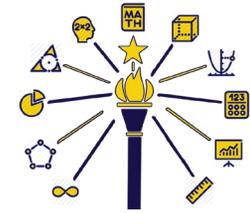




Indiana Academic Standards for Mathematics – Geometry Standards Resource Guide Document



This Teacher Resource Guide, revised in July 2018, provides supporting materials to help educators successfully implement the Indiana Academic Standards for Geometry. This resource guide is provided to help ensure all students meet the rigorous learning expectations set by the academic standards. Use of this guide and the resources on the web page is optional – teachers should decide which resources will work best for their students. However, all guidance contained in this document and on the website has been chosen to best support effective teaching practices and promote the Mathematics Process Standards.

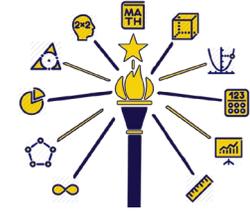
With an increased emphasis on content area literacy, academic vocabulary has been noted. Best practices should be utilized when teaching students academic vocabulary. Please see the Literacy Framework and the Science and Technical Subjects Content Area Literacy Standards for examples of best practices.

Examples have been removed from the document as they tend to limit interpretation and classroom application. Rather, success criteria, in the form of “I can” statements, have been included. According to Hattie (2017), success criteria is specific, concrete and measurable, describing what success looks like when a learning goal is reached. Additionally, success criteria contributes to teacher clarity, which has a 0.75 effect size! An effect size of 0.40 reportedly indicates one year of growth. Utilizing success criteria in the classroom allows students to monitor their own learning and increases motivation (Hattie, p. 57). **It is important to note that the success criteria provided here are not intended to be limiting. Teachers may have additional success criteria for their students.**

Guidance around vertical articulation has been provided in the last two columns. Knowing what was expected of students at previous grade levels will help teachers connect new learning to prior knowledge. Additionally, understanding what a student will be expected to learn in the future provides the teacher a context for the current learning. This information is not exhaustive; rather it is provided to give teachers a quick understanding of how the work builds from previous grade levels into subsequent courses. The Indiana Department of Education (IDOE) math team recommends teachers further study this vertical articulation to situate their course objectives in the broader math context.

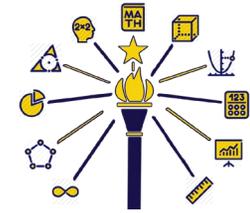
If you have any questions, please do not hesitate to reach out to the IDOE math team. Contact information for the Elementary and Secondary Math Specialists can be found on the website: <https://www.doe.in.gov/standards/mathematics>. If you have suggested resources for the website, please share those as well.

Hattie, J., Fisher, D., Frey, N., Gojak, L. M., Moore, S. D., & Mellman, W. (2017). *Visible learning for mathematics: What works best to optimize student learning, grades K-12*. Thousand Oaks, CA: Corwin Mathematics.



Logic and Proofs

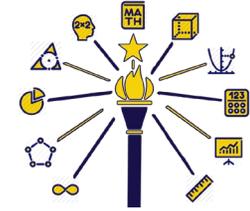
Logic and Proofs					
Geometry Mathematics Standards		Success Criteria	Academic Vocabulary	Looking Back	Looking Ahead
MA.G.LP.1:	Understand and describe the structure of and relationships within an axiomatic system (undefined terms, definitions, axioms and postulates, methods of reasoning, and theorems). Understand the differences among supporting evidence, counterexamples, and actual proofs.	<p>I can describe the structure of an axiomatic system and the relationships within.</p> <p>I can understand the difference among supporting evidence, counterexamples, and actual proofs.</p> <p>I can identify and name defined terms and undefined terms.</p> <p>I can apply definitions, postulates, and theorems to justify and support conclusions.</p>	<p>Axiomatic system</p> <p>Undefined terms</p> <p>Axiom</p> <p>Postulate</p> <p>Theorem</p> <p>Counterexample</p>		
MA.G.LP.2:	Know precise definitions for angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, and plane. Use standard geometric notation.	<p>I can define any geometric term using words, diagrams, and notation.</p> <p>I can explain what the undefined terms are and why they are undefined.</p>	<p>Angle</p> <p>Circle</p> <p>Perpendicular Line</p> <p>Parallel Line</p> <p>Line Segment</p>	Students come to geometry with a variety of informal definitions. When introducing new, more formal, definitions we should help students make connections to them by bridging their past	Students will continue to define geometric concepts throughout the entire course. These formal definitions will help in many places such as proof where students need to connect concepts



