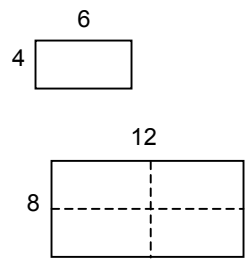
Geometry & Spatial Sense K-8

CONTENT STANDARD #5 – PROPERTIES AND RELATIONSHIPS *Analyze properties of objects and relationships among the properties*	Topic: GEOMETRIC SHAPES & THEIR PROPERTIES & RELATIONSHIPS
Understanding(s): *Students will understand that…* • Geometric relationships allow us to make logical conjectures and conclusions. • Properties of geometric shapes will lead to problem solutions.	**Essential Question(s):** • How can one classify geometric figures based on their properties? • How can one use relationships among properties of objects to solve problems?
Knowledge: *Students will know…* • Congruence of shapes. • Similarity of shapes. • Proportional relationship related to similarity. • Dilation. • Scale factor. • Point, line segment, ray, line, angle. • Three-dimensional geometric solids and their properties. • Two-dimensional geometric figures and their properties. • Pythagorean theorem. • Sum of the measures of the angles in any triangle is 180°.	**Skill(s)**: *Students will be able to…* • Identify geometric shapes (two-dimensional and three-dimensional). • Classify triangles and quadrilaterals by their properties. • Classify angles. • Apply the Pythagorean theorem to find missing sides of a right triangle. • Classify shapes as either congruent or similar. • Apply concepts of similarity and congruence to solve problems. • Writing and solving proportions.

Grade	Reference	Benchmark
Grade 8	MA.8.5.1	Apply the Pythagorean theorem to solve problems involving right triangles
Grade 7	MA. 7.5.1	Apply the concept of similarity to solve problems
Grade 6	MA.6.5.1	Analyze and describe the relationships among the angles, side lengths, perimeters, and areas of similar geometric figures
	MA.6.5.2	Create arguments for proving that two shapes are congruent
Grade 5	MA.5.5.1	Describe the properties that define classifications of three-dimensional shapes (e.g., cylinders have two bases that are circles)
	MA.5.5.2	Apply the understanding that the sum of the measures of the angles in any triangle is 180°
	MA.5.5.3	Classify angles (no larger than 180°) as acute, right, obtuse, or straight
Grade 4	MA.4.5.1	Classify different types of triangles and quadrilaterals according to their properties and identify the properties that define the classifications
	MA.4.5.2	Describe lines in the plane (i.e., parallel, perpendicular, intersecting)
	MA.4.5.3	Compare points, lines, line segments, and rays
	MA.4.5.4	Predict and confirm the results of putting together and taking apart two- and three-dimensional shapes
Grade 3	MA.3.5.1	Compare the basic properties of isosceles, equilateral, and right triangles
	MA.3.5.2	Classify shapes as congruent or similar
Grade 2	MA.2.5.1	Compare and sort two- and three-dimensional shapes according to selected attributes
Grade 1	MA.1.5.1	Identify basic three-dimensional geometric solids (e.g., cube, sphere, rectangular prism)
	MA.1.5.2	Identify attributes and parts of common two- and three-dimensional shapes
Grade K	MA.K.5.1	Identify common geometric shapes (e.g., circle, square, rectangle, triangle)

	LEVELS OF PROGRESSION BELOW THE BENCHMARK			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Foundational ⟷ Approaching the Benchmark					
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 8	• Distinguish the hypotenuse from the legs of a right triangle.	• Recognize that a given problem situation has information about the side lengths of a right triangle.	• Recognize that the Pythagorean theorem should be used but has difficulty replacing variables with the correct values in the equation $a^2 + b^2 = c^2$ where a and b are the lengths of the legs and c is the length of the hypotenuse of a right triangle.	• Identify the necessary right triangle(s) and use the Pythagorean theorem to solve problems.	**MA.8.5.1 Apply the Pythagorean theorem to solve problems involving right triangles**	
Gr. 7		• Recognize that a given problem situation involves similar figures with different orientations. • Recognize if two figures are similar.	• Attempt to use an appropriate strategy (such as setting up a proportion, or determining and using the scale factor) to determine unknown measurements based on known measurements with different orientations, e.g., missing side lengths/angles, area/perimeter of image, determining the scale factor.	• Use an appropriate strategy (such as setting up a proportion, or determining and using the scale factor) to determine unknown measurements based on known measurements with different orientations, e.g., missing side lengths/angles, area/perimeter of image, determining the scale factor.	**MA.7.5.1 Apply the concept of similarity to solve problems**	• Use a variety of strategies to determine unknown measurements based on known measurements with different orientations, e.g., missing side lengths/angles, area/perimeter of image, determining the scale factor.

