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STATE OF NEW JERSEY
DEPARTMENT OF EDUCATION

Geometry: New Jersey Student Learning Standards for Mathematics - Prerequisite Standards and Learning Objectives by Domain

Description

Included here are the prerequisite concepts and skills necessary for students to learn grade level content based on the New Jersey Student Learning Standards in mathematics. This tool is intended to support educators in the identification of any gaps in conceptual understanding or skill that might exist in a student's understanding of mathematics standards. The organization of this document mirrors that of the New Jersey Student Learning Standards for mathematics, includes all grade- or course-level standards and the associated student learning objectives, and reflects a grouping of the standards by conceptual category and domain.

The tables are divided into two columns. The first column contains the grade level standard and student learning objectives, which reflect the corresponding concepts and skills in that standard. The second column contains standards from prior grades and the corresponding learning objectives, which reflect prerequisite concepts and skills essential for student attainment of the grade level standard as listed in the first column. Given that a single standard may reflect multiple concepts and skills, all learning objectives for a prior grade standard may not be listed. Only those prior grade learning objectives that reflect prerequisite concepts and skills important for attainment of the associated grade level standard is listed.

Content Emphases Key: ■: Major Cluster ▣: Supporting Cluster ◎: Additional Cluster

Note: Double asterisks (**) indicate that the example(s) included within the New Jersey Student Learning Standard may be especially informative when considering the Student Learning Objective.

Geometry – Congruence (G.CO)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc We are learning to/that… ▪ define line segment based on some or all of the undefined notions of point, line, distance along a line, and distance around a circular arc ▪ define angle based on some or all of the undefined notions of point, line, distance along a line, and distance around a circular arc ▪ define parallel lines based on some or all of the undefined notions of point, line, distance along a line, and distance around a circular arc ▪ define perpendicular lines based on some or all of the undefined notions of point, line, distance along a line, and distance around a circular arc ▪ define a circle based on some or all of the undefined notions of point, line, distance along a line, and distance around a circular arc	**4.MD.C.5** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one degree angle," and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees We have learned to/that… ▪ recognize angles as geometric shapes that are formed wherever two rays share a common endpoint ▪ an angle is measured by considering the fraction of the circular arc that is between the two points where the two rays intersect the circle ▪ a "one degree angle" is defined as 1/360 of the entire circle **4.G.A.1** Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. We have learned to/that… ▪ draw points, lines, line segments, rays, right angles, acute angles, obtuse angles, perpendicular lines and parallel lines ▪ identify points, lines, line segments, rays, right angles, acute angles, obtuse angles, perpendicular lines and parallel lines in two-dimensional figures

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). We are learning to/that… ▪ represent transformations in the plane using transparencies and geometry software ▪ describe transformations as functions that take points in the plane as inputs and give other points as outputs ▪ compare transformations, including dilations, that preserve distance and angle to those that do not	**8.G.A.1** Verify experimentally the properties of rotations, reflections, and translations: a. Lines are transformed to lines, and line segments to line segments of the same length. b. Angles are transformed to angles of the same measure. c. Parallel lines are transformed to parallel lines. We have learned to/that… ▪ verify that when a reflection, rotation, and/or translation is performed, lines are transformed to lines, and line segments to line segments of the same length ▪ verify that when a reflection, rotation, and/or translation is performed, angles are transformed to angles of the same measure ▪ verify that when a reflection, rotation, and/or translation is performed, parallel lines are transformed to parallel lines **8.G.A.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. We have learned to/that… ▪ describe the effects of dilations, translations, rotations, and reflections using coordinates **8.F.A.1** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. We have learned to/that… ▪ a function is a rule that assigns to each input exactly one output ▪ the graph of a function is the set of ordered pairs consisting of an input and the corresponding output