		I can state the meaning of symbols and use them consistently and appropriately.	Point Line Plane	knowledge to the current relationships.	and express them in a clear way.
MA.G.LP.3:	State, use, and examine the validity of the converse, inverse, and contrapositive of conditional (“if – then”) and bi-conditional (“if and only if”) statements.	I can understand and use the converse, inverse, and contrapositive of conditional and bi-conditional statements. I can make conjectures and justify. I can determine the truth value of statements.	Converse Inverse Contrapositive Conditional Statement Bi-conditional Statement		
MA.G.LP.4:	Develop geometric proofs, including direct proofs, indirect proofs, proofs by contradiction and proofs involving coordinate geometry, using two-column, paragraphs, and flow charts formats.	I can develop geometric proofs using direct and indirect proofs. I can develop geometric proofs using contradiction. I can use coordinate proofs to develop geometric arguments. I can connect and write two-column proofs, paragraph proofs, and flow proofs.	Geometric Proof Direct Proof Indirect Proof Proof by Contradiction Coordinate Proof Two-column Proof	Use inductive reasoning to explain the Pythagorean Theorem. (MA.8.GM.7)	Prove the Laws of Sines and Cosines and use them to solve problems. (MA.TR.G.4) Prove the Pythagorean Identity. (MA.TR.ID.1)

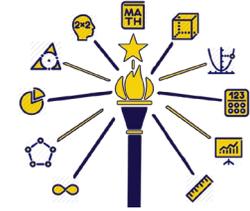


Indiana Academic Standards for Mathematics – Geometry
Standards Resource Guide Document

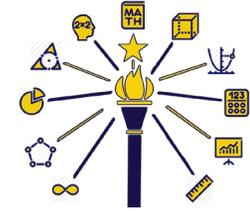


			Paragraph Proof		
			Flow Chart Proof		

Points, Lines, Angles, and Planes					
Geometry Mathematics Standards		Success Criteria	Academic Vocabulary	Looking Back	Looking Ahead
MA.G.PL.1:	Identify, justify, and apply properties of planes.	<p>I can identify and apply the properties of planes.</p> <p>I can justify the properties of planes.</p>	Properties of Planes		
MA.G.PL.2:	Describe the intersection of two or more geometric figures in the same plane.	I can describe the intersection of two or more geometric figures in the same plane.	<p>Geometric Figure</p> <p>Plane</p>		
MA.G.PL.3:	Prove and apply theorems about lines and angles, including the following: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent, alternate exterior angles are congruent, and corresponding angles are congruent; when a	<p>I can prove and apply that vertical angles are congruent.</p> <p>I can prove and apply the angle relationships formed when two parallel lines are cut by a transversal.</p> <p>I can prove and that all points on a perpendicular bisector of a segment are equidistant from the segment endpoints.</p>	<p>Vertical Angle Congruence Theorem</p> <p>Alternate Interior Angles Theorem</p> <p>Alternate Exterior Angles Theorem</p> <p>Corresponding Angles Postulate</p> <p>Same Side Interior Angles Theorem</p>	Solve real-world and other mathematical problems that involve vertical, adjacent, complementary, and supplementary angles. (MA.7.GM.4)	



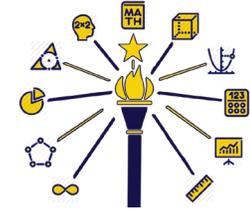
	transversal crosses parallel lines, same side interior angles are supplementary; and points on a perpendicular bisector of a line segment are exactly those equidistant from the endpoints of the segment.	I can discuss the relationships between pairs of angles.	Perpendicular Bisector Theorem		
MA.G.PL.4:	Know that parallel lines have the same slope and perpendicular lines have opposite reciprocal slopes. Determine if a pair of lines are parallel, perpendicular, or neither by comparing the slopes in coordinate graphs and in equations. Find the equation of a line, passing through a given point that is parallel or perpendicular to a given line.	<p>I can graph parallel lines and discover that their slopes are the same.</p> <p>I can graph perpendicular lines and discover their slopes are opposite reciprocals.</p> <p>I can justify why perpendicular lines may have the same y-intercept while parallel lines may not.</p> <p>I can determine whether two lines are parallel, perpendicular, or neither given the equations in any form.</p> <p>I can translate between the various forms of linear equations fluently.</p>	<p>Slope</p> <p>Parallel lines</p> <p>Perpendicular lines</p> <p>Opposite</p> <p>Reciprocal</p> <p>Slope-Intercept Form</p> <p>Point-Slope Form</p>	<p>Represent linear functions give a point on the line and the slope of the line. (MA.A1.L.4)</p> <p>Translate among equivalent forms of equations for linear functions, including slope-intercept, point-slope, and standard. (MA.A1.L.5)</p>	



