

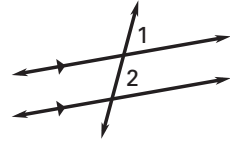
3.3

Parallel Lines and Transversals

- Goals**
- Prove and use results about parallel lines and transversals.
 - Use properties of parallel lines to solve problems.

POSTULATE 15: CORRESPONDING ANGLES POSTULATE

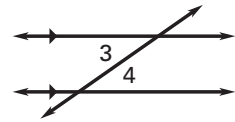
If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.



$$\angle 1 \cong \angle 2$$

THEOREM 3.4: ALTERNATE INTERIOR ANGLES

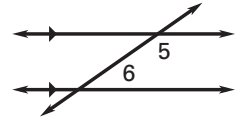
If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.



$$\angle 3 \cong \angle 4$$

THEOREM 3.5: CONSECUTIVE INTERIOR ANGLES

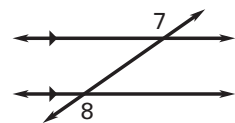
If two parallel lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.



$$m\angle 5 + m\angle 6 = 180^\circ$$

THEOREM 3.6: ALTERNATE EXTERIOR ANGLES

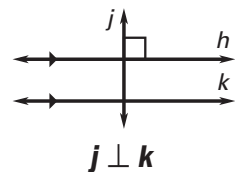
If two parallel lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.



$$\angle 7 \cong \angle 8$$

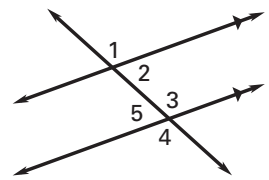
THEOREM 3.7: PERPENDICULAR TRANSVERSAL

If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other.



Example 1 Using Properties of Parallel Lines

Given that $m\angle 1 = 118^\circ$, find each measure. Tell which postulate or theorem you use.



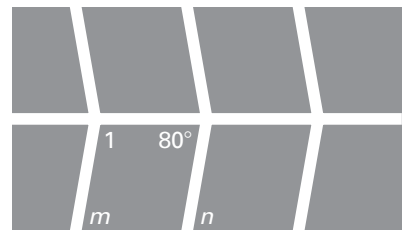
- a. $\angle 2$ b. $\angle 3$ c. $\angle 5$ d. $\angle 4$

Solution

- a. $m\angle 2 = 180^\circ - m\angle 1 = \underline{62^\circ}$ Linear Pair Postulate
- b. $m\angle 3 = m\angle 1 = \underline{118^\circ}$ Corresponding Angles Postulate
- c. $m\angle 5 = m\angle 2 = \underline{62^\circ}$ Alternate Interior Angles Theorem
- d. $m\angle 4 = m\angle 1 = \underline{118^\circ}$ Alternate Exterior Angles Theorem

Example 2 Using Properties of Parallel Lines

Parking Lot Design In the diagram of the parking lot, $m \parallel n$. What is $m\angle 1$?

**Solution**

$$m\angle 1 + 80^\circ = \underline{180^\circ} \quad \text{Consecutive Interior Angles Theorem}$$

$$m\angle 1 = \underline{100^\circ} \quad \text{Subtraction Property of Equality}$$

- ✓ **Checkpoint** Given that $m\angle 6 = 53^\circ$, find the angle measure. Tell which postulate or theorem you use.

1. $\angle 7$

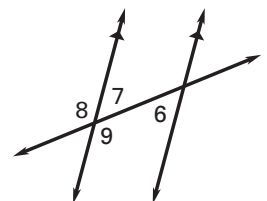
53° ; Alternate Interior Angles Theorem

2. $\angle 8$

127° ; Linear Pair Postulate

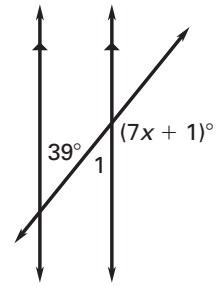
3. $\angle 9$

127° ; Consecutive Interior Angles Theorem



Example 3 Using Properties of Parallel Lines

Use properties of parallel lines to find the value of x .

**Solution**

$$m\angle 1 = \underline{39}^\circ$$

Alternate Interior Angles Theorem

$$m\angle 1 + (7x + 1)^\circ = \underline{180}^\circ$$

Linear Pair Postulate

$$\underline{39}^\circ + (7x + 1)^\circ = \underline{180}^\circ$$

Substitute.

$$7x = \underline{140}$$

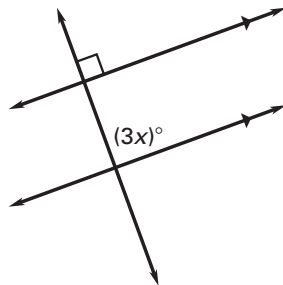
Subtract.

$$x = \underline{20}$$

Divide.

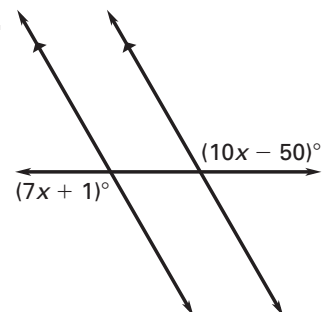
✔ **Checkpoint** Use properties of parallel lines to find the value of x .

4.



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5.



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