**Geometry**

**Prince William County Schools Pacing Guide**

**2021-2022**

Teacher focus groups have assigned a given number of days to each unit based on their experiences and knowledge of the curriculum. Teacher teams will need to include time for assessment as they are planning each unit. It is recommended that teachers stay as close as possible to the pacing guidelines to ensure that all of the Standards of Learning have been taught prior to the SOL Test, and that, as students move within the Division, their math instruction remains consistent. Ongoing review should occur throughout the year.

Teachers may find the full wording of the objectives, along with the essential knowledge and skills to be learned, in the Unit Plans located on the Mathematics Staff Communities webpage. Unit plans created by the Teacher Focus Groups provide suggestions for learning experiences as well as resources to support instruction.

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| **\*\*\*Important Notice\*\*\*** |
| **This pacing guide has been revised to reflect unfinished learning from the school closure in the spring of 2020 and the pandemic school year 2020-2021 based on Unfinished Learning spreadsheet completed by each middle and high school prior to the end of the 2020-2021 school year.** **Objectives in RED font indicate** **1) an Algebra I standard were taught to varying levels of mastery during the 2020-21 school year or may require additional review. This is standard A.3 (radicals) that is in Geometry Unit 8.****2) the inclusion of the unit circle (T.2) for degrees only in Geometry Unit 8 for Advanced GEOMETRY ONLY!! This is necessary to reflect the changes being addressed in the Advanced Algebra II course which will replace Pre-AP Algebra II/Trigonometry in the 2021-22 school year.** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives in ORANGE font indicate 8th grade standards.****Please note, 2019-2020 school year, student may require additional review due to closure of school. These Math-8 standards will be identified on the 2021-2022 school pacing guide.**Information in BLUE font provides guidance on priority standards.   |

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| **(12days / 6 blocks)** **Unit 1: Geometric Thinking and Vocabulary** |
| **Focus Topics:** **Geometric Arguments. Reasoning, and Proofs** | **Standards of Learning** |
| **The student will** use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will includea) identifying the converse, inverse, and contrapositive of a conditional statement;b) translating a short verbal argument into symbolic form; andc) determining the validity of a logical argument. * Identify the converse, inverse, and contrapositive of a conditional statement. (a)
* Translate verbal arguments into symbolic form using the symbols of formal logic. (b)
* Determine that the validity of a logical argument using valid forms of deductive reasoning. (c)
* Determine that an argument is false using a counterexample. (c)
 | G.1 abc |

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| **(12 days /6 blocks)** **Unit 2: Coordinate Geometry, Basic Constructions, and Equations of Circles** |
| **Focus Topics:** **Transformational and Coordinate Geometry**  | **Standards of Learning** |
| **Note:** In middle school, students were taught that the slope is the rate of change and that it is the change in y over the change in x. In Algebra 1, students were taught the slope formula. Geometry should be the FIRST time that students apply Slope to verify and determine whether lines are parallel and perpendicular.**The student will** use solve problems involving symmetry and transformation. This will include1. prove two or more lines are parallel; and
2. applying slope to verify and determine whether lines are parallel or perpendicular
* Determine the coordinates of the midpoint or endpoint of a segment, using the midpoint formula. (a)
* Use a formula to determine the slope of a line. (a)
* Apply the distance formula to determine the length of a line segment when given the coordinates of the endpoints. (a)
* Compare the slopes to determine whether two lines are parallel, perpendicular, or neither. (b)

**The student will*** Construct and justify the constructions of
1. a line segment congruent to a given line segment;
2. the perpendicular bisector of a line segment;
3. the bisector of a given angle.
4. an angle congruent to a given angle.