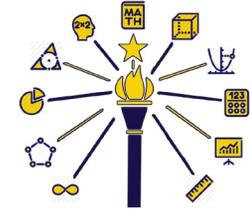
		I can write the equation of the line passing through a given point that is parallel or perpendicular to a given line.			
MA.G.PL.5:	Explain and justify the process used to construct, with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.), congruent segments and angles, angle bisectors, perpendicular bisectors, altitudes, medians, and parallel and perpendicular lines.	<p>I can construct segments and angles, angle bisectors, perpendicular bisectors, parallel lines, and perpendicular lines.</p> <p>I can select the appropriate tool and method to perform a construction.</p> <p>I can explain the construction process.</p> <p>I can justify my steps taken in constructions.</p> <p>I can use technological tools to deepen my understanding.</p>	<p>Congruent Segments</p> <p>Congruent Angles</p> <p>Angle Bisectors</p> <p>Perpendicular Bisector</p> <p>Altitude</p> <p>Median</p> <p>Parallel Lines</p> <p>Perpendicular Lines</p>		

Triangles

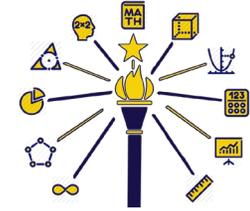
Geometry Mathematics Standards	Success Criteria	Academic Vocabulary	Looking Back	Looking Ahead
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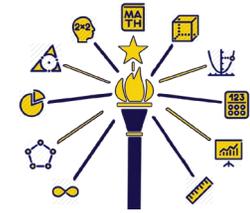
<p>MA.G.T.1:</p>	<p>Prove and apply theorems about triangles, including the following: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point; a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem, using triangle similarity; and the isosceles triangle theorem and its converse.</p>	<p>I can prove and apply theorems about triangles.</p> <p>I can prove and apply that the sum of the interior angles of a triangle is 180°.</p> <p>I can prove and apply that the base angles of an isosceles triangle are congruent.</p> <p>I can prove and apply the midsegment (midline) of a triangle theorem.</p> <p>I can prove that the medians of a triangle meet at a single point, a point of concurrency.</p> <p>I can prove and apply the exterior angle theorem.</p> <p>I can prove that a line parallel to one side of a triangle divides the other two proportionally.</p>	<p>Triangle Sum Theorem</p> <p>Base Angles Theorem</p> <p>Midsegment Theorem</p> <p>Medians of a Triangle</p> <p>Point of concurrency</p> <p>Centroid</p> <p>Triangle Proportionality Theorem</p> <p>Pythagorean Theorem</p> <p>Third Angles Theorem</p> <p>Exterior Angle Theorem</p> <p>Isosceles Triangle Theorem</p>	<p>Know that the sum of the interior angles of any triangle is 180°. (MA.6.GM.2)</p>	
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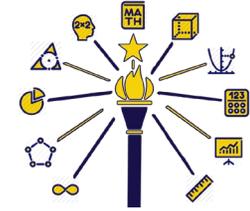
		I can prove the Pythagorean Theorem using similarity.			
MA.G.T.2:	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	<p>I can identify corresponding angles and sides based on congruence statements.</p> <p>I can write congruence statements for two congruent triangles.</p> <p>I can determine if two triangles are congruent based on their corresponding parts.</p> <p>I can explain and apply the criteria of SSS, SAS, and ASA to prove triangle congruence.</p> <p>I can show cases in which AA and SSA do and do not prove triangle congruency.</p> <p>I can explain the connection between the criteria for triangle</p>	<p>Angle-Side-Angle Triangle Congruence</p> <p>Side-Angle-Side Triangle Congruence</p> <p>Side-Side-Side Triangle Congruence</p> <p>Rigid Motion</p>	Understand that a two-dimensional figure is congruent to another if the second can be obtained from a sequence of rotations, reflections, and translations. (MA.8.GM.4)	



