

5.5

Proving Geometric Relationships

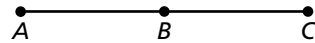
For use with Exploration 5.5

Essential Question How can you use a flowchart to prove a mathematical statement?

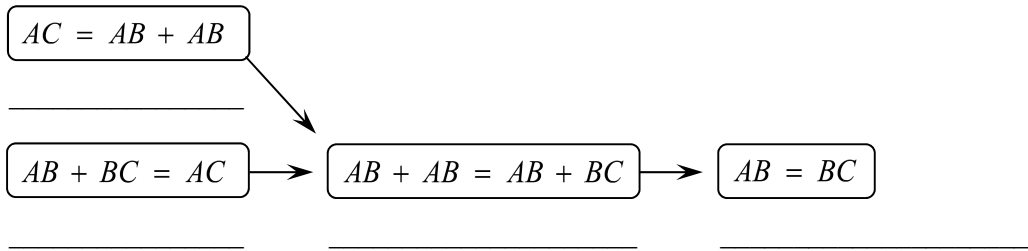
1 EXPLORATION: Matching Reasons in a Flowchart Proof

Work with a partner. Match each reason with the correct step in the flowchart.

Given $AC = AB + AB$



Prove $AB = BC$



- A. Segment Addition Postulate
- B. Given
- C. Transitive Property of Equality
- D. Subtraction Property of Equality

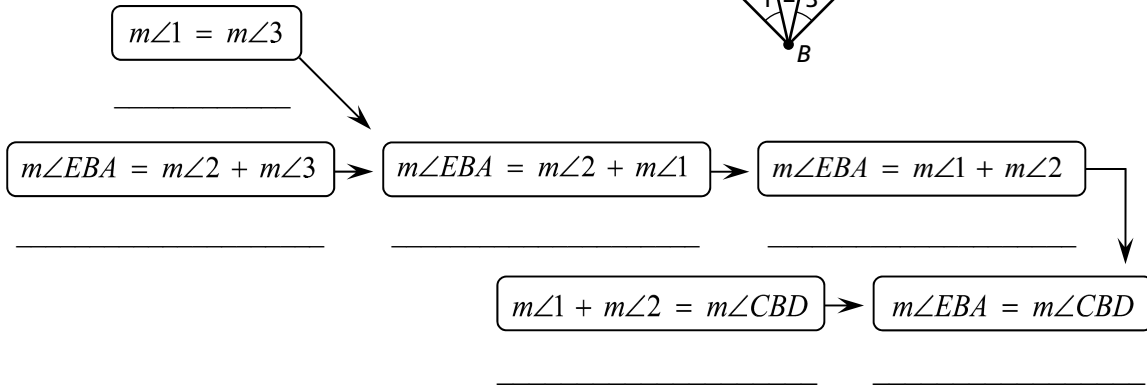
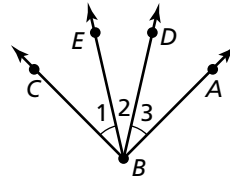
5.5 Proving Geometric Relationships (continued)

2 EXPLORATION: Matching Reasons in a Flowchart Proof

Work with a partner. Match each reason with the correct step in the flowchart.

Given $m\angle 1 = m\angle 3$

Prove $m\angle EBA = m\angle CBD$



- | | |
|---|--|
| A. Angle Addition Postulate | B. Transitive Property of Equality |
| C. Substitution Property of Equality | D. Angle Addition Postulate |
| E. Given | F. Commutative Property of Addition |

Communicate Your Answer

- How can you use a flowchart to prove a mathematical statement?
- Compare the flowchart proofs above with the two-column proofs in the Section 9.4 Explorations. Explain the advantages and disadvantages of each.

5.5

Practice
For use after Lesson 5.5

Theorems and Postulates

Right Angles Congruence Theorem

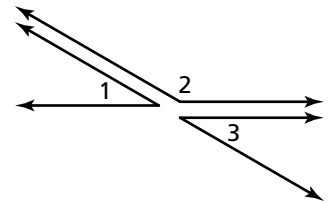
All right angles are congruent.

Notes:

Congruent Supplements Theorem

If two angles are supplementary to the same angle (or to congruent angles), then they are congruent.

If $\angle 1$ and $\angle 2$ are supplementary and $\angle 3$ and $\angle 2$ are supplementary, then $\angle 1 \cong \angle 3$.

