Postulates and Theorems

Properties and Postulates

Reflexive Property	A quantity is congruent (equal) to itself. a = a
Symmetric Property	If a = b, then b = a.
Transitive Property	If a = b and b = c, then a = c.
Addition Postulate	If equal quantities are added to equal quantities, the sums are equal.
Subtraction Postulate	If equal quantities are subtracted from equal quantities, the differences are equal.
Multiplication Postulate	If equal quantities are multiplied by equal quantities, the products are equal.
Division Postulate	If equal quantities are divided by equal nonzero quantities, the quotients are equal.
Substitution Postulate	A quantity may be substituted for its equal in any expression.
Partition Postulate	The whole is equal to the sum of its parts.
Construction	Two points determine a straight line.
Construction	From a given point on (or not on) a line, one and only one perpendicular can be drawn to the line.
Segment Addition Postulate	Point B is a point on segment AC, i.e. B is between A and C, if and only if $AB + BC = AC$

Angles

Angle Addition Postulate	Point C lies in the interior of $\angle ABD$, if and only if, $m\angle ABC + m\angle CBD = m\angle ABD$
Right Angles	All right angles are congruent.
Straight Angles	All straight angles are congruent.
Congruent Supplements	Supplements of the same angle are congruent. Supplements of congruent angles are congruent.
Congruent Complements	Complements of the same angle are congruent. Complements of congruent angles are congruent.
Linear Pair	If two angles form a linear pair, they are supplementary.
Vertical Angles	Vertical angles are congruent.
Triangle Sum	The sum of the interior angles of a triangle is 180º.
Exterior Angle	The measure of an exterior angle of a triangle is equal to the sum of the measures of the two non-adjacent interior angles.
Base Angle Theorem (Isosceles Triangle)	If two sides of a triangle are congruent, the angles opposite these sides are congruent.
Base Angle Converse (Isosceles Triangle)	If two angles of a triangle are congruent, the sides opposite these angles are congruent.

Triangle

Side-Side-Side (SSS) Congruence	If three sides of one triangle are congruent to three sides of another triangle, then the triangles are congruent.
Side-Angle-Side (SAS) Congruence	If two sides and the included angle of one triangle are congruent to the corresponding parts of another triangle, the triangles are congruent.
Angle-Side-Angle (ASA) Congruence	If two angles and the included side of one triangle are congruent to the corresponding parts of another triangle, the triangles are congruent.
Angle-Angle-Side (AAS) Congruence	If two angles and the non-included side of one triangle are congruent to the corresponding parts of another triangle, the triangles are congruent.
Hypotenuse-Leg (HL) Congruence (right triangle)	If the hypotenuse and leg of one right triangle are congruent to the corresponding parts of another right triangle, the two right triangles are congruent.
CPCTC	Corresponding parts of congruent triangles are congruent.
Angle-Angle (AA) Similarity	If two angles of one triangle are congruent to two angles of another triangle, the triangles are similar.
SSS for Similarity	If the three sets of corresponding sides of two triangles are in proportion, the triangles are similar.
SAS for Similarity	If an angle of one triangle is congruent to the corresponding angle of another triangle and the lengths of the sides including these angles are in proportion, the triangles are similar.
Side Proportionality	If two triangles are similar, the corresponding sides are in proportion.
Mid-segment Theorem (also called mid-line)	The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long.
Sum of Two Sides	The sum of the lengths of any two sides of a triangle must be greater than the third side
Longest Side	In a triangle, the longest side is across from the largest angle. In a triangle, the largest angle is across from the longest side.
Altitude Rule	The altitude to the hypotenuse of a right triangle is the mean proportional between the segments into which it divides the hypotenuse.
Leg Rule	Each leg of a right triangle is the mean proportional between the hypotenuse and the projection of the leg on the hypotenuse.
Base Angle Theorem (Isosceles Triangle)	If two sides of a triangle are congruent, the angles opposite these sides are congruent.
Base Angle Converse (Isosceles Triangle)	If two angles of a triangle are congruent, the sides opposite these angles are congruent.

Parallels

Corresponding Angles	If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent
Corresponding Angles Converse	If two lines are cut by a transversal and the corresponding angles are congruent, the lines are parallel.
Alternate Interior Angles	If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.
Alternate Exterior Angles	If two lines are cut by a transversal and the alternate interior angles are congruent, the lines are parallel.
Interiors on Same Side	If two parallel lines are cut by a transversal, the interior angles on the same side of the transversal are supplementary
Alternate Interior Angles Converse	If two lines are cut by a transversal and the alternate interior angles are congruent, the lines are parallel.
Alternate Exterior Angles Converse	If two lines are cut by a transversal and the alternate exterior angles are congruent, the lines are parallel.
Interiors on Same Side Converse	If two lines are cut by a transversal and the interior angles on the same side of the transversal are supplementary, the lines are parallel.

Circles

Radius	In a circle, a radius perpendicular to a chord bisects the chord and the arc.
	In a circle, a radius that bisects a chord is perpendicular to the chord.
	If a line is tangent to a circle, it is perpendicular to the radius drawn to the point of tangency.
Chords	In a circle, or congruent circles, congruent chords are equidistant from the center. (and converse)
	In a circle, or congruent circles, congruent chords have congruent arcs. (and converse)
	In a circle, parallel chords intercept congruent arcs
	In the same circle, or congruent circles, congruent central angles have congruent chords (and converse)
Tangents	Tangent segments to a circle from the same external point are congruent
Arcs	In the same circle, or congruent circles, congruent central angles have congruent arcs. (and converse)
Angles	An angle inscribed in a semi-circle is a right angle.
	In a circle, inscribed circles that intercept the same arc are congruent.
	The opposite angles in a cyclic quadrilateral are supplementary.
	In a circle, or congruent circles, congruent central angles have congruent arcs.