Anthony Wayne Local Schools
Course of Study
Geometry

Anthony Wayne Local Schools Mathematics Belief Statements

All Generals will experience an innovative and engaging curriculum with instruction that is personalized, promotes creativity and application, and provides real-world experiences that facilitate deeper learning.

AWLS believes Mathematics instruction should:

- identify skill gaps for individual students and work to close them
- include engaging learning activities where all learners can grow through productive struggle.
- develop strong number sense with the ability to manipulate numbers and perform mental math with an emphasis on subitizing
- provide scenarios where real world problems help to provide a path towards being future ready students.
- develop strong mathematical modeling and reasoning skills that continually build on prior knowledge.
- encourage students to be risk takers, demonstrate resilience and grit, while solving complex mathematical problems.
- encourage flexibility, creativity, and communication while working collaboratively with peers.
- include consistent and cohesive academic vocabulary through all grade-levels that is utilized by both teachers and students

Geometry Course Description:

Geometry is a course, which includes an in-depth analysis of plane, solid, and coordinate geometry as they relate to both abstract mathematical concepts as well as real-world problem situations. Topics include logic and proof, parallel lines and polygons, area, volume, similarity and congruence, trigonometry, and circles. Emphasis will be placed on developing critical thinking skills as they relate to logical reasoning and argument. Students will be required to use different technological tools and manipulatives to discover and explain much of the course content. A scientific calculator is required for this course.

Honors Geometry Course Description:

Honors Geometry is a course, which includes an in-depth analysis of plane, solid, and coordinate geometry as they relate to both abstract mathematical concepts as well as real-world problem situations. Topics include logic and proof, parallel lines and polygons, area, volume, similarity and congruence, trigonometry, and circles. Emphasis will be placed on developing critical thinking skills as they relate to logical reasoning and argument. Students will be required to use different technological tools and manipulatives to discover and explain much of the course content. A scientific calculator is required for this course.

Geometry and Honors Geometry

Domain/ Conceptual Category	Standard	
Geometry	G.CO.1	**Experiment with transformations in the plane.** **G.CO.1** Know precise definitions of ray, angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and arc length.
Geometry	G.CO.2	**Experiment with transformations in the plane.** **G.CO.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.
Geometry	G.CO.3	**Experiment with transformations in the plane.** **G.CO.3** Identify the symmetries of a figure, which are the rotations and reflections that carry it onto itself. **a.** Identify figures that have line symmetry; draw and use lines of symmetry to analyze properties of shapes. **b.** Identify figures that have rotational symmetry; determine the angle of rotation, and use rotational symmetry to analyze properties of shapes.
Geometry	G.CO.4	**Experiment with transformations in the plane.** **G.CO.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
Geometry	G.CO.5	**Experiment with transformations in the plane.** **G.CO.5** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using items such as graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
Geometry	G.CO.6	**Understand congruence in terms of rigid motions.** **G.CO.6** Use geometric descriptions of rigid motionsG 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.G
Geometry	G.CO.7	**Understand congruence in terms of rigid motions.** **G.CO.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.
Geometry	G.CO.8	**Understand congruence in terms of rigid motions.** **G.CO.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
Geometry	G.CO.9	**Prove geometric theorems both formally and informally using a variety of methods.** **G.CO.9** Prove and apply theorems about lines and angles. *Theorems include but are not restricted to the following: 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.*
Geometry	G.CO.10	**Prove geometric theorems both formally and informally using a variety of methods.** **G.CO.10** Prove and apply theorems about triangles. *Theorems include but are not restricted to the following: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
Geometry	G.CO.11	**Prove geometric theorems both formally and informally using a variety of methods.** **G.CO.11** Prove and apply theorems about parallelograms. *Theorems include but are not restricted to the following: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*
Geometry	G.CO.12	**Make geometric constructions.** **G.CO.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.*
Geometry	G.CO.13	**Make geometric constructions.** **G.CO.13** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
Geometry	G.CO.14	**Classify and analyze geometric figures.** **G.CO.14** Classify two-dimensional figures in a hierarchy based on properties.

