

3.2

Proof and Perpendicular Lines

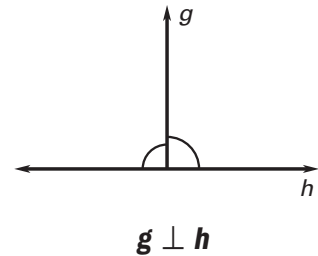
- Goals**
- Write different types of proofs.
 - Prove results about perpendicular lines.

VOCABULARY

Flow proof A flow proof is a type of proof that uses arrows to show the flow of a logical argument. Statements are connected by arrows to show how each statement comes from the ones before it, and each reason is written below the statement it justifies.

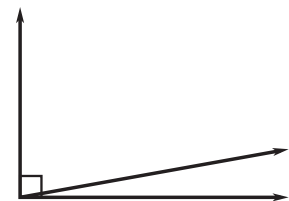
THEOREM 3.1

If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.



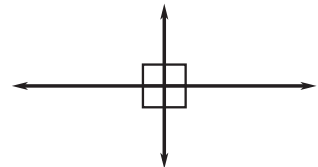
THEOREM 3.2

If two sides of two adjacent acute angles are perpendicular, then the angles are complementary.



THEOREM 3.3

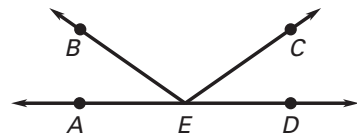
If two lines are perpendicular, then they intersect to form four right angles.



Example 1 Comparing Types of Proofs

Given: $m\angle AEC = m\angle DEB$

Prove: $m\angle AEB = m\angle DEC$



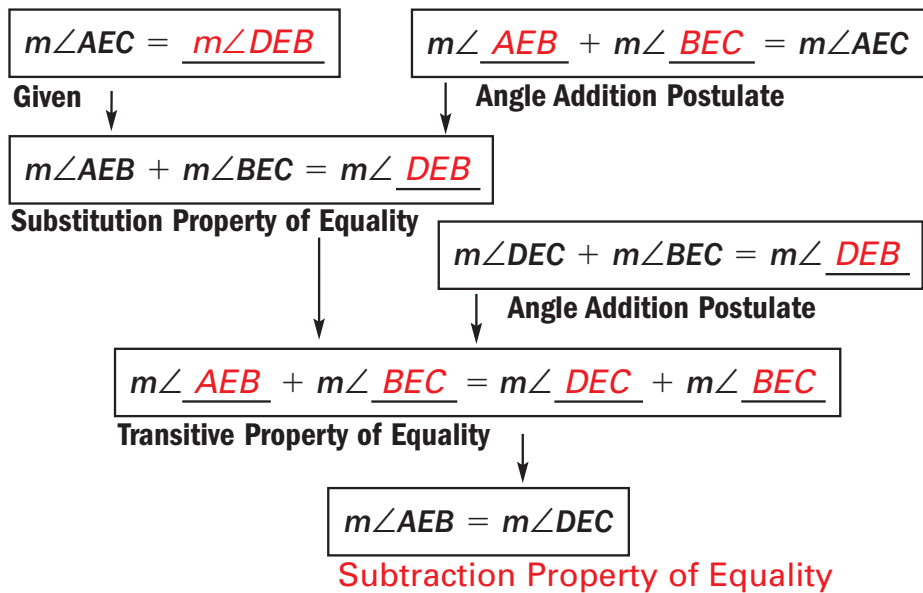
Method 1 Two-column Proof

Statements	Reasons
1. $m\angle AEC = m\angle DEB$	1. Given
2. $m\angle AEB + m\angle BEC = m\angle AEC$	2. Angle Addition Postulate
3. $m\angle AEB + m\angle BEC = m\angle DEB$	3. Substitution Property of Equality
4. $m\angle DEC + m\angle BEC = m\angle DEB$	4. Angle Addition Postulate
5. $m\angle AEB + m\angle BEC = m\angle DEC + m\angle BEC$	5. Transitive Property of Equality
6. $m\angle AEB = m\angle DEC$	6. <u>Subtraction Property of Equality</u>

Method 2 Paragraph Proof

By the Angle Addition Postulate, $m\angle AEB + m\angle BEC = m\angle AEC$. Using the Substitution Property of Equality and the given fact that $m\angle AEC = m\angle DEB$, you can conclude that $m\angle AEB + m\angle BEC = m\angle DEB$. Using the Angle Addition Postulate and the Transitive Property of Equality, you can show that $m\angle AEB + m\angle BEC = m\angle DEC + m\angle BEC$. It follows from the Subtraction Property of Equality that $m\angle AEB = m\angle DEC$.

Method 3 Flow Proof

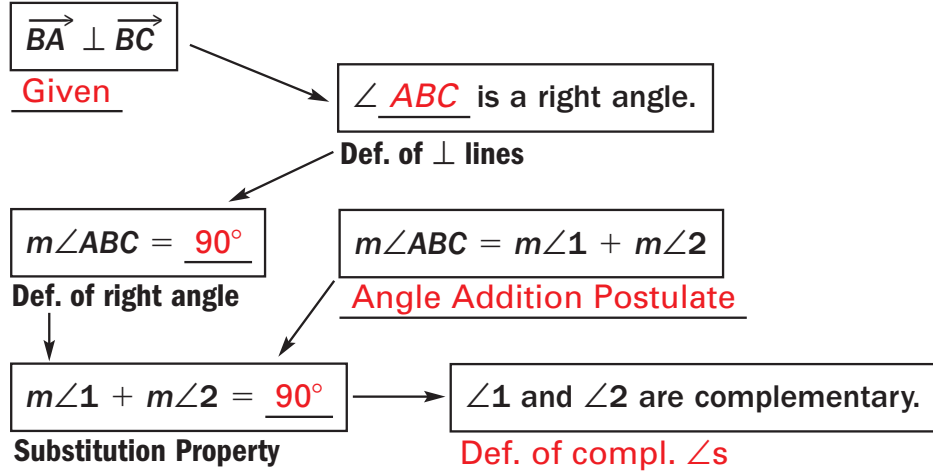
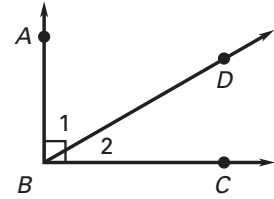


Example 2 Proof of Theorem 3.2

Given: $\overrightarrow{BA} \perp \overrightarrow{BC}$

Prove: $\angle 1$ and $\angle 2$ are complementary.

Plan for Proof Use $m\angle ABC = 90^\circ$ and $m\angle 1 + m\angle 2 = m\angle ABC$ to show that $\angle 1$ and $\angle 2$ are complementary.



Checkpoint Complete the flow proof of Theorem 3.3.

1. Given: $j \perp k$, $\angle 1$ and $\angle 2$ are a linear pair.
Prove: $\angle 2$ is a right angle.