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 6	• Match corresponding angles OR sides of similar geometric figures with the same orientation, i.e., image is a translation only.	• Match corresponding angles AND sides of similar geometric figures with the same orientation, i.e., image is a translation only.	• State and justify the relationship between the corresponding angles, side lengths, perimeters or areas of similar geometric figures with the same orientation, i.e., image is a translation only.	• State and justify the relationship between the corresponding angles, side lengths, perimeters and areas of similar geometric figures in terms of a ratio, e.g., in the figures below, each pair of corresponding sides are in the ratio of 1:2; e.g., ratio of the perimeters are 1:2; e.g., the ratio of the areas is 1:4.  	**MA.6.5.1** **Analyze and describe the relationships among the angles, side lengths, perimeters, and areas of similar geometric figures** *NOTE: This is the first introduction to similarity.*	
		• Match congruent shapes given a variety of figures of different shapes and sizes and orientation.	• Prove that two shapes are congruent by showing that one of the shapes has been reflected, translated, or rotated. OR • Use angles and side lengths.	• Prove two shapes are congruent by showing that one of the shapes has been reflected, translated, or rotated, AND directly compare it to the second shape by **validating** that corresponding angles and corresponding sides are equal in measure.	**MA.6.5.2** **Create arguments for proving that two shapes are congruent**	

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	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 5	• Sort three-dimensional solids with or without the use of manipulatives, i.e., students put together solids that look alike.	• Identify parts of three-dimensional solids, e.g., vertices, edges, faces, bases.	• Classify three-dimensional shapes as prisms, pyramids, cylinders, with or without the use of manipulatives.	• Describe the properties (vertices, faces, curved surfaces, flat surfaces, bases, heights) that define classifications of three-dimensional shapes, e.g., cylinders have two bases that are circles.	**MA.5.5.1** **Describe the properties that define classifications of three-dimensional shapes (e.g., cylinders have two bases that are circles)**	
			• Show that the sum of the angles of any triangle is 180° (or forms a straight angle).	• Use the understanding that the sum of the angles in any triangle is 180° to solve problems, e.g., determining if the given angles can form a triangle; finding a missing angle when given the measurement of the other two angles.	**MA.5.5.2** **Apply the understanding that the sum of the measures of the angles in any triangle is 180°**	
			• Identify a given angle as a straight angle or right angle.	• Identify a given angle as being a right angle, acute angle, obtuse angle, or straight angle. *NOTE: Reflex angles (angles greater than 180° but less than 360°) are not included in this benchmark.*	**MA.5.5.3** **Classify angles (no larger than 180°) as acute, right, obtuse, or straight**	• Identify and justify a given angle as being a right angle, acute angle, obtuse angle, or straight angle.

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 4	• Sort triangles and quadrilaterals into two groups.	• Categorize triangles by their side lengths (scalene, isosceles, equilateral), or angle measures (right, obtuse, acute, equiangular) but has difficulty justifying. • Categorize quadrilaterals (including concave quadrilaterals) by their side lengths or angle measures but has difficulty justifying.	• Categorize and describe triangles by their side lengths (scalene, isosceles, equilateral), or angle measures (right, obtuse, acute, equiangular). • Categorize and describe quadrilaterals (including concave quadrilaterals) by their side lengths or angle measures.	• Categorize and describe triangles by their side lengths (scalene, isosceles, equilateral) and angle measures (right, obtuse, acute, equiangular). • Categorize and describe quadrilaterals (including concave quadrilaterals) by their side lengths and angle measures.	**MA.4.5.1** **Classify different types of triangles and quadrilaterals according to their properties and identify the properties that define the classifications**	• Compare and contrast triangles by their side lengths (scalene, isosceles, equilateral) and angle measures (right, obtuse, acute, equiangular). • Compare and contrast quadrilaterals (including concave quadrilaterals) by their side lengths and angle measures.
	• Identify examples of lines that are parallel, perpendicular, and intersecting.	• Identify examples of lines in a plane that are parallel, perpendicular, and intersecting.	• Construct examples of lines in a plane that are parallel, perpendicular, and intersecting.	• Describe/define lines in a plane that are parallel, perpendicular, and intersecting.	**MA.4.5.2** **Describe lines in the plane (i.e., parallel, perpendicular, intersecting)**	• Compare and contrast lines in a plane that are parallel, perpendicular, and intersecting.
	• Identify at least one of the following: points, lines, line segments, and rays.	• Identify points, lines, line segments, and rays.	• Describe points, lines, line segments, and rays.	• Compare and contrast points, lines, line segments, and rays.	**MA.4.5.3** **Compare points, lines, line segments, and rays**	

