Important Properties/Definitions

Definition of Congruence

1. If $AB = CD$, then $\overline{AB} \cong \overline{CD}$, and conversely, if $\overline{AB} \cong \overline{CD}$, then $AB = CD$.

2. If $\angle A \cong \angle B$, then $m\angle A = m\angle B$, and conversely, if $m\angle A = m\angle B$, then $\angle A \cong \angle B$.

Premises for Logical Augments in Geometry

1. Definitions and undefined terms
2. Properties of arithmetic, equality, and congruence
3. Postulates of geometry
4. Previously proved geometry conjectures (theorems)

Properties of Arithmetic

For any numbers a, b, and c:

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

$(ab)c = a(bc)$

Distributive property

$a(b + c) = ab + ac$

Properties of Equality

For any numbers a, b, c, and d:

Reflexive property

$a = a$ (Any number is equal to itself)

Transitive property

If $a = b$ and $b = c$, then $a = c$. (This property often takes the form of the **substitution property**, which says that if $b = c$, you can substitute c for b.)

Symmetric property

If $a = b$, then $b = a$.

Addition property

If $a = b$, then $a + c = b + c$.

(Also, if $a = b$ and $c = d$, then $a + c = b + d$.)

Subtraction Property

If $a = b$, then $a - c = b - c$.

(Also, if $a = b$ and $c = d$, then $a - c = b - d$.)

Multiplication property

If $a = b$, then $ac = bc$.

(Also, if $a = b$ and $c = d$, then $ac = bd$)

Division property

If $a = b$, then $\frac{a}{c} = \frac{b}{c}$ provided $c \neq 0$.

(Also, if $a = b$ and $c = d$, then $\frac{a}{c} = \frac{b}{d}$ provided that $c \neq 0$ and $d \neq 0$.)

Square root property

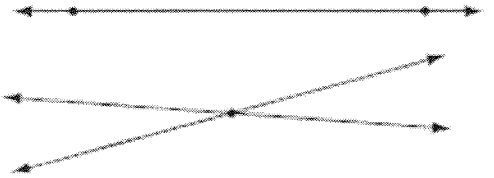
If $x^2 = a$, then $x = \pm\sqrt{a}$.

Zero product property

If $ab = 0$, then $a = 0$ or $b = 0$ or both a and $b = 0$.

Important Postulates

Line Postulate You can construct exactly one line through any two points. In other words, two points determine a line



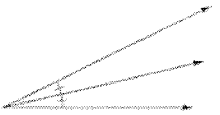
Line Intersection Postulate The intersection of two distinct lines is exactly one point

Segment Duplication Postulate You can construct a segment congruent to another segment

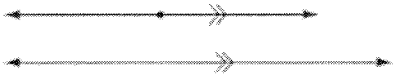
Angle Duplication Postulate You can construct an angle congruent to another angle

Midpoint Postulate You can construct exactly one midpoint on any line segment

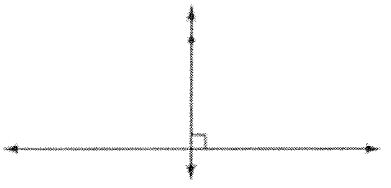
Angle Bisector Postulate You can construct exactly one angle bisector in any angle



Parallel Postulate Through a point not on a given line, you can construct exactly one line parallel to the given line



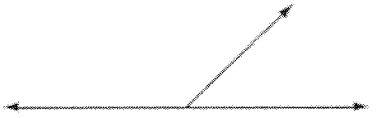
Perpendicular Postulate Through a point not on a given line, you can construct exactly one line perpendicular to the given line



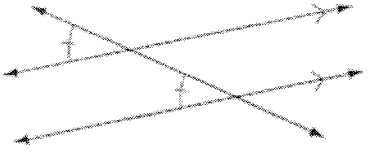
Segment Addition Postulate If point B is on $\overline{AC}$ and between points A and C, then
AB +BC = AC

Angle Addition Postulate If point D lies in the interior of $\angle ABC$, then $m\angle ABD + m\angle DBC = m\angle ABC$

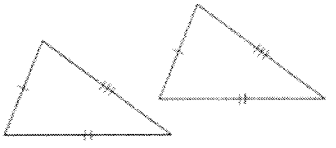
Linear Pair Postulate If two angles are a linear pair, then they are supplementary



Corresponding Angles Postulate (CA Postulate) If two parallel lines are cut by a transversal, then the corresponding angles are congruent. Conversely, if two coplanar lines are cut by a transversal forming congruent corresponding angles, then the lines are parallel



SSS Congruence Postulate If the three sides of one triangle are congruent to three sides of another triangle, then the two triangles are congruent



SAS Congruence Postulate If the two sides and the included angle in one triangle are congruent to two sides and the included angle in another triangle, then the two triangles are congruent

ASA Congruence Postulate If two angles and the included side in one triangle are congruent to two angles and the included side in another triangle, then the two triangles are congruent