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
◻ **G.CO.A.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. We are learning to/that… ▪ describe rotations that carry a given rectangle, parallelogram, trapezoid, or regular polygon onto itself ▪ describe reflections that carry a given rectangle, parallelogram, trapezoid, or regular polygon onto itself	■ **8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We have learned to/that… ▪ translate, rotate, and reflect two-dimensional figures on a coordinate plane ■ **8.G.A.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. We have learned to/that… ▪ describe the effects of translations, rotations, and reflections using coordinates
◻ **G.CO.A.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. We are learning to/that… ▪ develop the definition of rotations in terms of angles, circles, perpendicular lines, parallel lines, and/or line segments ▪ develop the definition of reflections in terms of angles, circles, perpendicular lines, parallel lines, and/or line segments ▪ develop the definition of translations in terms of angles, circles, perpendicular lines, parallel lines, and/or line segments	■ **8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We have learned to/that… ▪ translate, rotate, and reflect two-dimensional figures on a coordinate plane ■ **8.G.A.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. We have learned to/that… ▪ describe the effects of translations, rotations, and reflections using coordinates

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. We are learning to/that… ▪ given a figure and a rotation, draw the transformed figure using graph paper, tracing paper, or geometry software ▪ given a figure and a reflection, draw the transformed figure using graph paper, tracing paper, or geometry software ▪ given a figure and a translation, draw the transformed figure using graph paper, tracing paper, or geometry software ▪ specify a sequence of transformations that will carry a given figure onto another	**8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We have learned to/that… ▪ translate, rotate, and reflect two-dimensional figures on a coordinate plane **8.G.A.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. We have learned to/that… ▪ describe the effects of translations, rotations, and reflections using coordinates
G.CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. We are learning to/that… ▪ use geometric descriptions of rigid motions to transform figures. ▪ predict the effect of a given rigid motion on a given figure using geometric descriptions of rigid motions ▪ use the definition of congruence in terms of rigid motions to decide if two given figures are congruent	**8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We have learned to/that… ▪ two figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one congruent figure onto another ▪ translate, rotate, and reflect two-dimensional figures on a coordinate plane
G.CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	**8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
We are learning to/that… ▪ show that two triangles are congruent using the definition of congruence in terms of rigid motions if and only if corresponding pairs of sides and corresponding pairs of angles are congruent	We have learned to/that… ▪ two figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one congruent figure onto another ▪ translate, rotate, and reflect two-dimensional figures on a coordinate plane
■ **G.CO.B.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. We are learning to/that… ▪ explain how ASA, SAS, and SSS follow from the definition of congruence in terms of rigid motions.	■ **8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We have learned to/that… ▪ two figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one congruent figure onto another ▪ dilate, translate, rotate, and reflect two-dimensional figures on a coordinate plane ◎ **7.G.A.2** Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. We have learned to/that… ▪ draw geometric shapes with given conditions with technology, with rulers and protractors, as well as freehand ▪ construct triangles from three measures of angles or sides using technology and notice when the conditions determine a unique triangle, more than one triangle, or no triangle

<table>
<tr><th>Standard and Student Learning Objectives</th><th>Previous Grade(s) Standards and Student Learning Objectives</th></tr>
<tr><td></td><td>construct triangles from three measures of angles or sides using rulers and protractors and notice when the conditions determine a unique triangle, more than one triangle, or no triangle</td></tr>
<tr><td>■ G.CO.C.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

We are learning to/that…
prove theorems about lines and angles
prove vertical angles are congruent
prove that when a transversal crosses parallel lines, alternate interior angles are congruent
prove that when a transversal crosses parallel lines, corresponding angles are congruent
prove points on a perpendicular bisector of a line segment is exactly those that are equidistant from the segment endpoints</td><td>■ 8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

We have learned to/that…
the sum of the interior angles of a triangle is 180 degrees
the measure of an exterior angle of a triangle is equal to the sum of the two remote interior angles
when parallel lines are cut by a transversal, corresponding, alternate interior, and alternate exterior angles are congruent
if two sets of corresponding angles in two triangles are congruent, then the triangles are similar
use informal arguments to establish facts about angles
◎ 7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

We have learned to/that…
supplementary angles are two angles whose sum is 180 degrees and complementary angles are two angles whose sum is 90 degrees
vertical angles, the pairs of opposite angles made by two intersecting lines, have equal measures
adjacent angles are two angles that share a vertex and a side</td></tr>
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Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	▪ use facts about supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure **4.MD.C.7** Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. We have learned to/that… ▪ angle measure as additive ▪ when an angle is decomposed into non-overlapping parts, the angle measurement of the whole equals the sum of the angle measures of its parts
G.CO.C.10 Prove theorems about triangles. Theorems include: 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. We are learning to/that… ▪ prove measures of the interior angles of a triangle sum to 180 degrees ▪ prove theorems about triangles ▪ prove base angles of an isosceles triangle are congruent ▪ prove that the segment joining midpoints of two sides of a triangle is parallel to the third side of a triangle and half the length ▪ prove the medians of a triangle meet at a point	**8.G.A.5** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example,* arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. We have learned to/that… ▪ the sum of the interior angles of a triangle is 180 degrees ▪ the measure of an exterior angle of a triangle is equal to the sum of the two remote interior angles ▪ when parallel lines are cut by a transversal, corresponding, alternate interior, and alternate exterior angles are congruent ▪ if two sets of corresponding angles in two triangles are congruent, then the triangles are similar

