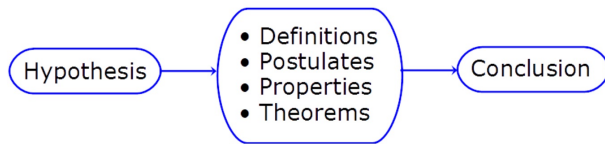


## Lesson 2 - 6

### Geometric Proof Going Deeper

**Essential question:** How can you organize the deductive reasoning of a geometric proof?

When writing a proof, it is important to justify each logical step with a . You can use symbols and abbreviations, but they must be clear enough so that anyone who reads your proof will understand them.



### Definitions

Examples:

**Postulates:** A statement accepted

Examples:

### Properties

Examples: The algebraic properties from yesterday

**Theorems:** A statement that can be

Once you prove a theorem, you can use it to prove other theorems

A geometric proof begins with  and  statements, which restate the  and  of the conjecture. In a **two-column proof**, you list the steps of the proof in the left column. You write the matching reason for each step in the right column.

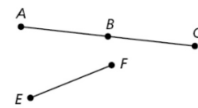
**Write a justification for each step, given that  $\angle A$  and  $\angle B$  are supplementary and  $m\angle A = 45^\circ$ .**  
Prove that  $m\angle B = 135^\circ$



Statements	Reasons
1. $\angle A$ and $\angle B$ are supplementary. $m\angle A = 45^\circ$	<input type="text"/>
2. $m\angle A + m\angle B = 180^\circ$	<input type="text"/>
3. $45^\circ + m\angle B = 180^\circ$	<input type="text"/>
4. $m\angle B = 135^\circ$	<input type="text"/>

**Write a justification for each step, given that  $B$  is the midpoint of  $\overline{AC}$  and  $\overline{AB} \cong \overline{EF}$ .**

Prove  $\overline{BC} \cong \overline{EF}$

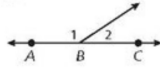


Statements	Reasons
1. $B$ is the midpoint of $\overline{AC}$ .	<input type="text"/>
2. $\overline{AB} \cong \overline{BC}$	<input type="text"/>
3. $\overline{AB} \cong \overline{EF}$	<input type="text"/>
4. $\overline{BC} \cong \overline{EF}$	<input type="text"/>

We are going to prove the theorem below

**Theorem**

THEOREM	HYPOTHESIS	CONCLUSION
<b>2-6-1 Linear Pair Theorem</b> If two angles form a linear pair, then they are <input type="text"/>	$\angle A$ and $\angle B$ form a linear pair.	$\angle A$ and $\angle B$ are <input type="text"/>



Statements	Reasons
1. $\angle 1$ and $\angle 2$ form a linear pair.	1. <input type="text"/>
2. $\overrightarrow{BA}$ and $\overrightarrow{BC}$ form a line.	2. Def. of lin. pair
3. $m\angle ABC = 180^\circ$	3. <input type="text"/>
4. $m\angle 1 + m\angle 2 = m\angle ABC$	4. <input type="text"/>
5. $m\angle 1 + m\angle 2 = 180^\circ$	5. <input type="text"/>
6. $\angle 1$ and $\angle 2$ are supplementary.	6. <input type="text"/>

We can now use the theorem in other proofs

**Theorem**

THEOREM	HYPOTHESIS	CONCLUSION
<b>2-6-2 Congruent Supplements Theorem</b> If two angles are supplementary to the same angle (or to two congruent angles), then the two angles are <input type="text"/>	$\angle 1$ and $\angle 2$ are supplementary. $\angle 2$ and $\angle 3$ are supplementary.	<input type="text"/>