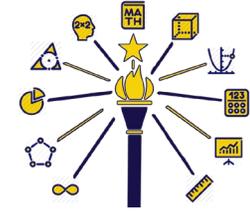
		congruence and rigid motions.			
MA.G.T.3:	Explain and justify the process used to construct congruent triangles with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).	<p>I can construct congruent triangles with a variety of geometric tools.</p> <p>I can explain the process of my construction.</p>	Congruent Triangles	Draw triangles (freehand, with ruler and protractor, and using technology) with given conditions. (MA.7.GM.1)	
MA.G.T.4:	Given two triangles, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides, and to establish the AA criterion for two triangles to be similar.	<p>I can identify corresponding angles and sides based on similarity statements.</p> <p>I can develop and write similarity statements for two triangles.</p> <p>I can determine if two triangles are similar based on their corresponding parts.</p> <p>I can establish a sequence of similarity transformations between two similar triangles.</p>	<p>Similarity</p> <p>Similarity Transformation</p> <p>Proportionality</p> <p>Angle-Angle Triangle Similarity</p> <p>Corresponding Parts</p>	Identify and describe similarity relationships of polygons including the angle-angle criterion for similar triangles. (MA.7.GM.2)	



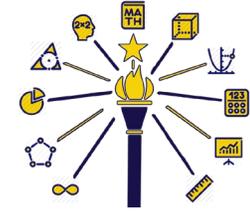
		<p>I can prove two triangles to be similar using the minimum requirements of AA.</p> <p>I can use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.</p>			
MA.G.T.5:	Use properties of congruent and similar triangles to solve real-world and mathematical problems involving sides, perimeters, and areas of triangles.	<p>I can solve real-world problems using the properties of congruent triangles, including perimeter, area, and missing lengths.</p> <p>I can solve real-world problems involving similar triangles, including perimeter, area, and missing lengths.</p> <p>I can solve problems using CPCTC (corresponding part of congruent triangles are congruent).</p>	<p>Congruent Triangles</p> <p>Similar Triangles</p> <p>Perimeter</p> <p>Area of a Triangle</p> <p>CPCTC</p>		



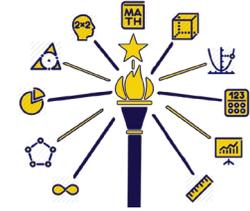
<p>MA.G.T.6:</p>	<p>Prove and apply the inequality theorems, including the following: triangle inequality, inequality in one triangle, and the hinge theorem and its converse.</p>	<p>I can prove and apply triangle inequality theorems.</p> <p>I can prove and apply inequality in one triangle.</p> <p>I can prove and apply the Hinge Theorem and its converse.</p>	<p>Triangle Inequality Theorem</p> <p>Inequality in One Triangle Theorem</p> <p>Hinge Theorem</p>	<p>Draw triangles with given conditions from three measures of angles or sides, and notice when the conditions determine a unique triangle, more than one triangle, or no triangle. (MA.7.GM.1)</p>	
<p>MA.G.T.7:</p>	<p>State and apply the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle. Understand and use the geometric mean to solve for missing parts of triangles.</p>	<p>I can identify the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle.</p> <p>I can find the geometric mean between two numbers.</p> <p>I can solve problems involving relationships between parts of a right triangle and the altitude is its hypotenuse.</p> <p>I can use the geometric mean to solve for sides of triangles.</p>	<p>Altitude</p> <p>Hypotenuse</p> <p>Right Triangle</p> <p>Geometric Mean</p>		