The student will solve problems involving equations of circles.* Given a graph or the equation of a circle in standard form, identify the coordinates of the center of the circle.
* Given the coordinates of the endpoints of a diameter of a circle, determine the coordinates of the center of the circle.
* Given a graph or the equation of a circle in standard form, identify the length of the radius or diameter of the circle.
* Given the coordinates of the endpoints of the diameter of a circle, determine the length of the radius or diameter of the circle.
* Given the coordinates of the center and the coordinates of a point on the circle, determine the length of the radius or diameter of the circle.
* Given the coordinates of the center and length of the radius of a circle, identify the coordinates of a point(s) on the circle.
* Determine the equation of a circle given:
	+ a graph of a circle with a center with coordinates that are integers;
	+ coordinates of the center and a point on the circle;
	+ coordinates of the center and the length of the radius or diameter; or
	+ coordinates of the endpoints of a diameter.
 | G.3 abG.4 abefG.12   |

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| **(12 days/6 blocks)** **Unit 3: Angle Relationships with Intersecting and Parallel Lines** |
| **Focus Topics:** **Applied Problems and Geometric Proofs in Angle Relationships with Intersecting and Parallel Lines****Intersecting an** | **Standards of Learning** |
| **The student will** use the relationships between angles formed by two lines intersected by a transversal toa) prove two or more lines are parallel; andb) solve problems, including practical problems, involving angles formed when parallel lines are intersected by a transversal.* Prove two or more lines are parallel given angle measurements expressed numerically or algebraically. (a)
* Prove two lines are parallel using deductive proofs given relationships between and among angles. (a)
* Solve problems by using the relationships between pairs of angles formed by the intersection of two parallel lines and a transversal including corresponding angles, alternate interior angles, alternate exterior angles, same-side (consecutive) interior angles, and same-side (consecutive) exterior angles. (b)
* Solve problems, including practical problems, involving intersecting and parallel lines. (b)

**The student will*** Construct and justify the constructions of
1. a perpendicular to a given line from a point not on the line;
2. a perpendicular to a given line at a given point on the line; and
3. a line parallel to a given line through a point not on the given line; (g)

**May Require Additional Review*** 8.5 The student will use the relationships among pairs of angles that are vertical angles, adjacent angles, supplementary angles, and complementary angles to determine the measure of unknown angles.
 | G.2 abG.4 cdg SOL 8.5 Unit 4 |

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| **(8 days/ 4 blocks)** **Unit 4: Angle Relationships in Circles** |
| **Focus Topics:** **Applied Problems and Modeling in Geometry Angle Relationships in Circles** | **Standards of Learning** |
| **The student will** solve problems, including practical problems, by applying properties of circles. This will include determininga) angle measures formed by intersecting chords, secants, and/or tangents;* Solve problems, including practical problems, by applying properties of circles. (a, b, c, d)
* Determine angle measures and arc measures associated with
* two intersecting chords;
* two intersecting secants;
* an intersecting secant and tangent;
* two intersecting tangents; and
* central and inscribed angles. (a)
 | G.11 a  |

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|  **(8 days/4 blocks)****Unit 5: Triangle Relationships**  |
| **Focus Topics:****Applied Problems and Modeling in Geometry Triangle Relationships** | **Standards of Learning** |
| **The student,** given information concerning the lengths of sides and/or measures of angles in triangles, will solve problems, including practical problems. This will include* Given information about the lengths of sides and/or measures of angles in triangles, solve problems, including practical problems. (a, b, c, d)
* Order the sides of a triangle by their lengths when given information about the measures of the angles. (a)
* Order the angles of a triangle by their measures when given information about the lengths of the sides. (b)
* Given the lengths of three segments, determine whether a triangle could be formed. (c)
* Given the lengths of two sides of a triangle, determine the range in which the length of the third side must lie. (d)
 | G.5 abcd |

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| **(12 days/ 6 blocks)** **Unit 6: Congruent Triangles** |
| **Focus Topics:** **Geometric Arguments. Reasoning, and Proofs with Congruent Triangles** | **Standards of Learning** |
| **The student**, given information in the form of a figure or statement, **will** prove two triangles are congruent.* Prove two triangles congruent given relationships among angles and sides of triangles expressed numerically or algebraically.
* Prove two triangles congruent given representations in the coordinate plane and using coordinate methods (distance formula and slope formula).
* Use direct proofs to prove two triangles congruent.
 | G.6 |