Geometry	G.SRT.1	**Understand similarity in terms of similarity transformations.** **G.SRT.1** Verify experimentally the properties of dilationsG 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.
Geometry	G.SRT.2	**Understand similarity in terms of similarity transformations.** **G.SRT.2** Given two figures, use the definition of similarity in terms of similarity transformationsG 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.
Geometry	G.SRT.3	**Understand similarity in terms of similarity transformations.** **G.SRT.3** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
Geometry	G.SRT.4	**Prove and apply theorems both formally and informally involving similarity using a variety of methods.** **G.SRT.4** Prove and apply theorems about triangles. *Theorems include but are not restricted to the following: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
Geometry	G.SRT.5	**Prove and apply theorems both formally and informally involving similarity using a variety of methods.** **G.SRT.5** Use congruence and similarity criteria for triangles to solve problems and to justify relationships in geometric figures that can be decomposed into triangles.
Geometry	G.SRT.6	**Define trigonometric ratios, and solve problems involving right triangles.** **G.SRT.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.
Geometry	G.SRT.7	**Define trigonometric ratios, and solve problems involving right triangles.** **G.SRT.7** Explain and use the relationship between the sine and cosine of complementary angles.
Geometry	G.SRT.8	**Define trigonometric ratios and solve problems involving right triangles.** **G.SRT.8** Solve problems involving right triangles.★ **a.** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems if one of the two acute angles and a side length is given. (G, M2)

Geometry	G.SRT.11	**Apply trigonometry to general triangles.** **G.SRT.11** (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles, e.g., surveying problems, resultant forces.
Geometry	G.C.1	**Understand and apply theorems about circles.** **G.C.1** Prove that all circles are similar using transformational arguments.
Geometry	G.C.2	**Understand and apply theorems about circles.** **G.C.2** Identify and describe relationships among angles, radii, chords, tangents, and arcs and use them to solve problems. *Include the relationship between central, inscribed, and circumscribed angles and their intercepted arcs; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
Geometry	G.C.3	**Understand and apply theorems about circles.** **G.C.3** Construct the inscribed and circumscribed circles of a triangle; prove and apply the property that opposite angles are supplementary for a quadrilateral inscribed in a circle.
Geometry	G.C.5	**Find arc lengths and areas of sectors of circles.** **G.C.5** Find arc lengths and areas of sectors of circles. **a.** Apply similarity to relate the length of an arc intercepted by a central angle to the radius. Use the relationship to solve problems. **b.** Derive the formula for the area of a sector, and use it to solve problems.
Geometry	G.GPE.1	**Translate between the geometric description and the equation for a conic section.** **G.GPE.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.
Geometry	G.GPE.4	**Use coordinates to prove simple geometric theorems algebraically and to verify specific geometric statements.** **G.GPE.4** Use coordinates to prove simple geometric theorems algebraically and to verify geometric relationships algebraically, including properties of special triangles, quadrilaterals, and circles. *For example, determine if a figure defined by four given points in the coordinate plane is a rectangle; determine if a specific point lies on a given circle.* (G, M2)
Geometry	G.GPE.5	**Use coordinates to prove simple geometric theorems algebraically and to verify specific geometric statements.** **G.GPE.5** Justify 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.
Geometry	G.GPE.6	**Use coordinates to prove simple geometric theorems algebraically and to verify specific geometric statements.** **G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
Geometry	G.GPE.7	**Use coordinates to prove simple geometric theorems algebraically and to verify specific geometric statements.** **G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★
Geometry	G.GMD.1	**Explain volume formulas, and use them to solve problems.** **G.GMD.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, and volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
Geometry	G.GMD.3	**Explain volume formulas, and use them to solve problems.** **G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★
Geometry	G.GMD.4	**Visualize relationships between two-dimensional and three-dimensional objects.** **G.GMD.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.
Geometry	G.GMD.5	**Understand the relationships between lengths, areas, and volumes.** **G.GMD.5** Understand how and when changes to the measures of a figure (lengths or angles) result in similar and non-similar figures.
Geometry	G.GMD.6	**Understand the relationships between lengths, areas, and volumes.** **G.GMD.6** When figures are similar, understand and apply the fact that when a figure is scaled by a factor of k, the effect on lengths, areas, and volumes is that they are multiplied by k, $k2$, and $k3$, respectively.
Geometry	G.MG.1	**Apply geometric concepts in modeling situations.** **G.MG.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.★
Geometry	G.MG.2	**Apply geometric concepts in modeling situations.** **G.MG.2** Apply concepts of density based on area and volume in modeling situations, e.g., persons per square mile, BTUs per cubic foot.★