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	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 3	• Randomly predict without confirmation (with or without manipulatives) the results of putting together and taking apart two- OR three-dimensional shapes.	• Use manipulatives to predict OR confirm the results of putting together and taking apart two- OR three-dimensional shapes.	• Use manipulatives to predict AND confirm the results of putting together and taking apart two- AND three-dimensional shapes.	• Predict and explain the effects of subdividing and/or combining together two- and three-dimensional shapes, then confirm the prediction by doing the subdividing and/or combining, e.g., "I predict that putting together two equilateral triangles will result in a rhombus because . . ."	**MA.4.5.4** **Predict and confirm the results of putting together and taking apart two- and three-dimensional shapes**	
	• Identify isosceles, equilateral, OR right triangles.	• Identify isosceles, equilateral, AND right triangles.	• Describe the attributes of isosceles, equilateral, AND right triangles.	• Describe differences and similarities between isosceles, equilateral, and right triangles.	**MA.3.5.1** **Compare the basic properties of isosceles, equilateral, and right triangles**	
				• Classify a pair of shapes into one of three categories: congruent, similar, or neither.	**MA.3.5.2** **Classify shapes as congruent or similar**	• Justify placement of a pair of shapes into one of three categories: congruent, similar, or neither.
Gr. 2	• Identify plane (two-dimensional) shapes by the following attributes: number of sides and vertices (corners), and side lengths.	• Identify three-dimensional solids by the following attributes: number of edges, vertices (corners), faces, and shape.	• Describe basic similarities, e.g., sides, corners, faces between common two-dimensional and three-dimensional shapes.	• Sort by comparing familiar plane two-dimensional and three-dimensional geometric shapes by attributes, such as number of sides/edges, side lengths, vertices (corners), faces, and shape.	**MA.2.5.1** **Compare and sort two- and three-dimensional shapes according to selected attributes**	• Sort in multiple ways an array of two-dimensional and three-dimensional geometric shapes and describe the method/attribute of each sort.

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 1		• Match cubes, spheres and rectangular prisms with their names (solids and their names are provided).	• Select cubes, spheres and rectangular prisms in an array of basic geometric solids, e.g., given the name of a three-dimensional solid, pick the corresponding solid from a set of objects.	• Identify cubes, spheres and rectangular prisms in an array of basic geometric solids and in our environment, i.e., student provides the name of the solid.	**MA.1.5.1** **Identify basic three-dimensional geometric solids (e.g., cube, sphere, rectangular prism)**	• Identify and classify items in an array of basic geometric shapes and in our environment as cubes, spheres, rectangular prisms, cylinders, and pyramids.
		• Identify attributes, e.g., triangle has three sides and three vertices, and parts, e.g., sides and vertices, of common two-dimensional shapes.	• Identify some attributes (cube has six faces), and parts (sides, vertices, faces, edges), of common three-dimensional shapes.	• Identify attributes and parts of common two- and three-dimensional shapes.	**MA.1.5.2** **Identify attributes and parts of common two- and three-dimensional shapes**	
Gr. K	• Match circles from an array of common geometric shapes.	• Select triangles and circles from an array of common geometric shapes and state their name.	• Identify some common shapes (circles, squares, rectangles and triangles) from an array of common geometric shapes and state their name.	• Identify common shapes (circles, squares, rectangles and triangles) in an array of common geometric shapes and in our environment.	**MA.K.5.1** **Identify common geometric shapes (e.g., circle, square, rectangle, triangle)**	• Identify shapes (circles, squares, rectangles, triangles, rhombi, hexagons, and trapezoids) from an array of geometric shapes and state their name.

Geometry & Spatial Sense K-8

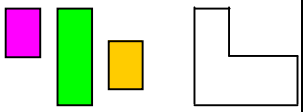
CONTENT STANDARD #6 *Use transformations to analyze mathematical situations*	**Topic: Transformations**
Understanding(s): *Students will understand that…* • Transformations consist of reflections, rotations, translations, and dilations or in combinations of them. • Figures do not change shape or size under reflections, rotations, and translations.	**Essential Questions:** • How can one use transformations to analyze mathematical situations?
Knowledge: *Students will know…* • Transformation. • Reflection (flip). • Rotation (turn). • Translation (slide). • Dilation. • Compositions of transformations.	**Skill(s)**: *Students will be able to…* • Demonstrate flips, slides, and turn. • Demonstrate a combination of flips, slides, and turn. • Describe changes in size between a given figure and its dilation. • Use flips, slides, and turns to show that a shape or design is symmetrical.

Grade	Reference	Benchmark
Grade 8	**MA.8.6.1**	**Perform a transformation (reflection, rotation, translation) when given a figure and necessary parameters**
	MA.8.6.2	**Describe the size, position, and orientation of shapes under transformations and compositions of transformations**
Grade 7	**MA.7.6.1**	**Describe changes in size between a given figure and its dilation**
Grade 6	**---**	**<no benchmark for this topic at this grade level>**
Grade 5	**MA.5.6.1**	**Predict and confirm the results of combinations of flips, turns, and slides**
Grade 4	**MA.4.6.1**	**Use flips, slides, and turns to determine if two figures are congruent**
Grade 3	**MA.3.6.1**	**Predict and confirm the result of flipping, sliding, and turning shapes**
	MA.3.6.2	**Use flips, slides, and turns to show that a shape or design is symmetrical**
Grade 2	**MA.2.6.1**	**Demonstrate flips, slides, and turns by moving shapes**
Grade 1	**-----**	**<no benchmark for this topic at this grade level>**
Grade K	**MA.K.6.1**	**Use slides, flips, and turns to solve puzzles**