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| **(12 days/ 6 blocks)** **Unit 7: Similar Triangles** |
| **Focus Topics:****Geometric Arguments. Reasoning, and Proofs with Similar Triangles** | **Standards of Learning** |
| **Note:** In middle school, students solved problems, including practical problems, involving the relationship between corresponding sides and corresponding angles of similar quadrilaterals and triangles**.** Geometry should be the FIRST time that students will apply deductive reasoning and logic for direct proofs. Direct proofs are presented in different formats (typically two-column or paragraph) and employ definitions, postulates, theorems, and algebraic justifications including coordinate methods. **The student**, given information in the form of a figure or statement, **will** prove two triangles are similar.* Prove two triangles similar given relationships among angles and sides of triangles expressed numerically or algebraically.
* Prove two triangles similar given representations in the coordinate plane and using coordinate methods (distance formula and slope formula).
* Use direct proofs to prove triangles similar.
 | G.7 |

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|  **(18 days/ 9 blocks)****Unit 8: Right Triangles and Special Right Triangles** |
| **Focus Topics:****Applied Problems and Measurement in Right Triangles** | **Standards of Learning** |
| **Note: High** Priority for **Pre-AP Geometry** is connecting properties of Special Right Triangles and the Trigonometric Ratios to the **Unit Circle**.**Note: Low** priority for Geometry is memorizing properties of special triangles.**Note:** In middle school, students were taught to verify and apply the Pythagorean Theorem. Geometry should be the FIRST time that students learn about the Pythagorean Theorem’s Converse.**Various Levels of Mastery Review as needed:****Radicals*** Express the square root of a whole number in simplest form. (a)
* Express the principal square root of a monomial algebraic expression in simplest form where variables are assumed to have positive values. (a)
* Express the cube root of an integer in simplest form. (b)
* Simplify a numerical expression containing square or cube roots. (c)
* Add, subtract, and multiply two monomial radical expressions limited to a numerical radicand. (c)

The student will solve problems, including practical problems, involving right triangles. This will include applying1. properties of special right triangles; and
2. trigonometric ratios.
* Solve problems, including practical problems, using right triangle trigonometry and properties of special right triangles. (a, b, c)
* Solve for missing lengths in geometric figures, using properties of 45°-45°-90° triangles where rationalizing denominators may be necessary. (b)
* Solve for missing lengths in geometric figures, using properties of 30°-60°-90° triangles where rationalizing denominators may be necessary. (b).
* Solve problems, including practical problems, involving right triangles with missing side lengths or angle measurements, using sine, cosine, and tangent ratios. (c)

The student will solve problems, including practical problems, involving right triangles. This will include applying1. the Pythagorean Theorem and its converse;
* Solve problems, including practical problems, using right triangle trigonometry and properties of special right triangles. (a, b, c)
* Determine whether a triangle formed with three given lengths is a right triangle. (a)

**The Unit Circle – for Pre-AP Geometry ONLY**The student will develop and apply the properties of the unit circle in degrees for all functions.* Define the six circular trigonometric functions of an angle in standard position.
* Apply the properties of the unit circle to determine trigonometric function values of special angles and their related angles in both degrees and radians without using a graphing utility.
* Apply the properties of the unit circle to convert between special angles expressed in radians and degrees, without using a graphing utility.