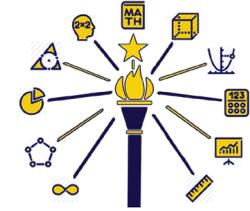
<p>MA.G.T.8:</p>	<p>Develop the distance formula using the Pythagorean Theorem. Find the lengths and midpoints of line segments in one- or two-dimensional coordinate systems. Find measures of the sides of polygons in the coordinate plane; apply this technique to compute the perimeters and areas of polygons in real-world and mathematical problems.</p>	<p>I can solve real-world problems involving perimeter and area using the Pythagorean Theorem.</p> <p>I can develop the distance formula from what I know about the Pythagorean Theorem.</p> <p>I can find the midpoint of a segment on the coordinate plane.</p> <p>I can find the measures of sides of a polygon on the coordinate plane.</p> <p>I can use the distance formula to find the measures of the sides of polygons in the coordinate plane in order to compute the perimeter and/or area of polygons in real-world problems</p>	<p>Distance Formula</p> <p>Pythagorean Theorem</p> <p>Midpoint</p> <p>Perimeter</p> <p>Polygon</p> <p>Area of Polygons</p>	<p>Apply the Pythagorean Theorem to determine unknown side lengths in right triangles. (MA.8.GM.8)</p> <p>Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane. (MA.8.GM.9)</p>	<p>Calculate the distance between numbers in the complex plane; find the midpoint of a segment in the complex plane. (MA.PC.PCN.1)</p>
<p>MA.G.T.9:</p>	<p>Understand that by similarity, side ratios in right triangles are</p>	<p>I can label a triangle in relation to the reference</p>	<p>Similarity</p> <p>Trigonometric Ratios</p>		



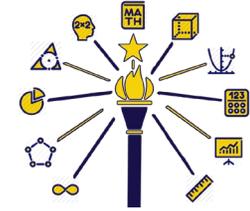
	<p>properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.</p>	<p>angle (opposite, adjacent, hypotenuse).</p> <p>I can define six ratios of corresponding sides of similar right triangles with respect to a specific reference angle.</p> <p>I can collect data to identify patterns when forming ratios that lead to the definition of the Trigonometric ratios.</p>	<p>Reference angle</p>		
MA.G.T.10:	<p>Use trigonometric ratios (sine, cosine and tangent) and the Pythagorean Theorem to solve real-world and mathematical problems involving right triangles.</p>	<p>I can determine the most appropriate trigonometric ratio (sine, cosine, tangent) to use for a given problem based on the information provided.</p> <p>I can solve for sides and angles of right triangles using trigonometry.</p> <p>I can interpret verbal descriptions into lengths and angles of a right triangle to diagram a relationship.</p>	<p>Trigonometric Ratios</p> <p>Reference angle</p> <p>Sine</p> <p>Cosine</p> <p>Tangent</p> <p>Pythagorean Theorem</p>	<p>Apply the Pythagorean Theorem to determine unknown side lengths in right triangles. (MA.8.GM.8)</p>	<p>Solve real-world problems that can be modeled with right triangles using trigonometric ratios. (MA.TR.G.1)</p>



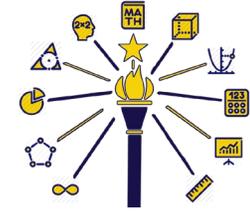
		I can identify whether the Pythagorean Theorem or trigonometry is necessary to solve a problem involving missing lengths of right triangles.			
MA.G.T.11:	Use special right triangles ($30^\circ - 60^\circ$ and $45^\circ - 45^\circ$) to solve real-world and mathematical problems.	<p>I can use the Pythagorean Theorem to explore lengths of the sides in special right triangles in order to identify a pattern.</p> <p>I can identify a special right triangle and label the appropriate relationship on each side.</p> <p>I can use exact values when solving for sides and angles in special right triangles.</p> <p>I can use special right triangles to solve real-world problems.</p>	<p>Special Right Triangles</p> <p>30-60-90 triangle</p> <p>45-45-90 triangle</p>	Simplify square roots of non-perfect square integers and algebraic monomials. (MA.AI.RNE.4)	Use special triangles to determine the values of sine, cosine, and tangent; apply special right triangles to the unit circle. (MA.TR.G.3)



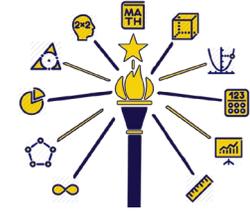
Quadrilaterals and Other Polygons					
Geometry Mathematics Standards		Success Criteria	Academic Vocabulary	Looking Back	Looking Ahead
MA.G.QP.1:	Prove and apply theorems about parallelograms, including the following: opposite sides are congruent; opposite angles are congruent; the diagonals of a parallelogram bisect each other; and rectangles are parallelograms with congruent diagonals.	<p>I can prove properties of parallelograms then apply them.</p> <p>I can prove that opposite sides are congruent in parallelograms and apply my understanding.</p> <p>I can prove that opposite angles are congruent in parallelograms and apply my understanding.</p> <p>I can prove that the diagonals of a parallelogram bisect each other and apply my understanding.</p> <p>I can prove rectangles are parallelograms with congruent diagonals.</p>	<p>Parallelogram</p> <p>Theorems About Parallelograms</p> <p>Diagonal</p> <p>Bisect</p>		
MA.G.QP.2:	Prove that given quadrilaterals are parallelograms, rhombuses, rectangles, squares or trapezoids.	I can prove properties of rectangles then apply them.	<p>Quadrilaterals</p> <p>Parallelogram</p> <p>Rhombus</p>	Identify and describe parallelograms, rhombuses, and trapezoids. (MA.4.G.1)	