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 8	• Sketch/demonstrate the image of a line segment when given the angle of rotation and one of the endpoints is the center of rotation.	• Draw/demonstrate the image of a line segment when given the line of reflection. • Sketch/demonstrate the image of a polygon when given the angle of rotation and one of the vertices is the center of rotation.	• Draw/demonstrate the image of a polygon when given the line of reflection and the polygon is on one side of the line. • Sketch/demonstrate the image of a line segment when given the angle of rotation and the segment does not contain the center of rotation. • Draw/demonstrate the image of a figure translated horizontally or vertically. • Perform a transformation with the correct size and orientation of its image.	• Perform a reflection of a polygon regardless of the position of the line of reflection. • Sketch/demonstrate the image of a polygon, given the angle of rotation regardless of where the center of rotation is located. • Draw/demonstrate the image of a figure when given the direction and distance of the translation for the original figure. • Perform a transformation with the correct size, orientation, AND position of its image.	**MA.8.6.1** **Perform a transformation (reflection, rotation, translation) when given a figure and necessary parameters**	
	• State that the size of a figure doesn't change under reflection, rotation, and translation.	• Describe how the size, position, and orientation of a figure have changed as a result of one transformation.	• Provide partial descriptions of how the position and orientation of a figure have changed as a result of the combination of two or more transformations.	• Describe how the size, position, and orientation of a figure have changed as a result of a combination of two or more transformations.	**MA.8.6.2** **Describe the size, position, and orientation of shapes under transformations and compositions of transformations**	

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 7	• Identify examples of dilations and be able to state if they are enlarging or reducing.	• Perform a dilation of a given figure when the scale factor is given.	• Compare the side lengths and perimeter of a given figure and its dilation and determine the scale factor or percent increase (or decrease).	• Compare the side lengths, perimeter, and **area** of a given figure and its dilation and determine the scale factor or percent increase (or decrease).	**MA.7.6.1** **Describe changes in size between a given figure and its dilation**	
Gr. 6					**<no benchmarks for this grade level>**	
Gr. 5		• Match the combination of flips, turns, and slides that result given several combinations to choose from. • Confirm the prediction by performing the flips, slides, and/or turns.	• Predict the result of a combination of only flips and/or slides (no turns); confirm the prediction by performing the flips and slides.	• Predict the result of a combination of flips, slides, and/or turns; confirm the prediction by performing the flips, slides, and/or turns.	**MA.5.6.1** **Predict and confirm the results of combinations of flips, turns, and slides**	
Gr. 4		• Show the image of a figure using flips, slides, or turns.	• Match congruent shapes given a variety of figures of different shapes and sizes.	• Show that two shapes are congruent by using flips, slides, or turns.	**MA.4.6.1** **Use flips, slides, and turns to determine if two figures are congruent**	
Gr. 3		• Match the original figure to its image after it has been flipped, slid or turned.	• Predict the location and the direction of the shape when it is flipped or slid. • Confirm the prediction by performing the flip or slide.	• Predict the location and the direction the shape is facing when it is flipped, slid, or turned. • Confirm the prediction by performing the flip, slide, or turn.	**MA.3.6.1** **Predict and confirm the result of flipping, sliding, and turning shapes**	

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
			• Uses flip, slide, OR turn to show shapes are symmetrical.	• Demonstrate that a shape or design has line symmetry by using a flip, e.g., folding half of the shape/design and showing that it matches the other half, or cutting out the original figure and flipping it over the line of reflection. • Demonstrate that a shape/design has rotational symmetry by showing that the shape looks the same even after turning it (less than a full turn). • Demonstrate that a design (such as ones seen on gift wrap or shower curtains) has translational symmetry by showing that the design pattern can be created by sliding and copying the same image.	**MA.3.6.2** **Use flips, slides, and turns to show that a shape or design is symmetrical** *Note: This benchmark is asking students to demonstrate reflectional, translational, and rotational symmetry.*	
Gr. 2		• Identifies the motion of slides and turns using various objects, e.g., own body, manipulatives.	• Demonstrate flips, slides, OR turns, e.g., use manipulatives such as pattern blocks or paper cut-outs of shapes.	• Demonstrate flips, slides, AND turns, e.g., use manipulatives such as pattern blocks or paper cut-outs of shapes.	**MA.2.6.1** **Demonstrate flips, slides, and turns by moving shapes**	• Demonstrate combinations of flips, slides, and turns of objects to show different ways of moving from one starting location to an ending location.
Gr. 1					**<no benchmarks for this grade level>**	

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. K		• Match and insert individual shape puzzle pieces into their corresponding frame/outline, e.g., tree shape puzzle piece gets fitted into an outlined shape of the tree shape on a wooden or hard cardboard puzzle frame.	• Slide, flip, or turn puzzle pieces to fit into a frame, e.g., flips, slides, and/or turns each of the colored tiles to fit them into the puzzle frame using outlined guidelines for each of the pieces to determine placement within the whole frame.	• Slide, flip, or turn puzzle pieces to fit into a frame, e.g., flips, slides, and/or turns each of the colored tiles to fit them into the puzzle frame without outline guidelines for each of the pieces. 	**MA.K.6.1** **Use slides, flips, and turns to solve puzzles**	• Slide, flip, or turn pieces to complete a puzzle without any frame or outline guidelines.

