Definitions, Postulates and Theorems

Name: ______________________________

Definitions		
Name	**Definition**	**Visual Clue**
Complementary Angles	Two angles whose measures have a sum of 90^{o}	
Supplementary Angles	Two angles whose measures have a sum of 180^{o}	
Theorem	A statement that can be proven	
Vertical Angles	Two angles formed by intersecting lines and facing in the opposite direction	
Transversal	A line that intersects two lines in the same plane at different points	
Corresponding angles	Pairs of angles formed by two lines and a transversal that make an F pattern	
Same-side interior angles	Pairs of angles formed by two lines and a transversal that make a C pattern	
Alternate interior angles	Pairs of angles formed by two lines and a transversal that make a Z pattern	
Congruent triangles	Triangles in which corresponding parts (sides and angles) are equal in measure	
Similar triangles	Triangles in which corresponding angles are equal in measure and corresponding sides are in proportion (ratios equal)	
Angle bisector	A ray that begins at the vertex of an angle and divides the angle into two angles of equal measure	
Segment bisector	A ray, line or segment that divides a segment into two parts of equal measure	
Legs of an isosceles triangle	The sides of equal measure in an isosceles triangle	
Base of an isosceles triangle	The third side of an isosceles triangle	
Equiangular	Having angles that are all equal in measure	
Perpendicular bisector	A line that bisects a segment and is perpendicular to it	
Altitude	A segment from a vertex of a triangle perpendicular to the line containing the opposite side	

Definitions, Postulates and Theorems

Definitions		
Name	**Definition**	**Visual Clue**
Geometric mean	The value of x in proportion a/x = x/b where a, b, and x are positive numbers (x is the geometric mean between a and b)	
Sine, sin	For an acute angle of a right triangle, the ratio of the side opposite the angle to the measure of the hypotenuse. (opp/hyp)	
Cosine, cos	For an acute angle of a right triangle the ratio of the side adjacent to the angle to the measure of the hypotenuse. (adj/hyp)	
Tangent, tan	For an acute angle of a right triangle, the ratio of the side opposite to the angle to the measure of the side adjacent (opp/adj)	

Algebra Postulates		
Name	**Definition**	**Visual Clue**
Addition Prop. Of equality	If the same number is added to equal numbers, then the sums are equal	
Subtraction Prop. Of equality	If the same number is subtracted from equal numbers, then the differences are equal	
Multiplication Prop. Of equality	If equal numbers are multiplied by the same number, then the products are equal	
Division Prop. Of equality	If equal numbers are divided by the same number, then the quotients are equal	
Reflexive Prop. Of equality	A number is equal to itself	
Symmetric Property of Equality	If a = b then b = a	
Substitution Prop. Of equality	If values are equal, then one value may be substituted for the other.	
Transitive Property of Equality	If a = b and b = c then a = c	
Distributive Property	a(b + c) = ab + ac	

Congruence Postulates		
Name	**Definition**	**Visual Clue**
Reflexive Property of Congruence	$A \cong A$	
Symmetric Property of Congruence	If $A \cong B, then \ B \cong A$	
Transitive Property of Congruence	If $A \cong B$ and $B \cong C$ then $A \cong C$	

Definitions, Postulates and Theorems

Angle Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Angle Addition postulate	For any angle, the measure of the whole is equal to the sum of the measures of its non-overlapping parts	
Linear Pair Theorem	If two angles form a linear pair, then they are supplementary.	
Congruent supplements theorem	If two angles are supplements of the same angle, then they are congruent.	
Congruent complements theorem	If two angles are complements of the same angle, then they are congruent.	
Right Angle Congruence Theorem	All right angles are congruent.	
Vertical Angles Theorem	Vertical angles are equal in measure	
Theorem	If two congruent angles are supplementary, then each is a right angle.	
Angle Bisector Theorem	If a point is on the bisector of an angle, then it is equidistant from the sides of the angle.	
Converse of the Angle Bisector Theorem	If a point in the interior of an angle is equidistant from the sides of the angle, then it is on the bisector of the angle.	