**May Require Additional Review**8.9ab The student will verify the Pythagorean Theorem; and apply the Pythagorean Theorem. | A.3abc(Units 8 and 9)G.8 bcG.8aT.2SOL 8.9abUnit 3 |

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|  **(8 days/4 blocks)** **Unit 9: Segments in Circles** |
| **Focus Topics:****Applied Problems and Measurement of Segments in Circles****Measurement** | **Standards of Learning** |
| **The student will** solve problems, including practical problems, by applying properties of circles. This will include determiningb) lengths of segments formed by intersecting chords, secants, and/or tangents.* Solve problems, including practical problems, by applying properties of circles. (a, b, c, d)
* Determine segment lengths associated with:
	+ two intersecting chords;
	+ two intersecting secants;
	+ an intersecting secant and tangent; and
	+ two intersecting tangents. (b)
 | G.11 b |

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| **(8/4 blocks)** **Unit 10: Quadrilaterals and Polygons** |
| **Focus Topics:****Applied Problems and Geometric Proofs with Quadrilaterals and Polygons** | **Standards of Learning** |
| **Note:** In middle school, students were taught to compare, and contrast quadrilaterals based on their properties; and determine unknown side lengths or angle measures of quadrilaterals. Geometry should be the FIRST time that students apply constructions to justify the properties of quadrilaterals.The student will verify and use properties of quadrilaterals to solve problems, including practical problems.* Solve problems, including practical problems, using the properties specific to parallelograms, rectangles, rhombi, squares, isosceles trapezoids, and trapezoids.
* Prove that quadrilaterals have specific properties, using coordinate and algebraic methods, such as the distance formula, slope, and midpoint formula.
* Prove the properties of quadrilaterals, using direct proofs.

The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the1. sum of the interior and/or exterior angles;
2. measure of an interior and/or exterior angle; and

c) number of sides of a regular polygon.* Solve problems, including practical problems, involving angles of convex polygons. (a, b, c)
* Determine the sum of the measures of the interior and exterior angles of a convex polygon. (a)
* Determine the measure of each interior and exterior angle of a regular polygon. (b)
* Determine angle measures of a regular polygon in a tessellation. (b) **(Could be done here or in Flex Unit)**
* Determine the number of sides of a regular polygon, given the measures of interior or exterior angles of the polygon. (c)

**The student will** construct and justify the constructions of h) an equilateral triangle, a square, and a regular hexagon inscribed in a circle.Construct and justify the  | G.9G.10 abcG.4 h |

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| **(10 days/ 5blocks)** **Unit 11: 2-D Figures – Area, Perimeter, and Similarity**  |
| **Focus Topics:****Measurement and Applied Problems with 2-D figures** | **Standards of Learning** |
| **Note:** In middle school, students were taught how changing one measured attribute of a rectangular prism affects the volume and surface area. Geometry should be the FIRST time that students apply ratio between dimensions of similar figures is a:b, areas is a2:b2.**Note:** In middle school, students were taught solve problems, including practicalproblems, involving circumference and area of a circle . Geometry should be the FIRSTtime that students learn about the arc length and area of sectors.**The student will** solve problems, including practical problems, by applying properties of circles. This will include determiningc) arc length; andd) area of a sector.* Solve problems, including practical problems, by applying properties of circles. (a, b, c, d)
* Calculate the length of an arc of a circle. (c)
* Calculate the area of a sector. (d)

**The student** will apply the concepts of similarity to two-dimensional geometric figures. This will includea) comparing ratios between lengths, perimeters, and areas of similar figures;b) determining how changes in one or more dimensions of a figure affect area of the figure;* Compare ratios between side lengths, perimeters, and areas given two similar figures. (a)
* Describe how changes in one or more dimensions affect other derived measures (perimeter, area) of a figure. (b)

**May Require Additional Review*** 8.10 The student will solve area and perimeter problems, including practical problems, involving composite plane figures.
 | G.11 cdG.14 abUnit 5 |

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| **(10 days/ 5 blocks)** **Unit 12: 3-D Figures** |
| **Focus Topics:****Measurement and Applied Problems with 3-D Figures** | **Standards of Learning** |
| **Note:** In middle school, students were taught solve problems, including practical problems, involving volume and surface area of cones and square-based pyramids Geometry should be the FIRST time that students learn about hemispheres, spheres, pyramids with triangular, and hexagonal bases.**The student will** use surface area and volume of three-dimensional objects to solve practical problems.* Determine the surface area of cylinders, prisms, pyramids, cones, hemispheres, and spheres, using the appropriate formulas.
* Determine the volume of cylinders, prisms, pyramids, cones, hemispheres, and spheres, using the appropriate formulas.
* Solve problems including practical problems, involving surface area and volume of cylinders, prisms, pyramids, cones, hemispheres, and spheres, as well as composite three-dimensional figures.
* Solve problems, including practical problems, involving the lateral area of circular cylinders, prisms, and regular pyramids.
* Given information about a three-dimensional figure such as length of a side, area of a face, or volume, determine missing information.