	<p>Include coordinate proofs of quadrilaterals in the coordinate plane.</p>	<p>I can prove the properties of rhombi then apply them.</p> <p>I can prove the properties of squares then apply them.</p> <p>I can classify a quadrilateral by its properties.</p> <p>I can classify a quadrilateral through the use of coordinate analysis.</p>	<p>Rectangle</p> <p>Square</p> <p>Trapezoid</p> <p>Coordinate Proof</p>	<p>Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points. (MA.6.GM.3)</p>	
MA.G.QP.3:	<p>Find measures of interior and exterior angles of polygons. Explain and justify the method used.</p>	<p>I can conclude that the measures of the exterior angles of any polygon sum to 360° through exploration.</p> <p>I can find the measure of a single exterior angle of a regular polygon.</p> <p>I can find patterns and develop the formula for the sum of the measures</p>	<p>Interior Angle</p> <p>Exterior Angle</p> <p>Polygon</p> <p>Regular polygon</p>	<p>Know that the sum of the interior angles of any triangle is 180° and that the sum of the interior angles of any quadrilateral is 360°. (MA.6.GM.2)</p>	

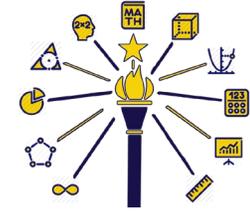


		<p>of the interior angles of a polygon.</p> <p>I can find the measure of a single angle in a regular polygon given the sum of the interior angles.</p>			
MA.G.QP.4:	Identify types of symmetry of polygons, including line, point, rotational, and self-congruencies.	<p>I can identify line, point, and/or rotational symmetry in a variety of polygons.</p> <p>I can identify self-congruencies in polygons.</p>	<p>Symmetry</p> <p>Line Symmetry</p> <p>Point Symmetry</p> <p>Rotational Symmetry</p> <p>Self-Congruency</p>	Identify figures that have line symmetry. (MA.4.G.2)	
MA.G.QP.5:	Deduce formulas relating lengths and sides, perimeters, and areas of regular polygons. Understand how limiting cases of such formulas lead to expressions for the circumference and the area of a circle.	<p>I can show how the formula for the area of a regular polygon is the sum of the areas of the triangles that make it up.</p> <p>I can relate the sides of polygons to perimeter and area of polygons.</p> <p>I can limit cases of such formulas to expressions for the circumference and the area of a circle.</p>	<p>Perimeter</p> <p>Area</p> <p>Circumference</p>		

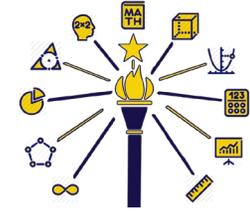


Circles

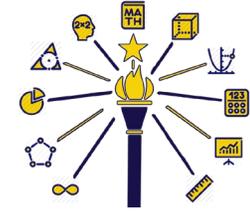
Circles					
Geometry Mathematics Standards		Success Criteria	Academic Vocabulary	Looking Back	Looking Ahead
MA.G.CI.1:	Define, identify and use relationships among the following: radius, diameter, arc, measure of an arc, chord, secant, tangent, and congruent concentric circles.	<p>I can label all parts of a circle.</p> <p>I can solve problems involving tangent lines to circles.</p> <p>I can find measure of angles and arcs.</p> <p>I can determine whether an arc is a major arc or a minor arc.</p> <p>I can distinguish between chords, secants, and tangents.</p> <p>I can discuss concentric circles in terms of similarity.</p>	<p>Radius</p> <p>Diameter</p> <p>Arc</p> <p>Measure of an Arc</p> <p>Chord</p> <p>Secant</p> <p>Tangent</p> <p>Congruent Concentric Circles</p>		