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	▪ use informal arguments to establish facts about angles **7.G.B.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. We have learned to/that… ▪ supplementary angles are two angles whose sum is 180 degrees and complementary angles are two angles whose sum is 90 degrees ▪ vertical angles, the pairs of opposite angles made by two intersecting lines, have equal measures ▪ adjacent angles are two angles that share a vertex and a side ▪ use facts about supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure **4.MD.C.7** Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. We have learned to/that… ▪ angle measure as additive ▪ when an angle is decomposed into non-overlapping parts, the angle measurement of the whole equals the sum of the angle measures of its parts

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.CO.C.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. We are learning to/that… ▪ prove theorems about parallelograms ▪ prove opposite sides in a parallelogram are congruent ▪ prove opposite angles in a parallelogram are congruent ▪ prove the diagonals of a parallelogram bisect each other ▪ prove rectangles are parallelograms with congruent diagonals	**5.G.B.3** Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example*, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. We have learned to/that… ▪ the attributes belonging to a category of two-dimensional figures also belong to all subcategories **4.G.A.2** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. We have learned to/that… ▪ classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines ▪ classify two-dimensional figures based on the presence or absence of angles of a specified size ▪ identify right triangles and recognize right triangles as a category
G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. We are learning to/that… ▪ compass, straightedge, string, reflective devices, and dynamic geometric software are examples of tools that may be used to make formal geometric constructions	**4.MD.C.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. We have learned to/that… ▪ sketch angles that have a specified measure

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
▪ make formal geometric constructions with a variety of tools and methods (i.e. paper folding) ▪ use a variety of geometric tools and methods to copy a segment ▪ use a variety of geometric tools and methods to copy an angle ▪ use a variety of geometric tools and methods to bisect a segment ▪ use a variety of geometric tools and methods to bisect an angle ▪ use a variety of geometric tools and methods to construct perpendicular lines, including perpendicular bisectors ▪ use a variety of geometric tools and methods to construct a line parallel to a given line through a point not on the line	
G.CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. We are learning to/that… ▪ construct an equilateral triangle inscribed in a circle ▪ construct a regular hexagon inscribed in a circle ▪ construct a square inscribed in a circle	**7.G.A.2** Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. We have learned to/that… ▪ draw geometric shapes with given conditions with technology, with rulers and protractors, as well as freehand ▪ construct triangles from three measures of angles or sides using rulers and protractors

Geometry – Similarity, Right Triangles, and Trigonometry (G.SRT)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: a. 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. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. We are learning to/that… ▪ verify experimentally, given a center and scale factor, that the dilation of a line segment is longer or shorter in the ratio given by the scale factor ▪ verify experimentally, given a center and scale factor, that a dilation leaves a line passing through the center of the dilation unchanged ▪ verify experimentally, given a center and scale factor, that a dilation takes a line not passing through the center of the dilation to a parallel line ▪ represent dilations in the plane using transparencies and geometry software	**F.BF.B.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. We have learned to/that… ▪ identify the effect on the graph of linear and exponential functions by replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k, and illustrate an explanation of the effects on the graph using technology ▪ identify the effect on the graph of linear and exponential functions by replacing $f(x)$ by $kf(x)$ and $f(kx)$ for specific values of k, and illustrate an explanation of the effects on the graph using technology ▪ experiment with all cases, $f(x) + k$, $f(x + k)$, $kf(x)$ and $f(kx)$, and illustrate an explanation of the effects on the graph using technology **8.G.A.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We have learned to/that… ▪ two figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and/or translations