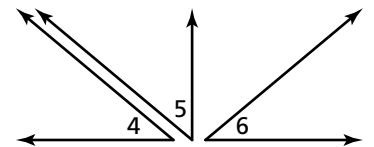


Notes:

Congruent Complements Theorem

If two angles are complementary to the same angle (or to congruent angles), then they are congruent.

If $\angle 4$ and $\angle 5$ are complementary and $\angle 6$ and $\angle 5$ are complementary, then $\angle 4 \cong \angle 6$.

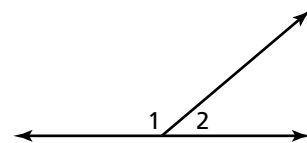


Notes:

Linear Pair Postulate

If two angles form a linear pair, then they are supplementary.

$\angle 1$ and $\angle 2$ form a linear pair, so $\angle 1$ and $\angle 2$ are supplementary and $m\angle 1 + m\angle 2 = 180^\circ$.

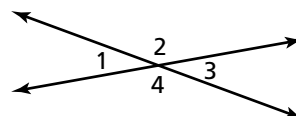


Notes:

Vertical Angles Congruence Theorem

Vertical angles are congruent.

Notes:



$\angle 1 \cong \angle 3, \angle 2 \cong \angle 4$

5.5 Practice (continued)

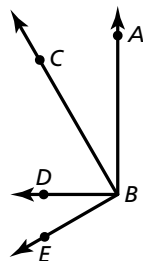
Worked-Out Examples

Example #1

Copy and complete the two-column proof. Then write a flowchart proof.

Given $\angle ABD$ is a right angle.
 $\angle CBE$ is a right angle.

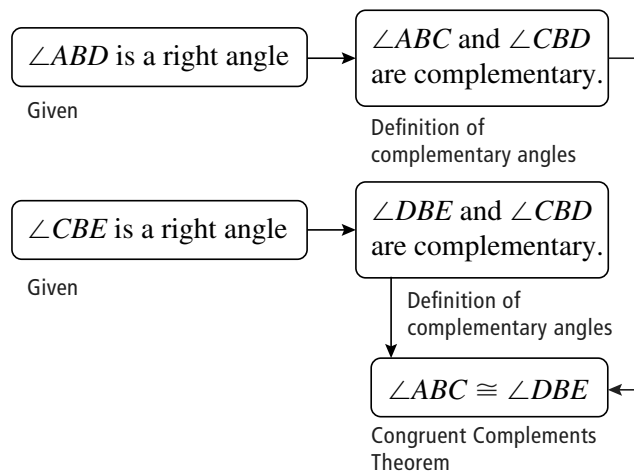
Prove $\angle ABC \cong \angle DBE$



STATEMENTS	REASONS
1. $\angle ABD$ is a right angle. $\angle CBE$ is a right angle.	1. _____
2. $\angle ABC$ and $\angle CBD$ are complementary.	2. Definition of complementary angles
3. $\angle DBE$ and $\angle CBD$ are complementary.	3. _____
4. $\angle ABC \cong \angle DBE$	4. _____

STATEMENTS	REASONS
1. $\angle ABD$ is a right angle. $\angle CBE$ is a right angle.	1. Given
2. $\angle ABC$ and $\angle CBD$ are complementary.	2. Definition of complementary angles
3. $\angle DBE$ and $\angle CBD$ are complementary.	3. Definition of complementary angles
4. $\angle ABC \cong \angle DBE$	4. Congruent Complements Theorem

Flowchart proof:



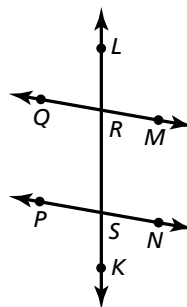
Example #2

Write a proof using any format.

Given $\angle QRS$ and $\angle PSR$ are supplementary angles.

Prove $\angle QRL \cong \angle PSR$

Because $\angle QRS$ and $\angle PSR$ are supplementary, $m\angle QRS + m\angle PSR = 180^\circ$ by the definition of supplementary angles. $\angle QRL$ and $\angle QRS$ form a linear pair and by definition are supplementary, which means that $m\angle QRL + m\angle QRS = 180^\circ$. So, by the Transitive Property of Equality, $m\angle QRS + m\angle PSR = m\angle QRL + m\angle QRS$, and by the Subtraction Property of Equality, $m\angle PSR = m\angle QRL$. So, by definition of congruent angles, $\angle PSR \cong \angle QRL$, and by the Symmetric Property of Angle Congruence, $\angle QRL \cong \angle PSR$.