Lines Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Segment Addition postulate	For any segment, the measure of the whole is equal to the sum of the measures of its non-overlapping parts	
Postulate	Through any two points there is exactly one line	
Postulate	If two lines intersect, then they intersect at exactly one point.	
Common Segments Theorem	Given collinear points A,B,C and D arranged as shown, if $\overline{AB} \cong \overline{CD}$ then $\overline{AC} \cong \overline{BC}$	
Corresponding Angles Postulate	If two parallel lines are intersected by a transversal, then the corresponding angles are equal in measure	
Converse of Corresponding Angles Postulate	If two lines are intersected by a transversal and corresponding angles are equal in measure, then the lines are parallel	

Definitions, Postulates and Theorems

Lines Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Postulate	Through a point not on a given line, there is one and only one line parallel to the given line	
Alternate Interior Angles Theorem	If two parallel lines are intersected by a transversal, then alternate interior angles are equal in measure	
Alternate Exterior Angles Theorem	If two parallel lines are intersected by a transversal, then alternate exterior angles are equal in measure	
Same-side Interior Angles Theorem	If two parallel lines are intersected by a transversal, then same-side interior angles are supplementary.	
Converse of Alternate Interior Angles Theorem	If two lines are intersected by a transversal and alternate interior angles are equal in measure, then the lines are parallel	
Converse of Alternate Exterior Angles Theorem	If two lines are intersected by a transversal and alternate exterior angles are equal in measure, then the lines are parallel	
Converse of Same-side Interior Angles Theorem	If two lines are intersected by a transversal and same-side interior angles are supplementary, then the lines are parallel	
Theorem	If two intersecting lines form a linear pair of congruent angles, then the lines are perpendicular	
Theorem	If two lines are perpendicular to the same transversal, then they are parallel	
Perpendicular Transversal Theorem	If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other one.	
Perpendicular Bisector Theorem	If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment	
Converse of the Perpendicular Bisector Theorem	If a point is the same distance from both the endpoints of a segment, then it lies on the perpendicular bisector of the segment	
Parallel Lines Theorem	In a coordinate plane, two nonvertical lines are parallel IFF they have the same slope.	
Perpendicular Lines Theorem	In a coordinate plane, two nonvertical lines are perpendicular IFF the product of their slopes is -1.	
Two-Transversals Proportionality Corollary	If three or more parallel lines intersect two transversals, then they divide the transversals proportionally.	

Definitions, Postulates and Theorems

Triangle Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Angle-Angle (AA) Similarity Postulate	If two angles of one triangle are equal in measure to two angles of another triangle, then the two triangles are similar	
Side-side-side (SSS) Similarity Theorem	If the three sides of one triangle are proportional to the three corresponding sides of another triangle, then the triangles are similar.	
Side-angle-side SAS) Similarity Theorem	If two sides of one triangle are proportional to two sides of another triangle and their included angles are congruent, then the triangles are similar.	
Third Angles Theorem	If two angles of one triangle are congruent to two angles of another triangle, then the third pair of angles are congruent	
Side-Angle-Side Congruence Postulate SAS	If two sides and the included angle of one triangle are equal in measure to the corresponding sides and angle of another triangle, then the triangles are congruent.	
Side-side-side Congruence Postulate SSS	If three sides of one triangle are equal in measure to the corresponding sides of another triangle, then the triangles are congruent	
Angle-side-angle Congruence Postulate ASA	If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then the triangles are congruent.	
Triangle Sum Theorem	The sum of the measure of the angles of a triangle is 180^o	
Corollary	The acute angles of a right triangle are complementary.	
Exterior angle theorem	An exterior angle of a triangle is equal in measure to the sum of the measures of its two remote interior angles.	
Triangle Proportionality Theorem	If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides proportionally.	
Converse of Triangle Proportionality Theorem	If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	