Geometry & Spatial Sense K-8

CONTENT STANDARD #6 *Use symmetry to analyze mathematical situations*	**Topic: SYMMETRY**
Understanding(s): *Students will understand that…* • Some plane figures have line symmetry. • Some plane figures and three-dimensional figures have rotational symmetry.	**Essential Question(s):** • How is symmetry used to analyze mathematical situations?
Knowledge: *Students will know…* • Symmetrical. • Asymmetrical. • Line symmetry. • Rotational symmetry. • Rotational axis. • Line of symmetry in plane figures. • Plane of symmetry in three-dimensional objects.	**Skill(s)**: *Students will be able to…* • Identify symmetrical shapes in the real world. • Recognize rotational symmetry of plane figures. • Recognize line symmetry in plane figures. • Identify three-dimensional objects that have rotational symmetry. • Classify shapes based on line symmetry and rotational symmetry.

Grade	Reference	Benchmark
Grade 8	**---**	**<no benchmark for this topic at this grade level>**
Grade 7	**---**	**<no benchmark for this topic at this grade level>**
Grade 6	**MA.6.6.1**	**Use line symmetry and rotational symmetry to describe classifications of shapes (e.g., squares have 4 lines of symmetry and 90° rotational symmetry)**
Grade 5	**MA.5.6.2**	**Identify three-dimensional objects that have rotational symmetry and locate the rotational axis**
Grade 4	**MA.4.6.2**	**Locate the plane of symmetry in three-dimensional objects**
Grade 3	**MA.3.6.3**	**Recognize rotational symmetry of plane figures**
Grade 2	**MA.2.6.2**	**Recognize line symmetry in plane figures and create pictures with line symmetry**
Grade 1	**MA.1.6.1**	**Identify symmetrical shapes found in the real world**
Grade K	**-----**	**<no benchmark for this topic at this grade level>**

	LEVELS OF PROGRESSION FOR BELOW THE BENCHMARK			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Foundational ⟷ Approaching the Benchmark					
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 8					**<no benchmarks for this grade level>**	
Gr. 7					**<no benchmarks for this grade level>**	
Gr. 6			• Describe the classification of shapes in terms of the number of lines of symmetry OR the degrees of rotational symmetry that all shapes in this classification share, e.g., describe all parallelograms (those that are nonrectangular) as having zero lines of symmetry and 180° rotational symmetry.	• Describe the classification of shapes in terms of the number of lines of symmetry AND the degrees of rotational symmetry that all shapes in this classification share, e.g., describe all parallelograms (those that are nonrectangular) as having zero lines of symmetry and 180° rotational symmetry.	**MA.6.6.1 Use line symmetry and rotational symmetry to describe classifications of shapes (e.g., squares have 4 lines of symmetry and 90° rotational symmetry)**	• Make generalizations about classifications of shapes, e.g., all regular polygons have line and rotational symmetry with justification.
Gr. 5			• Classify three-dimensional objects as "nice" shapes, i.e., has rotational symmetry or "not so nice" shapes, i.e., does not have rotational symmetry.	• Identify three-dimensional objects, e.g., sphere, cube, tetrahedron, ice cream cone, etc., that have rotational symmetry. • Locate the three-dimensional object's rotational axis/axes, e.g., poke a toothpick through a clay model of a cube to show one of its rotational axes.	**MA.5.6.2 Identify three-dimensional objects that have rotational symmetry and locate the rotational axis**	

	LEVELS OF PROGRESSION FOR BELOW THE BENCHMARK			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Foundational ⟷ Approaching the Benchmark					
	Students will	Students will	Students will	Students will		Students will
Gr. 4		• Describe what a plane is in mathematical terms.	• Determine if a plane within a three-dimensional object is a plane of symmetry.	• Show where a plane intersects (slices) a given three-dimensional object so that each half is a mirror image of the other.	**MA.4.6.2 Locate the plane of symmetry in three-dimensional objects**	
Gr. 3		• Manipulate shapes to show rotational symmetry.	• Describe rotational symmetry as a basic turn movement.	• Recognize that a shape/design has rotational symmetry by showing that the shape looks the same even after turning it (less than a full turn).	**MA.3.6.3 Recognize rotational symmetry of plane figures**	• Recognize rotational symmetry in the environment, e.g., fan blades, plumeria flower petals.
Gr. 2			• Recognize that two halves of a picture make a whole picture, given a symmetrical shape. • Complete a picture by putting together the figure and its mirror image.	• Indicate whether or not a plane figure (two-dimensional shape) has line symmetry, i.e., when the shape is folded in half, each half is a mirror image of the other. • Create a picture that has line symmetry, e.g., draw, and use manipulatives such as pattern blocks.	**MA.2.6.2 Recognize line symmetry in plane figures and create pictures with line symmetry**	• Justify why a figure is symmetrical.
Gr. 1				• Identify and name shapes in the environment that can be divided perfectly in half such that each half is a mirror image of each other.	**MA.1.6.1 Identify symmetrical shapes found in the real world**	
Gr. K					**<no benchmarks for this grade level>**	

Geometry & Spatial Sense K-8

CONTENT STANDARD# 7 – VISUAL & SPATIAL SENSE

Use visualization and spatial reasoning to solve problems both within and outside of mathematics **Topic: Visual And Spatial Reasoning**

Understanding(s): ***Students will understand that…***
- Two-dimensional representations of three-dimensional figures can be used to solve problems involving these figures.