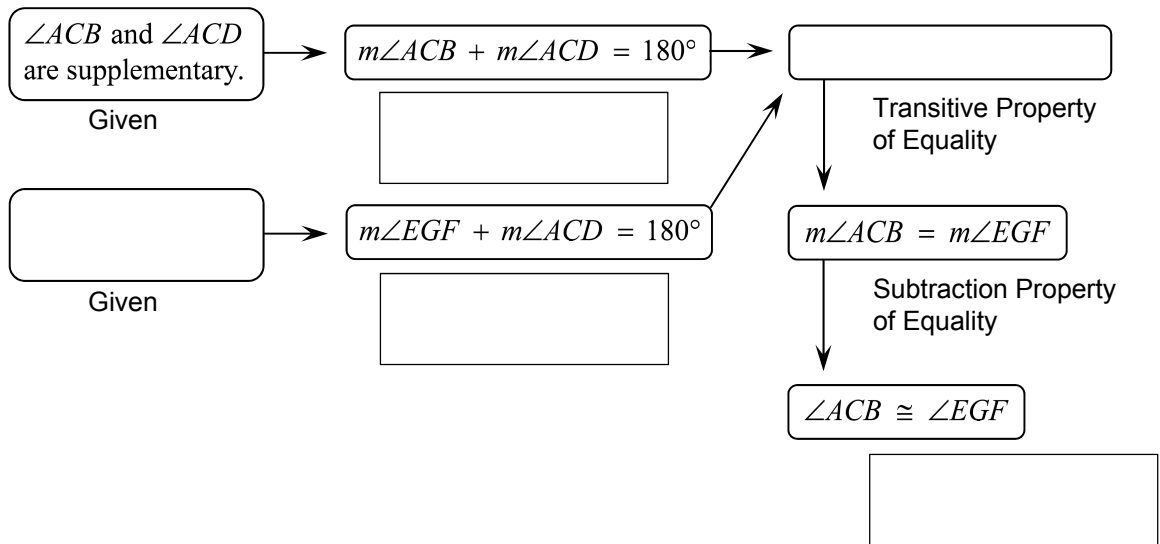
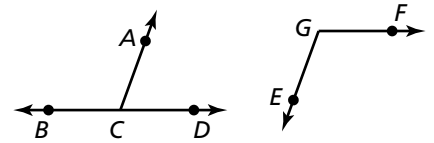
5.5 Practice (continued)

Practice A

1. Complete the flowchart proof. Then write a two-column proof.

Given $\angle ACB$ and $\angle ACD$ are supplementary.
 $\angle EGF$ and $\angle ACD$ are supplementary.

Prove $\angle ACB \cong \angle EGF$

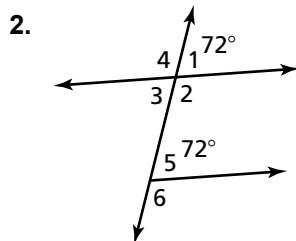
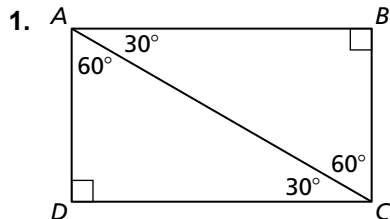


Two-Column Proof

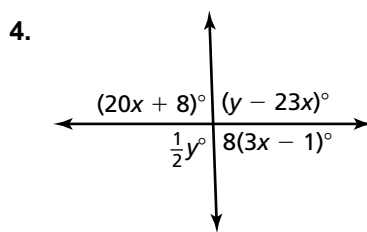
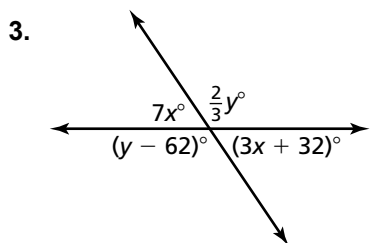
STATEMENTS	REASONS

Practice B

In Exercises 1 and 2, identify the pair(s) of congruent angles in the figures. Explain how you know they are congruent.

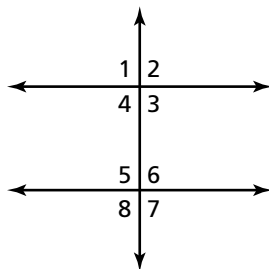


In Exercises 3 and 4, find the values of x and y .



5. Copy and complete the flowchart proof. Then write a paragraph proof.

- Given** $\angle 1$ is a right angle.
 $\angle 5$ is a right angle.
 $\angle 5$ and $\angle 8$ are supplementary.



Prove $\angle 3 \cong \angle 8$

