interior angles are ________________, then the two lines are parallel.

5. If two coplanar lines are cut by a transversal so that a pair of same-side interior angles are ________________, then the two lines are parallel.

6. If two coplanar lines are cut by a transversal so that a pair of alternate exterior angles are congruent, then the two lines are ________________.

7. Shu believes that a theorem is missing from the lesson. His conjecture is that if two coplanar lines are cut by a transversal so that a pair of same-side exterior angles are supplementary, then the two lines are parallel. Complete the two-column proof with the statements and reasons provided.

**Given:** \( \angle 1 \) and \( \angle 3 \) are supplementary.

**Prove:** \( m \parallel n \)

**Proof:**

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
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<tbody>
<tr>
<td>1. ( \angle 1 ) and ( \angle 3 ) are supplementary.</td>
<td>1. a. ________________</td>
</tr>
<tr>
<td>2. b. ________________</td>
<td>2. Linear Pair Thm.</td>
</tr>
<tr>
<td>3. ( \angle 1 \cong \angle 2 )</td>
<td>3. c. ________________</td>
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</tbody>
</table>
Use the figure for Exercises 2 and 3. Given the information in each exercise, state the reason why lines a and b are parallel.

1. 
2. 
3. 

Conv. of Corr. \& Post.

\[ \angle 1 = \angle 3 \]

Prove:

\[ \angle 2 \text{ and } \angle 3 \text{ are supplementary.} \]

Given:

\[ m\angle 1 \text{ and } m\angle 3 \text{ are supplementary.} \]

Proof:

Fill in the blanks to complete these theorems about parallel lines.

1. If two coplanar lines are cut by a transversal so that a pair of alternate interior angles are congruent, then the two lines are parallel.
2. If two coplanar lines are cut by a transversal so that a pair of same-side interior angles are congruent, then the two lines are parallel.
3. If two coplanar lines are cut by a transversal so that a pair of same-side interior angles are supplementary, then the two lines are parallel.
4. Shu believes that a theorem is missing from the lesson. His conjecture is that if two coplanar lines are cut by a transversal so that a pair of same-side exterior angles are congruent, then the two lines are parallel.

Given:

\[ \angle 1 \text{ and } \angle 3 \text{ are supplementary.} \]

Prove:

\[ \angle 2 \text{ and } \angle 3 \text{ are supplementary.} \]

Hint:

\[ \text{Supps. Thm.} \]

Practice B

Use the figure for Exercises 1–8. Tell whether lines m and n must be parallel from the given information. If they are, state your reasoning. (Hint: The angle measures change for each exercise, and the figure is for reference only.)

1. \[ \angle 1 = \angle 3 \]
2. \[ m\angle 3 = (15x + 22)^\circ, m\angle 1 = (19x - 10)^\circ, x = 8 \]
3. \[ \angle 1 = \angle 3 \]
4. \[ m\angle 2 = (5x + 3)^\circ, m\angle 3 = (8x - 5)^\circ, x = 14 \]
5. \[ m\angle 8 = (6x - 1)^\circ, m\angle 4 = (6x + 3)^\circ, x = 9 \]
6. \[ m\angle 3 = \angle 7 \]
7. \[ m\angle 3 \text{ and } m\angle 2 \text{ are parallel.} \]
8. \[ m\angle 6 = (x + 10)^\circ, m\angle 2 = (x + 15)^\circ, m\angle 3 \text{ and } m\angle 2 \text{ are not parallel.} \]

Sample answer: The given information states that \( \angle 1 \) and \( \angle 3 \) are supplementary, \( \angle 1 \) and \( \angle 2 \) are also supplementary by the Linear Pair Postulate. Therefore \( \angle 3 \) and \( \angle 2 \) must be congruent by the Congruent Supplements Theorem. Since \( \angle 3 \) and \( \angle 2 \) are congruent, \( HI \parallel JK \) are parallel by the Converse of the Corresponding Angles Postulate.

Exercise 10

Use the figure for Exercises 1 and 2. Tell whether lines m and n must be parallel from the given information. If they are, state your reasoning. (Hint: The angle measures change for each exercise, and the figure is for reference only.)

1. \[ \angle 1 = \angle 3 \]
2. \[ m\angle 3 = (15x + 22)^\circ, m\angle 1 = (19x - 10)^\circ, x = 8 \]
3. \[ \angle 1 = \angle 3 \]
4. \[ m\angle 2 = (5x + 3)^\circ, m\angle 3 = (8x - 5)^\circ, x = 14 \]
5. \[ m\angle 8 = (6x - 1)^\circ, m\angle 4 = (6x + 3)^\circ, x = 9 \]
6. \[ m\angle 3 = \angle 7 \]
7. \[ m\angle 3 \text{ and } m\angle 2 \text{ are parallel.} \]
8. \[ m\angle 6 = (x + 10)^\circ, m\angle 2 = (x + 15)^\circ, m\angle 3 \text{ and } m\angle 2 \text{ are not parallel.} \]

Sample answer: The given information states that \( \angle 1 \) and \( \angle 3 \) are supplementary, \( \angle 1 \) and \( \angle 2 \) are also supplementary by the Linear Pair Postulate. Therefore \( \angle 3 \) and \( \angle 2 \) must be congruent by the Congruent Supplements Theorem. Since \( \angle 3 \) and \( \angle 2 \) are congruent, \( HI \parallel JK \) are parallel by the Converse of the Corresponding Angles Postulate.

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