Essential Question(s):
- How does one use visualization and spatial reasoning to solve problems both within and outside of mathematics?

Knowledge: *Students will know…*
- Net.
- Geometric solid.
- Surface area.
- Properties of geometric figures.
- Two-dimensional figures.
- Three-dimensional figures.

Skill(s): *Students will be able to…*
- Draw two-dimensional shapes with specified properties.
- Draw a net of a three-dimensional figure.
- Draw a two-dimensional representation from different angles of a three-dimensional figure.

Grade	Reference	Benchmark
Grade 8	MA.8.7.1	Use two-dimensional representations of pyramids, prisms, and cylinders to solve problems involving these figures
Grade 7	---	<no benchmark for this topic at this grade level>
Grade 6	MA.6.7.1	Construct a two-dimensional representation from different angles of a three-dimensional object
	MA.6.7.2	Draw two-dimensional shapes with specified properties
Grade 5	MA.5.7.1	Use two-dimensional nets of rectangular solids to solve surface area problems
Grade 4	MA.4.7.1	Predict the three-dimensional object that will result from folding a two-dimensional net of the object and justify the prediction
Grade 3	---	<no benchmark for this topic at this grade level>
Grade 2	---	<no benchmark for this topic at this grade level>
Grade 1	---	<no benchmark for this topic at this grade level>
Grade K	---	<no benchmark for this topic at this grade level>

	LEVELS OF PROGRESSION BELOW THE BENCHMARK			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Foundational ⟷ Approaching the Benchmark					
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 8		• Identify components of pyramids, prisms, and cylinders needed to calculate surface areas and volumes, i.e., height, base, and slant height of pyramids; height and base of prisms; base, height, and circumference of cylinders.	• Match surface area and volume formulas to pyramids, prisms and cylinders.	• Use information from two-dimensional representations (such as nets) of pyramids, prisms, and cylinders to determine a desired measurement (such as the surface area or volume).	**MA.8.7.1 Use two-dimensional representations of pyramids, prisms, and cylinders to solve problems involving these figures**	
Gr. 7					**<no benchmarks for this grade level>**	
Gr. 6	• Draw or identify the outline (silhouette) of a three-dimensional figure from at least one perspective.	• Draw a two-dimensional representation of a three-dimensional figure from at least one perspective: from the top view, front view, or side view.	• Draw a two-dimensional representation of a three-dimensional figure from at least three perspectives: from the top view, front view, and side view.	• Draw a two-dimensional representation of a three-dimensional figure from all perspectives: from the top, bottom, front, back, right, and left views, e.g., the student would draw a circle to represent the top and bottom views of a soda can and draw a rectangle to represent the front, left, right, and back views.	**MA.6.7.1 Construct a two-dimensional representation from different angles of a three-dimensional object**	• Solve problems involving two-dimensional representations of three-dimensional figures, e.g., given a figure made with cubes, determine which/how many cube(s) can be removed/added so that the view(s) remain the same.

	LEVELS OF PROGRESSION BELOW THE BENCHMARK			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Foundational Benchmark ⟷ Approaching the					
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
		• Identify two-dimensional shapes according to provided specifications.	• Draw two-dimensional shapes according to provided specifications such as: ○ The number of sides, vertices, angles. ○ Characteristics of sides, such as congruent sides, parallel sides.	• Draw two-dimensional shapes according to provided specifications such as: ○ The number of sides, vertices, angles. ○ Characteristics of sides, such as congruent sides, parallel sides. ○ Number of lines of symmetry. ○ Degree of rotational symmetry.	**MA.6.7.2** **Draw two-dimensional shapes with specified properties**	
Gr. 5		• Match two-dimensional nets of various objects (not only rectangular solids) to their three-dimensional counterparts with rationale.	• Determine the surface area of a rectangular solid (given its two-dimensional net) by finding the area of each part of its two-dimensional net.	• Determine the two-dimensional net of the given rectangular solid (labeled picture provided), then determine the surface area.	**MA.5.7.1** **Use two-dimensional nets of rectangular solids to solve surface area problems**	

	LEVELS OF PROGRESSION BELOW THE BENCHMARK			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Foundational ⟷ Approaching the Benchmark					
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 4	• Define a net as two-dimensional patterns that can be folded into a three-dimensional figure.	• Use manipulatives to find the net of three-dimensional objects, e.g., take apart several rectangular boxes so that students can see the different nets.	• Construct a three-dimensional object by folding along the lines of its net.	• Predict the shape of the three-dimensional object, e.g., cube, pyramid, cylinder formed by viewing its two-dimensional layout (net) and provide rationale for the prediction.	**MA.4.7.1 Predict the three-dimensional object that will result from folding a two-dimensional net of the object and justify the prediction**	
Gr. 3					**<no benchmarks for this grade level>**	
Gr. 2					**<no benchmarks for this grade level>**	
Gr. 1					**<no benchmarks for this grade level>**	
Gr. K					**<no benchmarks for this grade level>**	

Geometry & Spatial Sense K-8

CONTENT STANDARD #8 – REPRESENTATIONAL SYSTEMS

Select and use different representational systems, including coordinate geometry

Topic: Coordinate Geometry

Understanding(s): *Students will understand that…*
- Coordinate geometry can be used to represent transformations in the plane.
- Points in the plane can be named and located using ordered pairs of numbers.

