

2.5

Proving Statements about Segments and Angles

For use with Exploration 2.5

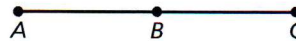
Essential Question How can you prove a mathematical statement?

A **proof** is a logical argument that uses deductive reasoning to show that a statement is true.

1 EXPLORATION: Writing Reasons in a Proof

Work with a partner. Four steps of a proof are shown. Write the reasons for each statement.

Given $AC = AB + AB$



Prove $AB = BC$

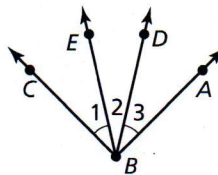
STATEMENTS	REASONS
1. $AC = AB + AB$	1. Given
2. $AB + BC = AC$	2. <u>Segment Addition Postulate (Post 1.2)</u> Definition of 2 segments that add to
3. $AB + AB = AB + BC$	3. <u>Transitive Property of Equality</u>
4. $AB = BC$	4. <u>Subtraction Property of Equality</u>

2 EXPLORATION: Writing Steps in a Proof

Work with a partner. Six steps of a proof are shown. Complete the statements that correspond to each reason.

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

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



2.5 Proving Statements about Segments and Angles (continued)

2 EXPLORATION: Writing Steps in a Proof (continued)

STATEMENTS	REASONS
1. $m\angle 1 = m\angle 3$	1. Given
2. $m\angle EBA = m\angle 2 + m\angle 3$	2. Angle Addition Postulate (Post. 1.4)
3. $m\angle EBA = m\angle 2 + m\angle 1$	3. Substitution Property of Equality
4. $m\angle EBA = m\angle 1 + m\angle 2$	4. Commutative Property of Addition
5. $m\angle 1 + m\angle 2 = m\angle CBD$	5. Angle Addition Postulate (Post. 1.4)
6. $m\angle EBA = m\angle CBD$	6. Transitive Property of Equality

Communicate Your Answer

3. How can you prove a mathematical statement?

You can use deductive reasoning to make statements about a given situation & use math definitions, postulates, and theorems as your reason of justification for each statement.

4. Use the given information and the figure to write a proof for the statement.

Given B is the midpoint of \overline{AC} .
 C is the midpoint of \overline{BD} .



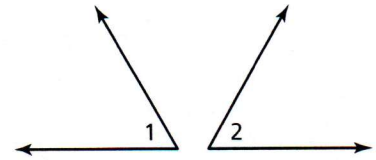
Prove $AB = CD$

2.5 Notetaking with Vocabulary (continued)

Core Concepts

Writing a Two-Column Proof

In a proof, you make one statement at a time until you reach the conclusion. Because you make statements based on facts, you are using deductive reasoning. Usually the first statement-and-reason pair you write is given information.



Copy or draw diagrams and label given information to help develop proofs. Do not mark or label the information in the Prove statement on the diagram.

Proof of the Symmetric Property of Angle Congruence

Given $\angle 1 \cong \angle 2$ **Prove** $\angle 2 \cong \angle 1$

	STATEMENTS	REASONS	
statements based on facts that you know or on conclusions from deductive reasoning	1. $\angle 1 \cong \angle 2$	1. Given	definitions, postulates, or proven theorems that allow you to state the corresponding statement
	2. $m\angle 1 = m\angle 2$	2. Definition of congruent angles	
	3. $m\angle 2 = m\angle 1$	3. Symmetric Property of Equality	
	4. $\angle 2 \cong \angle 1$	4. Definition of congruent angles	
	The number of statements will vary.	Remember to give a reason for the last statement.	

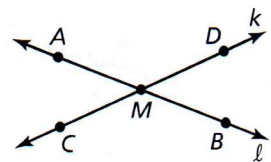
Notes:

Extra Practice

In Exercises 1 and 2, complete the proof.

1. **Given** Line k and line ℓ bisect each other at point M and $\overline{BM} \cong \overline{CM}$.

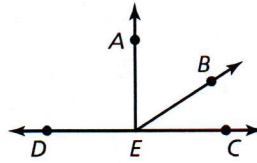
Prove $AB = AM + DM$



STATEMENTS	REASONS
1. $\overline{BM} \cong \overline{CM}$	1. Given
2. $\overline{CM} \cong \overline{DM}$	2. <u>Def of segment bisector</u>
3. $\overline{BM} \cong \overline{DM}$	3. <u>Transitive Property of Equality</u>
4. $BM = DM$	4. <u>Definition of congruent segments</u>
5. <u>$AB = AM + BM$</u>	5. Segment Addition Postulate (Post. 1.2)
6. $AB = AM + DM$	6. <u>Substitution Property of Equality</u>

2.5 Notetaking with Vocabulary (continued)

2. Given $\angle AEB$ is a complement of $\angle BEC$.
 Prove $m\angle AED = 90^\circ$



STATEMENTS	REASONS
1. $\angle AEB$ is a complement of $\angle BEC$.	1. Given
2. $m\angle AEB + m\angle BEC = 90^\circ$	2. Definition of complementary angles
3. $m\angle AEC = m\angle AEB + m\angle BEC$	3. <u>Angle Addition Postulate</u>
4. $m\angle AEC = 90^\circ$	4. <u>Transitive Property of Equality</u>
5. $m\angle AED + m\angle AEC = 180^\circ$	5. Definition of supplementary angles
6. $m\angle AED + 90^\circ = 180^\circ$	6. Substitution Property of Equality
7. $m\angle AED = 90^\circ$	7. <u>Subtraction Property of Equality</u>

In Exercises 3 and 4, name the property that the statement illustrates.

3. If $\angle RST \cong \angle TSU$ and $\angle TSU \cong \angle VWX$, then $\angle RST \cong \angle VWX$.
Transitive Property of Angle Congruence (Thm 2.2)
4. If $\overline{GH} \cong \overline{JK}$, then $\overline{JK} \cong \overline{GH}$.
Symmetric Property of Segment Congruence (Thm 2.1)
5. Write a two-column proof.

Given M is the midpoint of \overline{RT} .
 Prove $MT = RS + SM$



STATEMENTS	REASONS
1. M is the midpoint of \overline{RT}	1. Given
2. $\overline{RM} \cong \overline{MT}$	2. Def of midpoint
3. $RM = RS + SM$	3. Segment
4. $\overline{MT} \cong \overline{RM}$	4. Symmetric Property of Segment Congruence
5. $MT = RS + SM$	5. Substitution Property of Equality