Definitions, Postulates and Theorems

Triangle Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Triangle Angle Bisector Theorem	An angle bisector of a triangle divides the opposite sides into two segments whose lengths are proportional to the lengths of the other two sides.	
Angle-angle-side Congruence Theorem AAS	If two angles and a non-included side of one triangle are equal in measure to the corresponding angles and side of another triangle, then the triangles are congruent.	
Hypotenuse-Leg Congruence Theorem HL	If the hypotenuse and a leg of a right triangle are congruent to the hypotenuse and a leg of another right triangle, then the triangles are congruent.	
Isosceles triangle theorem	If two sides of a triangle are equal in measure, then the angles opposite those sides are equal in measure	
Converse of Isosceles triangle theorem	If two angles of a triangle are equal in measure, then the sides opposite those angles are equal in measure	
Corollary	If a triangle is equilateral, then it is equiangular	
Corollary	The measure of each angle of an equiangular triangle is 60°	
Corollary	If a triangle is equiangular, then it is also equilateral	
Theorem	If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.	
Pythagorean theorem	In any right triangle, the square of the length of the hypotenuse is equal to the sum of the square of the lengths of the legs.	
Geometric Means Corollary a	The length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the two segments of the hypotenuse.	
Geometric Means Corollary b	The length of a leg of a right triangle is the geometric mean of the lengths of the hypotenuse and the segment of the hypotenuse adjacent to that leg.	
Circumcenter Theorem	The circumcenter of a triangle is equidistant from the vertices of the triangle.	
Incenter Theorem	The incenter of a triangle is equidistant from the sides of the triangle.	

Definitions, Postulates and Theorems

Triangle Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Centriod Theorem	The centriod of a triangle is located 2/3 of the distance from each vertex to the midpoint of the opposite side.	
Triangle Midsegment Theorem	A midsegment of a triangle is parallel to a side of triangle, and its length is half the length of that side.	
Theorem	If two sides of a triangle are not congruent, then the larger angle is opposite the longer side.	
Theorem	If two angles of a triangle are not congruent, then the longer side is opposite the larger angle.	
Triangle Inequality Theorem	The sum of any two side lengths of a triangle is greater than the third side length.	
Hinge Theorem	If two sides of one triangle are congruent to two sides of another triangle and the third sides are not congruent, then the longer third side is across from the larger included angle.	
Converse of Hinge Theorem	If two sides of one triangle are congruent to two sides of another triangle and the third sides are not congruent, then the larger included angle is across from the longer third side.	
Converse of the Pythagorean Theorem	If the sum of the squares of the lengths of two sides of a triangle is equal to the square of the length of the third side, then the triangle is a right triangle.	
Pythagorean Inequalities Theorem	In ΔABC, c is the length of the longest side. If $c^2 > a^2 + b^2$, then ΔABC is an obtuse triangle. If $c^2 < a^2 + b^2$, then ΔABC is acute.	
45˚-45˚-90˚ Triangle Theorem	In a 45˚-45˚-90˚ triangle, both legs are congruent, and the length of the hypotenuse is the length of a length times the square root of 2.	
30˚-60˚-90˚ Triangle Theorem	In a 30˚-60˚-90˚ triangle, the length of the hypotenuse is 2 times the length of the shorter leg, and the length of the longer leg is the length of the shorter leg times the square root of 3.	
Law of Sines	For any triangle ABC with side lengths a, b, and c, $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$	
Law of Cosines	For any triangle, ABC with sides a, b, and c, $a^2 = b^2 + c^2 - 2bc\cos A, b^2 = a^2 + c^2 - 2ac\cos B,$ $c^2 = a^2 + b^2 - 2ac\cos C$	

Definitions, Postulates and Theorems

Plane Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Postulate	Through any three noncollinear points there is exactly one plane containing them.	
Postulate	If two points lie in a plane, then the line containing those points lies in the plane	
Postulate	If two points lie in a plane, then the line containing those points lies in the plane	

Polygon Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Polygon Angle Sum Theorem	The sum of the interior angle measures of a convex polygon with *n* sides.	
Polygon Exterior Angle Sum Theorem	The sum of the exterior angle measures, one angle at each vertex, of a convex polygon is 360˚.	
Theorem	If a quadrilateral is a parallelogram, then its opposite sides are congruent.	
Theorem	If a quadrilateral is a parallelogram, then its opposite angles are congruent.	
Theorem	If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.	
Theorem	If a quadrilateral is a parallelogram, then its diagonals bisect each other.	
Theorem	If one pair of opposite sides of a quadrilateral are parallel and congruent, then the quadrilateral is a parallelogram.	
Theorem	If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.	
Theorem	If both pairs of opposite angles are congruent, then the quadrilateral is a parallelogram.	
Theorem	If an angle of a quadrilateral is supplementary to both of its consecutive angles, then the quadrilateral is a parallelogram.	
Theorem	If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.	
Theorem	If a quadrilateral is a rectangle, then it is a parallelogram.	
Theorem	If a parallelogram is a rectangle, then its diagonals are congruent.	
Theorem	If a quadrilateral is a rhombus, then it is a parallelogram.	