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. We have learned to/that… ▪ dilate, translate, rotate, and reflect two-dimensional figures on a coordinate plane ▪ describe the effects of dilations, translations, rotations, and reflections using coordinates **8.G.A.4** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. We have learned to/that… ▪ describe a sequence of transformations that maps one similar figure onto another **8.EE.B.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example*, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. We have learned to/that… ▪ recognize that for proportional relationships, the unit rate is the slope of the graph ▪ compare the unit rates of two proportional relationships represented in different ways

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. We have learned to/that… ▪ explain why the slope is the same between any two distinct points on a non-vertical line by drawing similar right triangles and comparing the ratios of their sides.
G.SRT.A.2 Given two figures, 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. We are learning to/that… ▪ use the definition of similarity in terms of similarity transformations to decide if two figures are similar ▪ use similarity transformations to explain the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides	**8.G.A.4** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. We have learned to/that… ▪ two figures are similar if one can be obtained from the other by a sequence of dilations and rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one similar figure onto another
G.SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. We are learning to/that… ▪ use the properties of similarity transformations to establish the conditions for triangle similarity through the AA criterion	**8.G.A.5** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example,* arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. We have learned to/that… ▪ the sum of the interior angles of a triangle is 180 degrees

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	▪ if two sets of corresponding angles in two triangles are congruent, then the triangles are similar **8.G.A.4** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. We have learned to/that… ▪ two figures are similar if one can be obtained from the other by a sequence of dilations and rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one similar figure onto another
G.SRT.B.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. We are learning to/that… ▪ prove that a line parallel to one side of a triangle divides the other two sides of the triangle proportionally ▪ prove that a line that divides two sides of a triangle proportionally is parallel to the third side ▪ prove, using triangle similarity, the Pythagorean Theorem	**8.G.B.6** Explain a proof of the Pythagorean Theorem and its converse. We have learned to/that… ▪ the Pythagorean Theorem states that the square of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides ▪ explain a proof of the Pythagorean Theorem ▪ explain a proof of the converse of the Pythagorean Theorem **7.RP.A.2** Recognize and represent proportional relationships between quantities. c. Represent proportional relationships by equations. *For example*, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	We have learned to/that… ▪ represent proportional relationships by equations using the constant of proportionality (unit rate)
G.SRT.B.5 Given two figures, 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. We are learning to/that… ▪ use the definition of similarity in terms of similarity transformations to decide if two given figures 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	**8.G.A.1** Verify experimentally the properties of rotations, reflections, and translations: a. Lines are transformed to lines, and line segments to line segments of the same length. b. Angles are transformed to angles of the same measure. c. Parallel lines are transformed to parallel lines. We have learned to/that… ▪ verify that when a reflection, rotation, and/or translation is performed, lines are transformed to lines, and line segments to line segments of the same length ▪ verify that when a reflection, rotation, and/or translation is performed, angles are transformed to angles of the same measure ▪ verify that when a reflection, rotation, and/or translation is performed, parallel lines are transformed to parallel lines **8.G.A.4** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. We have learned to/that… ▪ two figures are similar if one can be obtained from the other by a sequence of dilations and rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one similar figure onto another

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
■ **G.SRT.C.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. We are learning to/that… ▪ similarity in right triangles leads to proportional relationships which produce the trigonometric ratios for the acute angles in the right triangle ▪ side ratios in right triangles are properties of the angles in the triangle as a result of properties of triangle similarity ▪ define trigonometric ratios for acute angles	■ **7.RP.A.2** Recognize and represent proportional relationships between quantities. c. Represent proportional relationships by equations. *For example*, if total cost *t* is proportional to the number *n* of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$. We have learned to/that… ▪ represent proportional relationships by equations using the constant of proportionality (unit rate)
■ **G.SRT.C.7** Explain and use the relationship between the sine and cosine of complementary angles. We are learning to/that… ▪ explain and use the relationship between the sine and cosine of complementary angles	○ **7.G.B.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. We have learned to/that… ▪ supplementary angles are two angles whose sum is 180 degrees and complementary angles are two angles whose sum is 90 degrees ▪ use facts about supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure
■ **G.SRT.C.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★ We are learning to/that… ▪ use trigonometric ratios to solve right triangles in applied problems ▪ use Pythagorean Theorem to solve right triangles in applied problems	■ **8.G.B.7** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. We have learned to/that… ▪ apply the Pythagorean Theorem to determine unknown side lengths in right triangles in two-dimensional figures ▪ apply the Pythagorean Theorem to determine unknown side lengths in right triangles in three-dimensional figures