Essential Question(s):
- How can one select and use different representational systems, including coordinate geometry to solve problems?

Knowledge: *Students will know…*
- Horizontal lines.
- Vertical lines.
- Coordinate grid.
- Ordered pairs of numbers.
- Coordinate plane.
- Dilation by a scale factor.
- Cardinal directions (north, south, east, or west) on a coordinate map.

Skill(s): *Students will be able to…*
- Use positional words to describe an object's location.
- Use directional words to describe an object's location.
- Use cardinal directions to describe an object's location.
- Use ordered pairs to plot points on the coordinate plane.
- Use coordinate geometry to represent transformations in the plane.
- Use coordinate geometry to determine the change in size of a figure that is dilated by a scale factor.

Grade	Reference	Benchmark
Grade 8	MA.8.8.1	Use coordinate geometry to represent transformations in the coordinate plane
Grade 7	MA.7.8.1	Use coordinate geometry to determine the change in size of a figure that is dilated by a scale factor
Grade 6	MA.6.8.1	Predict the shape that is formed by connecting the points represented by given coordinates
	MA.6.8.2	Use coordinate geometry to represent and analyze properties of geometric shapes
Grade 5	MA.5.8.1	Determine the distance between points along horizontal and vertical lines of a coordinate system
Grade 4	MA.4.8.1	Use ordered pairs to plot points on a coordinate grid
Grade 3	MA.3.8.1	Use coordinates to locate objects/locations on a grid
Grade 2	MA.2.8.1	Use cardinal directions that describe the location of an object or place (i.e., north, south, east, or west) on a coordinate map
Grade 1	MA.1.8.1	Use directional words to locate an object or place (e.g., left, right, near, far)
Grade K	MA.K.8.1	Use positional words to describe an object's location (e.g., up, down, above, under, inside, outside)

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 8	• Determine the coordinates of a point and its image after it has been reflected over a given line. *Note: The line of reflection is either horizontal or vertical.*	• Determine the coordinates of the endpoints of a line segment and its image after it has been reflected over a line. *Note: The line segment is on one side of the line of reflection and may be horizontal, vertical, or slanted.*	• Determine the coordinates of the vertices of a figure and its image after it has been reflected about a line. *Note: The figure is on one side of the line of reflection.*	• Determine the coordinates of the vertices of a figure and its image after it has been reflected over a line. *Note: Line of reflection may intersect the figure.*	**MA.8.8.1** **Use coordinate geometry to represent transformations in the coordinate plane**	
	• Determine the coordinates of line segment and its image after it has been rotated a given number of degrees about a given axis of rotation. *Note: One of the endpoints is at the center of rotation (0,0).*	• Determine the coordinates of a figure and its image after it has been rotated a given number of degrees about a given axis of rotation. *Note: One of the vertices is at the center of rotation (0,0).*	• Determine the coordinates of a line segment and its image after it has been rotated a given number of degrees about a given axis or rotation. *Note: The line does not contain the origin (0,0).*	• Determine the coordinates of the vertices of a figure and its image after it has been rotated a given number of degrees about a given axis of rotation. *Note: At this grade level, angles of rotation should be limited to multiples of 90°*		• Determine the coordinates of the vertices of a figure and its image after it has been rotated a given number of degrees about a given axis of rotation. *Note: Angles of rotation are not limited to multiples of 90°.*
	• Determine the resulting coordinates of a point after it has been translated a given distance in a given direction.	• Determine the resulting coordinates of the endpoints of a line segment after it has been translated a given distance in a given direction.	• Determine the resulting coordinates of the vertices of a simple figure after it has been translated a given distance in a given direction.	• Determine the resulting coordinates of the vertices of a geometric figure after it has been translated a given distance in a given direction. *Note: At this level, directions should be given in terms of the number of vertical units and horizontal units to move along the coordinate grid.* • Determines the coordinates of the image of a transformation and labels corresponding points.		

