Name: _____

Geometry Lesson 12

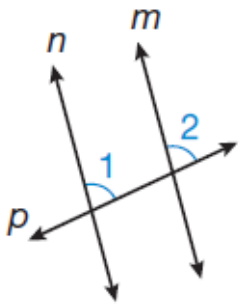
Date: _____

Objective: TSW prove that lines are parallel.

Period: _____

In Investigation 1, you learned Postulate 11: if two parallel lines are cut by a transversal, the corresponding angles formed are congruent. The converse of Postulate 11 is also true, and can be used to show that two lines are parallel.

Postulate 12: Converse of the Corresponding Angles Postulate - If two lines are cut by a transversal and the corresponding angles are congruent, then the lines are parallel. If



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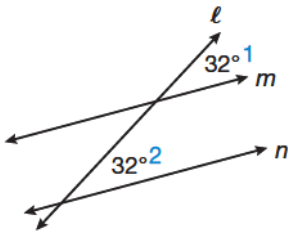
Hint

The postulate and theorems in Investigation 1 refer to two parallel lines cut by a transversal to prove that certain angles are congruent or supplementary. The postulate and theorems in this lesson work conversely. That is, they use known angle relationships to prove that lines are parallel.

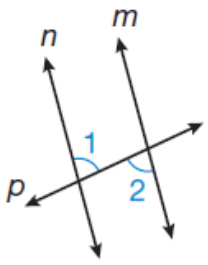
Example 1 Proving Parallelism: Corresponding Angles

Prove that lines *m* and *n* in this diagram are parallel.

SOLUTION



Theorem 12-1: Converse of the Alternate Interior Angles Theorem - If two lines are cut by a transversal and the alternate interior angles are congruent, then the lines are parallel.



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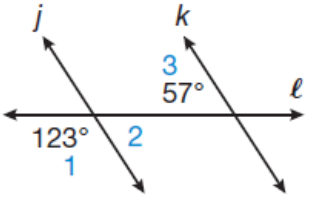
Math Language

Two angles are **supplementary** if the sum of their measures equals 180°.

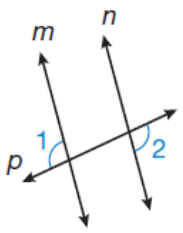
Example 2 Proving Parallelism: Alternate Interior Angles

Prove that lines *j* and *k* in this figure are parallel.

SOLUTION



Theorem 12-2: Converse of the Alternate Exterior Angles Theorem - If two lines are cut by a transversal and the alternate exterior angles are congruent, then the lines are parallel.



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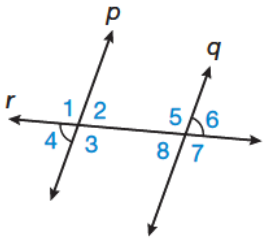
Example 3 Proving Parallelism: Alternate Exterior Angles

a. Identify both pairs of alternate exterior angles in this figure.

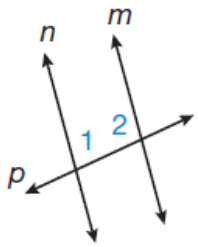
SOLUTION



b. Prove that lines *p* and *q* are parallel.

SOLUTION

Theorem 12-3: Converse of the Same-Side Interior Angles Theorem - If two lines are cut by a transversal and the same-side interior angles are supplementary, then the lines are parallel.



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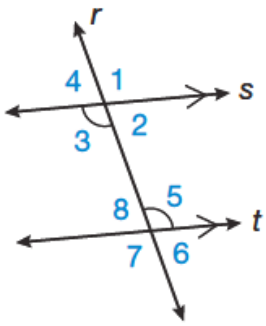
Example 4 Proving Parallelism: Same-Side Interior Angles

a. Identify both pairs of same-side interior angles in this figure.

SOLUTION

b. Use the Converse of the Same-Side Interior Angles Theorem (Theorem 12-3) to prove that lines *s* and *t* are parallel.

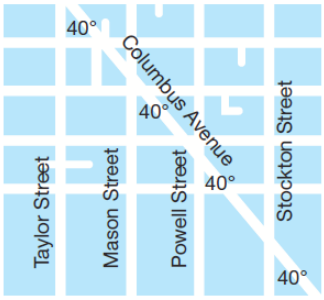
SOLUTION



Math Reasoning

Analyze Could another theorem in this lesson have been used to prove that lines *s* and *t* are parallel?

Example 5 Application: City Planning



In San Francisco, California, Columbus Avenue crosses Stockton, Powell, Mason, and Taylor Streets as shown on the map. Columbus Avenue makes a 40° angle with each of these four streets.

a. What geometric term best describes Columbus Avenue?

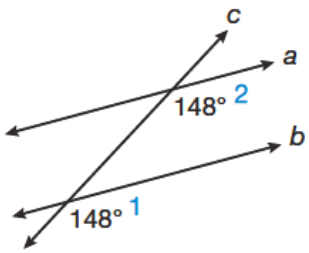
SOLUTION

b. Prove that Powell, Mason, and Taylor streets are all parallel to each other.

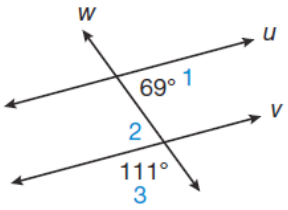
SOLUTION

You Try!!!!

a. Prove that lines *a* and *b* in this figure are parallel.

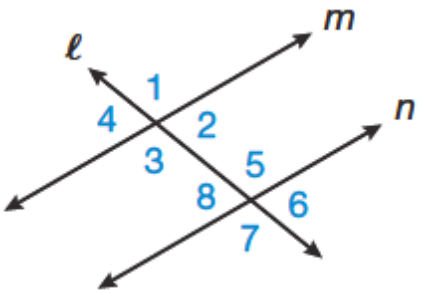


b. Prove that lines *u* and *v* in this figure are parallel.



Use the diagram to answer problems c through f.

c. Identify both pairs of alternate exterior angles in this figure.



d. Given that $\angle 1 \cong \angle 7$, prove that lines *m* and *n* are parallel.

e. Identify both pairs of same-side interior angles in this figure.

f. Given that $\angle 2 \cong \angle 6$, use Theorem 12-3 to prove that lines *m* and *n* are parallel.

Use the diagram to answer problems g and h.

g. City Planning: Speer Boulevard crosses Fox Street, Elati Street, and Delaware Street. Give the geometric term for Speer Boulevard.

h. City Planning: Prove that Fox, Elati, and Delaware streets are all parallel to one another.