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	▪ apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world problems ■ **7.RP.A.2** Recognize and represent proportional relationships between quantities. c. Represent proportional relationships by equations. *For example*, if total cost *t* is proportional to the number *n* of items purchased at a constant price *p*, the relationship between the total cost and the number of items can be expressed as $t = pn$. We have learned to/that… ▪ represent proportional relationships by equations using the constant of proportionality (unit rate)

Geometry – Circles (G.C)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.C.A.1 Prove that all circles are similar. We are learning to/that… ▪ prove that all circles are similar	n/a
G.C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. We are learning to/that… ▪ identify and describe relationships among inscribed angles, radii, and chords ▪ identify and describe relationships among inscribed angles, central angles, and circumscribed angles ▪ the radius of a circle is perpendicular to the tangent where the radius intersects the circle ▪ inscribed angles on a diameter are right angles	n/a
G.C.A.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. We are learning to/that… ▪ construct the inscribed and circumscribed circles of a triangle ▪ prove properties of angles for a quadrilateral inscribed in a circle	n/a

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.C.B.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. We are learning to/that… ▪ use similarity to derive the fact that the length of the arc intercepted by an angle is proportional to the radius of a circle ▪ define the radian measure of an angle as the constant of proportionality between the length of the arc intercepted by an angle and the radius of a circle ▪ derive the formula for the area of a sector	n/a

Geometry – Expressing Geometric Properties with Equations (G.GPE)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.GPE.A.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. We are learning to/that… ▪ derive the equation of a circle given the center and radius using Pythagorean Theorem ▪ complete the square to find the center and radius of a circle given by an equation	**A.REI.B.4** Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b We have learned to/that… ▪ solve quadratic equations by completing the square ▪ use completing the square to rewrite a quadratic equation in the form $(x-p)^2 = q$ ▪ use the form $(x-p)^2 = q$ to derive the quadratic formula ▪ solve quadratic equations by using the quadratic formula ▪ recognize, using the discriminant, when the quadratic formula gives complex solutions and write them as $a \pm bi$ **8.G.B.8** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. We have learned to/that… ▪ apply the Pythagorean Theorem to find the distance between two points in a coordinate system

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
■ **G.GPE.B.4** Use coordinates to prove simple geometric theorems algebraically. *For example*, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2). We are learning to/that… ▪ prove simple geometric theorems algebraically using coordinates	■ **8.G.B.8** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. We have learned to/that… ▪ apply the Pythagorean Theorem to find the distance between two points in a coordinate system
■ **G.GPE.B.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point. We are learning to/that… ▪ prove the slope criteria for parallel lines ▪ use the slope criteria for parallel lines to solve geometric problems ▪ prove the slope criteria for perpendicular lines ▪ use the slope criteria for perpendicular lines to solve geometric problems	■ **8.EE.B.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. We have learned to/that… ▪ explain why the slope is the same between any two distinct points on a non-vertical line by drawing similar right triangles and comparing the ratios of their sides ▪ derive the equation $y = mx$ for a line through the origin ▪ derive the equation $y = mx + b$ for a line intercepting the y-axis at b ■ **8.EE.B.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example*, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. We have learned to/that… ▪ graph proportional relationships represented in different ways (i.e. ordered pairs, table, equation, phrases, etc.)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
■ **G.GPE.B.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio. We are learning to/that… ▪ find the point that is between two given points on a directed line segment that partitions the segment in a given ratio	■ **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. We have learned to/that… ▪ represent and solve rate and ratio real-world and mathematical problems by using tables, tape diagrams, double number line diagrams, and equations
■ **G.GPE.B.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. We are learning to/that… ▪ compute perimeter of polygons using coordinates ▪ compute areas of rectangles using coordinates ▪ compute area of triangles using coordinates	■ **8.G.B.8** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. We have learned to/that… ▪ apply the Pythagorean Theorem to find the distance between two points in a coordinate system □ **6.G.A.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. We have learned to/that… ▪ find the area of right triangles and other triangles by composing into rectangles ▪ find the area of special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes □ **4.MD.A.3** Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example*, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	We have learned to/that… ▪ apply the area formula for rectangles in real world and mathematical problems ▪ apply perimeter formulas for rectangles in real world and mathematical problems