**Note:** In middle school, students were taught how changing one measured attribute of a rectangular prism affects the volume and surface area. Geometry should be the FIRST time that students apply ratio between dimensions of similar figures is a:b, areas is a2:b2, and volumes is a3:b3.**The student** will apply the concepts of similarity to two- or three-dimensional geometric figures. This will includea) comparing ratios between lengths, perimeters, areas, and volumes of similar figures;b) determining how changes in one or more dimensions of a figure affect area and/or volume of the figure;c) determining how changes in area and/or volume of a figure affect one or more dimensions of the figure; andd) solving problems, including practical problems, about similar geometric figures.* Compare ratios between side lengths, perimeters, areas, and volumes, given two similar figures. (a)
* Describe how changes in one or more dimensions affect other derived measures (perimeter, area, surface area, and volume) of a figure. (b)
* Describe how changes in one or more measures (perimeter, area, surface area, and volume) affect other measures of a figure. (c)
* Solve real-world problems involving measured attributes of similar figures. (d)

**May Require Additional Review*** 8.6a The student will solve problems, including practical problems, involving volume and surface area of cones and square-based pyramids; and
* 8.6b The student will describe how changing one measured attribute of a rectangular prism affects the volume and surface area.
* 8.8The student will construct a three-dimensional model, given the top or bottom, side, and front views.
 | G.13G.14 abcdUnit 5 |

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| **(2 days/ 1 block)** **A Floating Unit: Symmetry** |
| **Focus Topics:****Transformational Symmetry** | **Standards of Learning** |
| **The student will** use the relationships between angles formed by two lines intersected by a transversal to1. investigating symmetry and determining whether a figure is symmetric with respect to a line or a point
* Determine whether a figure has point symmetry, line symmetry, both, or neither. (c)
 | G.3 c |

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| **(2 days / 1 block)** **B. Floating Unit: Tessellations** |
| **Focus Topics:****Applied Problems and Modeling in Geometry** | **Standards of Learning** |
| The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining theb) measure of an interior and/or exterior angle; and  * Solve problems, including practical problems, involving angles of convex polygons. (a, b, c)
* Determine the measure of each interior and exterior angle of a regular polygon. (b)
* Determine angle measures of a regular polygon in a tessellation. (b)
 | G.10 b |

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| **(4-6 days/ 2-3 blocks)** **C. Floating Unit: Transformations** |
| **Focus Topics:****Transformational Geometry** | **Standards of Learning** |
| **Note:** In middle school, students were taught when given a polygon to apply transformations, to include translations, reflections, and dilations, in the coordinate plane. Geometry should be the FIRST time that students apply combinations of transformations.**The student will** use the relationships between angles formed by two lines intersected by a transversal to1. Determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.
* Given an image and preimage, identify the transformation or combination of transformations that has/have occurred. Transformations include:
* a translation;
* a reflection over any horizontal or vertical line or the lines *y* = *x* or *y* = −*x*;
* a clockwise or counter clockwise rotation of 90°, 180°, 270°, or 360° on a coordinate grid where the center of rotation is limited to the origin; and
* a dilation from a fixed point on a coordinate grid. (d)

**May Require Additional Review*** 8.6a Given a polygon, the student will apply transformations, to include

 translations, reflections, and dilations, in the coordinate plane.* 8.7b The student will identify practical applications of transformations.
 | G.3 dSOL 8.7bUnit 4  |

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| **(2 blocks)****SOL Review** |