

Writing Proofs

Proof: a form of logical reasoning in which each statement is organized and backed up by the reasons

Postulate: a statement that is accepted without proof

Theorem: a statement that is accepted after it is proved deductively

Ways of Writing Proofs

- 1. Flow-Chart Proof
- 2. Two-Column Proof
- 3. Paragraph Form Proof

Definitions:

- 1. Definition of Betweenness: If B is between \overline{AC} , then $\overline{AC} = AB + BC$.
- 2. Midpoint: If B is the midpoint of \overline{AC} , then $AB = BC$.
- 3. Segment Bisector: If a line, ray or another segment bisects the segment AB at X , then $AX \cong BX$.
- 4. Angle Bisector: If \overrightarrow{BD} bisects $\angle ABC$, then $\angle ABD \cong \angle DBC$.
- 5. Right Angle: If $\angle A$ is a right angle, then $m\angle A = 90^\circ$.
- 6. Perpendicular Line Segments: If $\overline{AB} \perp \overline{AC}$, then $\angle BAC$ is a right angle.
- 7. Complementary Angles: If $\angle A$ and $\angle B$ are complementary angles, then $m\angle A + m\angle B = 90^\circ$.
- 8. Supplementary Angles: If $\angle A$ and $\angle B$ are supplementary angles, then $m\angle A + m\angle B = 180^\circ$.
- 9. Linear Pair: If two angles are adjacent such that two of the rays are opposite, then they form a linear pair.
- 10. Definition of Congruent Segments: If $\overline{AB} \cong \overline{CD}$, then $AB = CD$.
- 11. Definition of Congruent Angles: If $\angle A \cong \angle B$, then $m\angle A = m\angle B$.

Properties:

- 1. Addition Property of Equality: If $a = b$, then $a + c = b + c$.
- 2. Subtraction Property of Equality: If $a = b$, then $a - c = b - c$.
- 3. Multiplication Property of Equality: If $a = b$, then $ac = bc$.
- 4. Division Property of Equality: If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$.
- 5. Reflexive Property of Equality: If a is any real number, then $a = a$.
- 6. Symmetric Property: If $a = b$, then $b = a$.
- 7. Transitive Property: If $a = b$ and $b = c$, then $a = c$.
- 8. Substitution Property: If $a + b = c$ and $b = x$, then $a + x = c$.

Postulates

- 1. Linear Pair Postulate: If two angles form a linear pair, then they are supplementary.
- 2. Segment Addition Postulate: If B lies on \overline{AC} , then $AC = AB + BC$.
- 3. Angle Addition Postulate: If B is in the interior of $\angle AOC$, then $m\angle AOC = m\angle AOB + m\angle BOC$.

Theorems

- 1. Vertical Angle Theorem: If two angles are vertical, then they are congruent.
- 2. Complementary Theorem: If two angles are complement of the same (or congruent) angles, then they are congruent.
- 3. Supplement Theorem: If two angles are supplement of the same (or congruent) angles, then they are congruent.

Practice Exercises

Provide a conclusion for each given hypothesis and give the reason.

- 1. If $\angle 1$ is a right angle, then ____.
Reason: ____
- 2. If $\angle A$ and $\angle B$ are supplementary, then ____.
Reason: ____
- 3. If X is the midpoint of \overline{AC} then ____.
Reason: ____
- 4. If $LO = VE$, then ____.
Reason: ____
- 5. If $2x = 10$ then ____.
Reason: ____
- 6. If $\angle M$ and $\angle N$ form a linear pair, then ____.
Reason: ____
- 7. If \overrightarrow{LM} bisects \overline{PG} at L , then ____.
Reason: ____
- 8. If $x + y = 12$ and $y = 9$, then ____.
Reason: ____
- 9. If $AB + BC = AC$ and $AC = 2AB$, then ____.
Reason: ____
- 10. If $\angle X$ and $\angle Y$ are vertical angles, then ____.
Reason: ____

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