**Proof:**

Statements	Reasons
1. $\angle 1$ and $\angle 2$ are supp., and $\angle 2$ and $\angle 3$ are supp.	1. <input type="text"/>
2. $m\angle 1 + m\angle 2 = 180^\circ$ $m\angle 2 + m\angle 3 = 180^\circ$	2. <input type="text"/>
3. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	3. <input type="text"/>
4. $m\angle 1 = m\angle 3$	4. <input type="text"/>
5. $\angle 1 \cong \angle 3$	5. <input type="text"/>
6. $\angle 1$ and $\angle 3$ are supplementary.	6. <input type="text"/>

**Theorems**

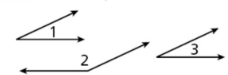
THEOREM	HYPOTHESIS	CONCLUSION
<b>2-6-3 Right Angle Congruence Theorem</b> All right angles are congruent.	$\angle A$ and $\angle B$ are right angles.	$\angle A \cong \angle B$
<b>2-6-4 Congruent Complements Theorem</b> If two angles are complementary to the same angle (or to two congruent angles), then the two angles are congruent.	$\angle 1$ and $\angle 2$ are complementary. $\angle 2$ and $\angle 3$ are complementary.	$\angle 1 \cong \angle 3$

Use the given plan to write a two-column proof.

Given:  $\angle 1$  and  $\angle 2$  are supplementary, and

$$\angle 1 \cong \angle 3$$

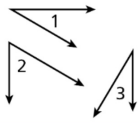
Prove:  $\angle 3$  and  $\angle 2$  are supplementary.



Statements	Reasons
1. $\angle 1$ and $\angle 2$ are supplementary. $\angle 1 \cong \angle 3$	1. <input type="text"/>
2. <input type="text"/>	2. Def. of supp. $\angle$ s
3. $m\angle 1 = m\angle 3$	3. Def. of $\cong \angle$ s
4. <input type="text"/>	4. Subst.
5. $\angle 3$ and $\angle 2$ are supplementary	5. <input type="text"/>

**Given:**  $\angle 1$  and  $\angle 2$  are complementary, and  
 $\angle 2$  and  $\angle 3$  are complementary.

**Prove:**  $\angle 1 \cong \angle 3$



Statements	Reasons
1. $\angle 1$ and $\angle 2$ are complementary. $\angle 2$ and $\angle 3$ are complementary.	1. <input type="text"/>
2. <input type="text"/>	2. Def. of comp. $\angle$ s
3. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	3. <input type="text"/>
4. $m\angle 2 = m\angle 2$	4. <input type="text"/>
5. <input type="text"/>	5. Subtr. Prop. of =
6. $\angle 1 \cong \angle 3$	6. <input type="text"/>

### Lesson Quiz: Part I

Write a justification for each step, given that  $m\angle ABC = 90^\circ$  and  $m\angle 1 = 4m\angle 2$ . Prove  $m\angle 2 = 18^\circ$



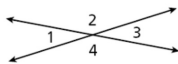
Statements	Reasons
1. $m\angle ABC = 90^\circ$ and $m\angle 1 = 4m\angle 2$	<input type="text"/>
2. $m\angle 1 + m\angle 2 = m\angle ABC$	<input type="text"/>
3. $4m\angle 2 + m\angle 2 = 90^\circ$	<input type="text"/>
4. $5m\angle 2 = 90^\circ$	<input type="text"/>
5. $m\angle 2 = 18^\circ$	<input type="text"/>

### Lesson Quiz: Part II

2. Use the given plan to write a two-column proof.

**Given:**  $\angle 1, \angle 2, \angle 3, \angle 4$

**Prove:**  $m\angle 1 + m\angle 2 = m\angle 1 + m\angle 4$



1. $\angle 1$ and $\angle 2$ are supp. $\angle 1$ and $\angle 4$ are supp.	<input type="text"/>
2. $m\angle 1 + m\angle 2 = 180^\circ$ , $m\angle 1 + m\angle 4 = 180^\circ$	<input type="text"/>
3. $m\angle 1 + m\angle 2 = m\angle 1 + m\angle 4$	<input type="text"/>