Polygon Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Theorem	If a parallelogram is a rhombus then its diagonals are perpendicular.	
Theorem	If a parallelogram is a rhombus, then each diagonal bisects a pair of opposite angles.	
Theorem	If one angle of a parallelogram is a right angle, then the parallelogram is a rectangle.	
Theorem	If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.	
Theorem	If one pair of consecutive sides of a parallelogram are congruent, then the parallelogram is a rhombus.	
Theorem	If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus.	
Theorem	If one diagonal of a parallelogram bisects a pair of opposite angles, then the parallelogram is a rhombus.	
Theorem	If a quadrilateral is a kite then its diagonals are perpendicular.	
Theorem	If a quadrilateral is a kite then exactly one pair of opposite angles are congruent.	
Theorem	If a quadrilateral is an isosceles trapezoid, then each pair of base angles are congruent.	
Theorem	If a trapezoid has one pair of congruent base angles, then the trapezoid is isosceles.	
Theorem	A trapezoid is isosceles if and only if its diagonals are congruent.	
Trapezoid Midsegment Theorem	The midsegment of a trapezoid is parallel to each base, and its length is one half the sum of the lengths of the bases.	

Definitions, Postulates and Theorems

Polygon Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Proportional Perimeters and Areas Theorem	If the similarity ratio of two similar figures is $\frac{a}{b}$, then the ratio of their perimeter is $\frac{a}{b}$ and the ratio of their areas is $\frac{a^2}{b^2}$ or $\left(\frac{a}{b}\right)^2$	
Area Addition Postulate	The area of a region is equal to the sum of the areas of its nonoverlapping parts.	

Circle Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Theorem	If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.	
Theorem	If a line is perpendicular to a radius of a circle at a point on the circle, then the line is tangent to the circle.	
Theorem	If two segments are tangent to a circle from the same external point then the segments are congruent.	
Arc Addition Postulate	The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.	
Theorem	In a circle or congruent circles: congruent central angles have congruent chords, congruent chords have congruent arcs and congruent acrs have congruent central angles.	
Theorem	In a circle, if a radius (or diameter) is perpendicular to a chord, then it bisects the chord and its arc.	
Theorem	In a circle, the perpendicular bisector of a chord is a radius (or diameter).	
Inscribed Angle Theorem	The measure of an inscribed angle is half the measure of its intercepted arc.	
Corollary	If inscribed angles of a circle intercept the same arc or are subtended by the same chord or arc, then the angles are congruent	
Theorem	An inscribed angle subtends a semicircle IFF the angle is a right angle	
Theorem	If a quadrilateral is inscribed in a circle, then its opposite angles are supplementary.	

Definitions, Postulates and Theorems

Circle Postulates And Theorems		
Name	**Definition**	**Visual Clue**
Theorem	If a tangent and a secant (or chord) intersect on a circle at the point of tangency, then the measure of the angle formed is half the measure of its intercepted arc.	
Theorem	If two secants or chords intersect in the interior of a circle, then the measure of each angle formed is half the sum of the measures of the intercepted arcs.	
Theorem	If a tangent and a secant, two tangents or two secants intersect in the exterior of a circle, then the measure of the angle formed is half the difference of the measure of its intercepted arc.	
Chord-Chord Product Theorem	If two chords intersect in the interior of a circle, then the products of the lengths of the segments of the chords are equal.	
Secant-Secant Product Theorem	If two secants intersect in the exterior of a circle, then the product of the lengths of one secant segment and its external segment equals the product of the lengths of the other secant segment and its external segment.	
Secant-Tangent Product Theorem	If a secant and a tangent intersect in the exterior of a circle, then the product of the lengths of the secant segment and its external segment equals the length of the tangent segment squared.	
Equation of a Circle	The equal of a circle with center (h, k) and radius r is $(x – h)^2 + (y - k)^2 = r^2$	

Other		
Name	**Definition**	**Visual Clue**