<p>MA.G.CI.2:</p>	<p>Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius; derive the formula for the area of a sector.</p>	<p>Through exploration, I can use similarity to derive the fact that the length of the arc intercepted by an angle is proportional to the radius.</p> <p>Through exploration, I can derive the formula for the area of a sector.</p> <p>I can find arc lengths.</p> <p>I can use proportional relationships to find the area of sectors.</p>	<p>Similarity</p> <p>Intercepted Arc</p> <p>Proportional</p> <p>Area of a Sector</p> <p>Arc Length</p>		
<p>MA.G.CI.3:</p>	<p>Identify and describe relationships among inscribed angles, radii, and chords, including the following: the relationship that exists between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; and the radius of a circle is perpendicular to a tangent where the radius intersects the circle.</p>	<p>I can determine values for all angles formed in the exterior, interior, and on the circle.</p> <p>I can apply my understanding arcs, angles, and chords to solve circle related problems.</p> <p>I can determine the lengths of intersecting chords and secants.</p>	<p>Inscribed Angles</p> <p>Radius</p> <p>Chord</p> <p>Secant</p> <p>Diameter</p> <p>Perpendicular</p> <p>Tangent</p>		



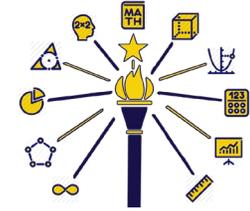
			Central Angle Circumscribed Angles		
MA.G.CI.4:	Solve real-world and other mathematical problems that involve finding measures of circumference, areas of circles and sectors, and arc lengths and related angles (central, inscribed, and intersections of secants and tangents).	I can solve real-world problems involving circles and all their parts. I can use formulas to find missing arc lengths and related angles.	Circumference Area of a circle Area of a Sector Arc Lengths Central Angle Inscribed Angle Secant Tangent	Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems. (MA.7.GM.5)	
MA.G.CI.5:	Construct a circle that passes through three given points not on a line and justify the process used.	I can construct circles with a compass and straightedge and/or with appropriate software.	Circle		



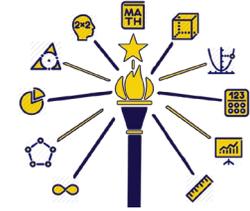
MA.G.CI.6:	Construct a tangent line to a circle through a point on the circle, and construct a tangent line from a point outside a given circle to the circle; justify the process used for each construction.	<p>I can construct the tangent line to a circle through a given exterior point.</p> <p>I can construct the tangent line to a circle through a point on the circle.</p> <p>I can justify my thinking when constructing tangents to a circle.</p>	Tangent		
MA.G.CI.7:	Construct the inscribed and circumscribed circles of a triangle with or without technology, and prove properties of angles for a quadrilateral inscribed in a circle.	<p>I can construct inscribed and circumscribed circles of a polygon with a compass and straightedge and/or appropriate software.</p> <p>I can solve problems involving inscribed and circumscribed angles.</p>	<p>Inscribed</p> <p>Circumscribed</p> <p>Properties of Inscribed Quadrilaterals</p>		

Transformations

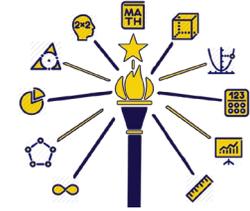
Geometry Mathematics Standards	Success Criteria	Academic Vocabulary	Looking Back	Looking Ahead
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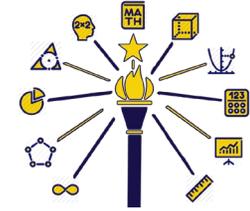
<p>MA.G.TR.1:</p>	<p>Use geometric descriptions of rigid motions to transform figures and to predict and describe the results of translations, reflections and rotations on a given figure. Describe a motion or series of motions that will show two shapes are congruent.</p>	<p>I can show two figures are congruent if there is a sequence of rigid motions that map one figure to another.</p> <p>I can show two figures are congruent if and only if they have the same shape and size.</p> <p>I can use composite transformations to map one figure to another.</p> <p>I can recognize the effects of rigid motion on orientation and location of a figure.</p>	<p>Transformations</p> <p>Rigid Motion</p> <p>Translations</p> <p>Reflections</p> <p>Rotations</p> <p>Congruent</p>	<p>Verify experimentally the properties of rotations, reflections, and translations. (MA.8.GM.3)</p> <p>Understand that a two-dimensional figure is congruent to another if the second can be obtained from a sequence of rotations, reflections, and translations. (MA.8.GM.4)</p>	
<p>MA.G.TR.2:</p>	<p>Understand a dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. Verify experimentally the properties of dilations given by a center and a scale factor. Understand</p>	<p>I can develop the properties of dilations.</p> <p>I can perform dilations when the center of dilation is in, on, and out of a figure.</p> <p>I can dilate a figure when given the center of</p>	<p>Dilation</p> <p>Scale Factor</p>	<p>Understand that a two-dimensional figure is similar to another if the second can be obtained from a sequence of rotations, reflections, translations, and dilations. (MA.8.GM.5)</p>	