Geometry – Geometric Measurement and Dimension (G.GMD)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments We are learning to/that… ▪ give an informal argument for the formulas for the circumference of a circle and for the area of a circle, using dissection arguments, Cavalieri's principle, and informal limit arguments ▪ give an informal argument for the formula for the volume of a cylinder, pyramid, and cone using dissection arguments, Cavalieri's principle, and informal limit arguments	**8.G.C.9** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. We have learned to/that… ▪ apply the formulas for volume of a cone, cylinder, or sphere in a real-world context ▪ calculate the volume of a cone, cylinder, or sphere **7.G.B.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. We have learned to/that… ▪ know the formulas for area and circumference of a circle ▪ solve problems using the formula for circumference of a circle and for the area of a circle ▪ informally derive the relationship between the circumference and area of a circle
G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. We are learning to/that… ▪ use volume formulas for cylinders, pyramids, cones, and spheres to solve problems	**8.G.C.9** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. We have learned to/that… ▪ apply the formulas for volume of a cone, cylinder, or sphere in a real-world context ▪ calculate the volume of a cone, cylinder, or sphere ▪ find a missing dimension of a cone, cylinder or sphere given its volume

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. We are learning to/that… ▪ identify three-dimensional objects generated by rotations of two-dimensional objects ▪ identify the shapes of two-dimensional cross-sections of three-dimensional objects	**7.G.A.3** Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. We have learned to/that… ▪ describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids

Geometry – Modeling with Geometry (G.MG)

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
G.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). We are learning to/that… ▪ describe real-world objects using geometric shapes, their measures, and their properties	**7.G.B.6** Solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms We have learned to/that… ▪ solve real-world and mathematical problems involving volume and surface area of three-dimensional objects composed of cubes and right prisms
G.MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). We are learning to/that… ▪ apply concepts of density based on area and volume in modeling situations	**8.G.C.9** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. We have learned to/that… ▪ apply the formulas for volume of a cone, cylinder, or sphere in a real-world context **7.G.B.6** Solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms We have learned to/that… ▪ solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles, quadrilaterals, and polygons ▪ solve real-world and mathematical problems involving volume and surface area of three-dimensional objects composed of cubes and right prisms

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example*, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes." We have learned to/that… ▪ use ratio language to describe a relationship between two quantities. **6.RP.A.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. *For example*, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger. We have learned to/that… ▪ construct a unit rate (a/b) from a given ratio (a:b) ▪ explain a unit rate (a/b) associated with a ratio (a:b) ▪ express a ratio relationship using rate language **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. We have learned to/that… ▪ represent and solve rate and ratio real-world and mathematical problems by using tables, tape diagrams, double number line diagrams, and equations

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
■ **G.MG.A.3** 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). We are learning to/that… ▪ apply geometric methods to solve design problems	■ **A.CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example,* represent inequalities describing nutritional and cost constraints on combinations of different foods. We have learned to/that… ▪ constraints reflect conditions in the modeling process ▪ represent a constraint as an equation or inequality ▪ interpret possible solutions as viable or nonviable in the modeling context ■ **A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. We have learned to/that… ▪ create linear equations and inequalities in one variable to model a problem or situation ▪ use linear equations and inequalities to solve problems ○ **8.G.C.9** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. We have learned to/that… ▪ apply the formulas for volume of a cone, cylinder, or sphere in a real-world context ▪ calculate the volume of a cone, cylinder, or sphere ▪ find a missing dimension of a cone, cylinder or sphere given its volume ○ **7.G.A.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives
	We have learned to/that… ▪ solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale **7.G.B.6** Solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. We have learned to/that… ▪ solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles, quadrilaterals, and polygons ▪ solve real-world and mathematical problems involving volume and surface area of three-dimensional objects composed of cubes and right prisms **6.G.A.4** Represent three-dimensional figures using nets made up of rectangles and triangles and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems We have learned to/that… ▪ represent three-dimensional figures made up of rectangles and triangles by using nets ▪ use the net to find the surface area of three-dimensional figures made up of rectangles and triangles ▪ solve real-world and mathematical problems by using nets to find surface area applying net surface area techniques