Geometry	G.MG.3	**Apply geometric concepts in modeling situations.** **G.MG.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.★
Statistics and Probability	S.CP.1	**Understand independence and conditional probability, and use them to interpret data.** **S.CP.1** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).★
Statistics and Probability	S.CP.2	**Understand independence and conditional probability, and use them to interpret data.** **S.CP.2** Understand that two events A and B are independent if and only if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.★
Statistics and Probability	S.CP.3	**Understand independence and conditional probability, and use them to interpret data.** **S.CP.3** Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.★
Statistics and Probability	S.CP.4	**Understand independence and conditional probability, and use them to interpret data.** **S.CP.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*★
Statistics and Probability	S.CP.5	**Understand independence and conditional probability, and use them to interpret data.** **S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*★
Statistics and Probability	S.CP.6	**Use the rules of probability to compute probabilities of compound events in a uniform probability model.** **S.CP.6** Find the conditional probability of A given B as the fraction of B’s outcomes that also belong to A, and interpret the answer in terms of the model.★

Statistics and Probability	S.CP.7	**Use the rules of probability to compute probabilities of compound events in a uniform probability model.** **S.CP.7** Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.★
Statistics and Probability	S.CP.8	**Use the rules of probability to compute probabilities of compound events in a uniform probability model.** (+) **S.CP.8** Apply the general Multiplication Rule in a uniform probability modelG, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.★ (G, M2)
Statistics and Probability	S.CP.9	**Use the rules of probability to compute probabilities of compound events in a uniform probability model.** **S.CP.9** (+) Use permutations and combinations to compute probabilities of compound events and solve problems.★ (G, M2)
Algebra	A.CED.4	**Create equations that describe numbers or relationships.** **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.★ **a.** Focus on formulas in which the variable of interest is linear or square. *For example, rearrange Ohm's law V=IR to highlight resistance R, or rearrange the formula for the area of a circle A=(π)r2to highlight radius r.* (A1) **b.** Focus on formulas in which the variable of interest is linear. *For example, rearrange Ohm's law V=IR to highlight resistance R.* (M1) **c.** Focus on formulas in which the variable of interest is linear or square. *For example, rearrange the formula for the area of a circle A=(π)r2 to highlight radius r.* (M2) **d.** While functions will often be linear, exponential, or quadratic, the types of problems should draw from more complicated situations. (A2, M3)
Number and Quantity	N.Q.3	**Reason quantitatively and use units to solve problems.** **N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.★
Number and Quantity	N.Q.1	**Reason quantitatively and use units to solve problems.** **N.Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.★

Number and Quantity	N.Q.2	**Reason quantitatively and use units to solve problems.** **N.Q.2** Define appropriate quantities for the purpose of descriptive modeling.★
Functions	F.IF.7	**Analyze functions using different representations.** **F.IF.7** Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.★ **a.** Graph linear functions and indicate intercepts. (A1, M1) **b.** Graph quadratic functions and indicate intercepts, maxima, and minima. (A1, M2) **c.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (A2, M3) **d.** Graph polynomial functions, identifying zeros, when factoring is reasonable, and indicating end behavior. (A2, M3) **e.** Graph simple exponential functions, indicating intercepts and end behavior. (A1, M1) **f.** Graph exponential functions, indicating intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. (A2, M3) **g.** (+) Graph rational functions, identifying zeros and asymptotes, when factoring is reasonable, and indicating end behavior. (A2, M3) **h.** (+) Graph logarithmic functions, indicating intercepts and end behavior.
Algebra	A.SSE.1	**Interpret the structure of expressions.** **A.SSE.1.** Interpret expressions that represent a quantity in terms of its context.★ **a.** Interpret parts of an expression, such as terms, factors, and coefficients. **b.** Interpret complicated expressions by viewing one or more of their parts as a single entity.
Algebra	A.CED.2	**Create equations that describe numbers or relationships.** **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★ **a.** Focus on applying linear and simple exponential expressions. (A1, M1) **b.** Focus on applying simple quadratic expressions. (A1, M2) **c.** Extend to include more complicated function situations with the option to graph with technology. (A2, M3)
Algebra	A.SSE.2	**Interpret the structure of expressions.** **A.SSE.2** Use the structure of an expression to identify ways to rewrite it. *For example, to factor 3x(x – 5) + 2(x – 5), students should recognize that the "x – 5" is common to both expressions being added, so it simplifies to (3x+2)(x – 5); or see x4– y4 as (x2)2– (y2)2, thus recognizing it as a difference of squares*

		that can be factored as (x2– y2)(x2+y2).
Algebra	A.SSE.3	**Write expressions in equivalent forms to solve problems.** **A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ **a.** Factor a quadratic expression to reveal the zeros of the function it defines. **b.** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **c.** Use the properties of exponents to transform expressions for exponential functions. *For example, 8t can be written as 23t.*
Algebra	A.REI.7	**Solve systems of equations.** **A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line y = –3x and the circle $x^2 + y^2 = 3$.*
Statistics and Probability	S.ID.5	**Summarize, represent, and interpret data on two categorical and quantitative variables.** **S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.★