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 7	• Determine the coordinates of a line segment that has been dilated by a scale factor OR compare the lengths of the line segment.	• Determine the resulting coordinates of a line segment that has been dilated by a scale factor AND compare their lengths.	• Determine the resulting coordinates of a figure that has been dilated by a scale factor but has difficulty specifically comparing its size to the original, e.g., provided the scale factor is three, the student can say the figure got "larger," but is not able to say the area is exactly nine times larger.	• Use the coordinates of the original figure and its dilation to compare how the sides, perimeter, and area have changed. *Note: Student must calculate the lengths of sides, perimeter, and areas to support statements about change. For example, if a square has side length 2 units and area 4 square units, under a dilation scale factor of 2 the side of the image is 4 and its area is 16 square units, thus creating a figure whose sides are twice as long and whose area is 4 times larger.*	**MA.7.8.1** **Use coordinate geometry to determine the change in size of a figure that is dilated by a scale factor**	
Gr. 6			• Predicts the general shape, e.g., triangle, quadrilateral, instead of isosceles triangle or rhombus.	• Predict the specific shape that would be formed by connecting the points represented by given coordinates using evidence based on the shape's properties, e.g., there are three coordinates, so the shape may be a triangle since a triangle has three vertices.	**MA.6.8.1** **Predict the shape that is formed by connecting the points represented by given coordinates**	

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
			• Use the coordinates provided to draw a geometric shape and name the resulting shape, e.g., the student looks at the shape on the coordinate grid and says, "I know that the shape is an isosceles triangle" but is unable to provide a justification.	• Use the coordinates provided to draw a geometric shape and to analyze the properties of the resulting shape, e.g., the student looks at the shape on the coordinate grid and says, "I know that the shape is an isosceles triangle because the top of the triangle is the same number of units away from each of the other vertices." • Determine the missing coordinate(s) to create a specific geometric shape when provided with two or more coordinates, e.g., where could the third point be to create a right triangle? Justify.	**MA.6.8.2** **Use coordinate geometry to represent and analyze properties of geometric shapes**	• Determine more than one possibility for the missing coordinate(s) to create a specific geometric shape when provided with two or more coordinates, e.g., where could the third point be to create a right triangle? Justify.
Gr. 5		• Locate points on 'x' and 'y' axes prior to determining distance between the points.	• Find the length of a horizontal line segment which has an endpoint on the y-axis. • Find the length of a vertical line segment which has an endpoint on the x-axis.	• Find the length of any horizontal and vertical line segment within a coordinate system.	**MA.5.8.1** **Determine the distance between points along horizontal and vertical lines of a coordinate system**	
Gr. 4		• Identify the vertical and horizontal axis.	• Identify the first number in the ordered pair as the x-coordinate, and the second as the y-coordinate.	• Plot points on a coordinate grid when given the coordinates.	**MA.4.8.1** **Use ordered pairs to plot points on a coordinate grid**	

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. 3			• Identify landmarks on a map.	• Find a location on a grid when given its coordinates.	**MA.3.8.1** **Use coordinates to locate objects/locations on a grid**	
Gr. 2	• Demonstrate north, south, east, west (e.g., have students move when cardinal directions are given verbally).	• Identify north, south, east, west using a compass rose.	• Use cardinal directions to locate an object or place on a coordinate map. OR • Give cardinal directions, i.e., north, south, east, west that describe the location of an object or place (position) on a coordinate map (coordinate grid).	• Use cardinal directions to locate an object or place on a coordinate map. • Give cardinal directions, i.e. north, south, east, west that describe the location of an object or place (position) on a coordinate map (coordinate grid). *Note: Provide number of blocks, e.g., four blocks north; or scale, e.g., one inch = one mile.*	**MA.2.8.1** **Use cardinal directions that describe the location of an object or place (i.e., north, south, east, or west) on a coordinate map**	• Use cardinal directions together with distances to locate an object on a coordinate map. • Give cardinal directions together with distances that describe the location of an object or place on a coordinate map. • Use/give more detailed cardinal directions of an object or place, i.e., northwest, southeast, northeast, southwest.
Gr. 1	• Demonstrate directional words (left, right, near, far, etc.) in different ways, such as using their body.	• Identify objects/places as left, right, near, or far.	• Follow a model to locate a place or an object when given directions, e.g., teacher demonstrates left, right, near, and far as students follow along.	• Use directions, e.g., left, right, near, far to locate an object or place.	**MA.1.8.1** **Use directional words to locate an object or place (e.g., left, right, near, far)**	• Give directions, e.g., left, right, near, far to locate an object or place.

	LEVELS OF PROGRESSION BELOW THE BENCHMARK Foundational ⟷ Approaching the Benchmark			AT THE BENCHMARK	BENCHMARK	ADVANCED
	Students will	**Students will**	**Students will**	**Students will**		**Students will**
Gr. K	• Demonstrate positional words (above, below, inside, outside, etc.) in different ways, such as using their body.	• Identify positions of objects as above, below, inside, outside, e.g., where is the ceiling? (Above) Where is the floor? (Below).	• Follows instructions to place an object, e.g., put the ball on your desk.	• Describe an object's location relative to other objects, e.g., the ball is under the table.	**MA.K.8.1** **Use positional words to describe an object's location (e.g., up, down, above, under, inside, outside)** *Note: Up and down are more directional words than positional words. See 1.8.1 above.*	• Describe an object's location in more than one way, e.g., the ball is under the table; the ball is above the floor; the ball is in the room.