

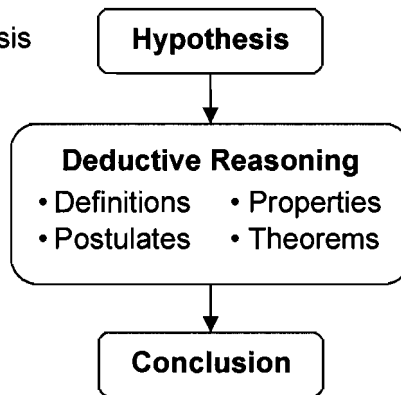
Geometry Notes 2-6

Geometric Proof

To write a geometric proof, start with the hypothesis of a conditional.

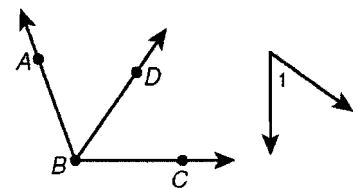
Apply deductive reasoning.

Prove that the conclusion of the conditional is true.



Given: \overrightarrow{BD} is the angle bisector of $\angle ABC$, and $\angle ABD \cong \angle 1$.

Prove: $\angle DBC \cong \angle 1$



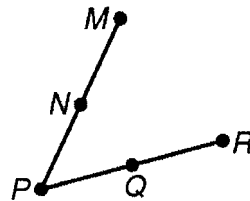
Proof:

1. \overrightarrow{BD} is the angle bisector of $\angle ABC$.
2. $\angle ABD \cong \angle DBC$
3. $\angle ABD \cong \angle 1$
4. $\angle DBC \cong \angle 1$

1. _____
2. _____
3. _____
4. _____

Given: N is the midpoint of \overline{MP} , Q is the midpoint of \overline{RP} , and $\overline{PQ} \cong \overline{NM}$.

Prove: $\overline{PN} \cong \overline{QR}$



Proof:

1. N is the midpoint of \overline{MP} .
2. Q is the midpoint of \overline{RP} .
3. $\overline{PN} \cong \overline{NM}$
4. $\overline{PQ} \cong \overline{NM}$
5. $\overline{PN} \cong \overline{PQ}$
6. $\overline{PQ} \cong \overline{QR}$
7. $\overline{PN} \cong \overline{QR}$

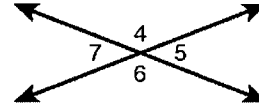
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

A **theorem** is any statement that you can prove. You can use **two-column proofs** and deductive reasoning to prove theorems.

Here is a two-column proof of one case of the Congruent Supplements Theorem.

Given: $\angle 4$ and $\angle 5$ are supplementary and
 $\angle 5$ and $\angle 6$ are supplementary.

Prove: $\angle 4 \cong \angle 6$



Proof:

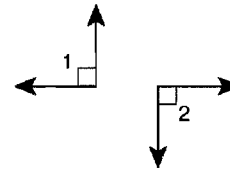
| Statements | Reasons |
|--|----------|
| 1. $\angle 4$ and $\angle 5$ are supplementary. | 1. Given |
| 2. $\angle 5$ and $\angle 6$ are supplementary. | 2. Given |
| 3. $m\angle 4 + m\angle 5 = 180^\circ$ | 3. |
| 4. $m\angle 5 + m\angle 6 = 180^\circ$ | 4. |
| 5. $m\angle 4 + m\angle 5 = m\angle 5 + m\angle 6$ | 5. |
| 6. $m\angle 4 = m\angle 6$ | 6. |

Fill in the blanks to complete the two-column proof of the Right Angle Congruence Theorem.

Given: $\angle 1$ and $\angle 2$ are right angles.

Prove: $\angle 1 \cong \angle 2$

Proof:



| Statements | Reasons |
|----------------------------|----------|
| 1. | 1. Given |
| 2. $m\angle 1 = 90^\circ$ | 2. |
| 3. $m\angle 2 = 90^\circ$ | 3. |
| 4. $m\angle 1 = m\angle 2$ | 4. |
| 5. | 5. |

Useful Definitions

Definition of Midpoint: A midpoint divides a segment into two congruent segments.

Definition of Angle Bisector: An angle bisector divides an angle into two congruent angles.

Definition of Congruent Segments: Two segments are congruent if and only if their lengths are equal.

Definition of Congruent Angles: Two angles are congruent if and only if their measures are equal.

Definition of Right Angle: An angle is a right angle if and only if its measure is 90° .

Definition of Supplementary Angles: Two angles are supplementary if and only if the sum of their measures is 180° .

Definition of Complementary Angles: Two angles are complementary if and only if the sum of their measures is 90° .

Definition of Opposite Rays: Opposite rays are two rays that have a common endpoint and form a straight line.

Definition of Linear Pair: A linear pair of angles is a pair of adjacent angles whose noncommon sides are opposite rays.

Definition of Vertical Angles: Vertical angles are two nonadjacent angles formed by intersecting lines.

Useful Theorems and Postulates

| | |
|---------------------------------------|--|
| Congruent Supplements Theorem | If two angles are supplementary to the same angle (or to two congruent angles), then the two angles are congruent. |
| Congruent Complements Theorem | If two angles are complementary to the same angle (or to two congruent angles), then the two angles are congruent. |
| Linear Pair Theorem | If two angles form a linear pair, then they are supplementary. |
| Vertical Angles Theorem | Vertical angles are congruent. |
| Right Angle Congruence Theorem | All right angles are congruent. |
| Angle Addition Postulate | If the measures of two adjacent angles are added together, then the sum of their measures is equal to the measure of the larger angle they form. |
| Segment Addition Postulate | If two nonoverlapping segments on a line have a common endpoint, then the sum of their lengths is equal to the length of the length of the longer segment they form. |