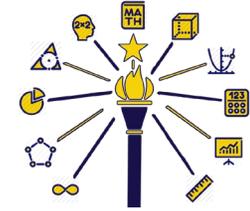
		can be made from a given net.			
MA.G.TS.2:	Describe symmetries of three-dimensional solids.	I can describe symmetries of three-dimensional solids.	Three-Dimensional Solid	Recognize line symmetry in two-dimensional figures. (MA.4.G.2)	
MA.G.TS.3:	Know properties of congruent and similar solids, including prisms, regular pyramids, cylinders, cones, and spheres; solve problems involving congruent and similar solids.	<p>I can state the properties of congruent solids, prisms, regular pyramids, cylinders, cones, and spheres.</p> <p>I can state the properties of similar solids, including prisms, regular pyramids, cylinders, cones, and spheres.</p> <p>I can create geometric solids from nets.</p>	<p>Prism</p> <p>Regular Pyramid</p> <p>Cylinder</p> <p>Cone</p> <p>Sphere</p> <p>Congruent Solid</p> <p>Similar Solid</p>	Use properties of congruent and similar triangles to solve real-world and mathematical problems. (MA.G.T.5)	



		I can solve problems involving congruent and similar solids.			
MA.G.TS.4:	Describe sets of points on spheres, including chords, tangents, and great circles.	I can identify chords and tangents. I can explain the great circle.	Chords in a Sphere Tangents in a Sphere Great Circles		
MA.G.TS.5:	Solve real-world and other mathematical problems involving volume and surface area of prisms, cylinders, cones, spheres, and pyramids, including problems that involve algebraic expressions.	I can calculate the volume of prisms, cylinders, pyramids, cones, and spheres. I can calculate the surface area of prisms, cylinders, pyramids, cones, and spheres. I can apply the formula for the volume of solids to solve real-world problems. I can apply the formula for surface area of solids to solve real-world problems. I can solve mathematical problems involving	Volume Surface Area Prism Cylinder Cone Sphere Pyramid Algebraic Expression	Construct right rectangular prisms from nets and use the nets to compute the surface area of prisms. (MA.6.GM.6) Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms. (MA.7.GM.6) Construct nets for right rectangular prisms and cylinders and use the nets to compute	



		volume and surface area of solids that includes algebraic expressions.		surface area. (MA.7.GM.7) Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres. (MA.8.GM.2)	
MA.G.TS.6:	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	I can solve design problems using geometric methods. I can solve optimization problems.			
MA.G.TS.7:	Graph points on a three-dimensional coordinate plane. Explain how the coordinates relate the point as the distance from the origin on each of the three axes.	I can graph points on a three dimensional plane. I can explain how the coordinates relate the point as a distance from the origin on each of the three axes.	Three-Dimensional Coordinate Plane	Graph points with whole number coordinates and explain how the coordinates relate the point as the distance from the origin. (MA.5.AT.6)	



		I can identify the coordinates of a point on a three-dimensional plane.			
MA.G.TS.8:	Determine the distance of a point to the origin on the three-dimensional coordinate plane using the distance formula.	<p>I can relate the distance formula in two-dimension to the distance formula in three-dimension.</p> <p>I can use the distance formula on the three-dimensional coordinate plane.</p>	Distance Formula on a Three-Dimensional Coordinate Plane	Develop the distance formula using the Pythagorean Theorem; Find the lengths of line segments in one- or two-dimensional coordinate systems. (MA.G.T.8)	
MA.G.TS.9:	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	<p>I can determine the cross sections formed by a cut to a solid.</p> <p>I can determine all possible cross sections for a given solid.</p> <p>I can use cross sections to determine the shape after rotating it about an axis.</p>	Rotation Cross Section	Explore the effects of slicing three-dimensional geometric objects and describe the two-dimensional figure that results. (MA.8.GM.1)	