

Geometry - Definitions, Postulates, Properties & Theorems

Chapter 1 & 2 – Basics of Geometry & Reasoning and Proof

Definitions

Congruent Segments (Same Size)

Congruent Angles (Same size)

Midpoint (bisects segment)

Bisector (gives two congruent halves)

- Angle Bisector
- Segment Bisector

Complementary Angles

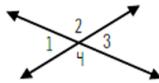
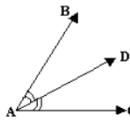
Supplementary Angles

Linear Pair

Right Angle

Vertical Angles (congruent)

Perpendicular Lines



Postulates

Segment Addition Postulate: If B is between A and C, then $AB + BC = AC$.

Angle Addition Postulate: If P is in the interior of $\angle RST$, then $m\angle RSP + m\angle PST = m\angle RST$.

Linear Pair Postulate: If two angles form a linear pair, then they are supplementary.

Properties of Numbers Let a , b , and c be real numbers.

Commutative Property of Addition: $a + b = b + a$

Commutative Property of Multiplication: $ab = ba$

Associative Property of Addition: $a + (b + c) = (a + b) + c$

Associative Property of Multiplication: $a(bc) = (ab)c$

Identity Property: Addition: $a + 0 = a$. Multiplication: $a(1) = a$

Zero Product Property of Mult.: $a(0) = 0$

Simplify: combining like terms on one side of an equation

Point, Line, and Plane Postulates

Two Point Postulate: Through any two points there exists exactly one line.

Line-Point Postulate: A line contains at least two points.

Line Intersection Postulate: If two lines intersect, then their intersection is exactly one point.

Three Point Postulate: Through any three noncollinear points there exists exactly one plane.

Plane-Point Postulate: A plane contains at least three noncollinear points.

Plane-Line Postulate: If two points lie in a plane, then the line containing them lies in the plane.

Plane Intersection Postulate: If two planes intersect, then their intersection is a line.

Algebraic Properties of Equality

Let a , b , and c be real numbers.

Addition Property: If $a = b$, then $a + c = b + c$

Subtraction Property: If $a = b$, then $a - c = b - c$

Multiplication Property: If $a = b$, then $ac = bc$

Division Property: If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$

Symmetric Property: If $a = b$, then $b = a$

Substitution Property: If $a = b$, then a can be substituted for b in any equation or expression.

Distributive Property: $a(b + c) = ab + ac$

Properties of Equality – Segment Length

Reflexive: For any segment AB , $AB = AB$.

Symmetric: If $AB = CD$, then $CD = AB$.

Transitive: If $AB = CD$ and $CD = EF$, then $AB = EF$.

Properties of Equality – Angle Measure

Reflexive: For any angle A , $m\angle A = m\angle A$.

Symmetric: If $m\angle A = m\angle B$, then $m\angle B = m\angle A$.

Transitive: If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$.

Theorems

Properties of Segment Congruence Theorem

Reflexive: For any segment \overline{AB} , $\overline{AB} \cong \overline{AB}$.

Symmetric: If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$.

Transitive: If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$.

Properties of Angle Congruence Theorem

Reflexive: For any angle A , $\angle A \cong \angle A$.

Symmetric: If $\angle A \cong \angle B$, then $\angle B \cong \angle A$.

Transitive: If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$.

Right Angles Congruence Theorem: All right angles are congruent.

Congruent Supplements Theorem: If two angles are supplementary to the same angle (or to congruent angles) then the two angles are congruent.

Congruent Complements Theorem: If two angles are complementary to the same angle (or to congruent angles) then the two angles are congruent.

Vertical Angles Theorem: Vertical angles are congruent.