



Anthony Wayne Local Schools
Course of Study
Eighth Grade Mathematics

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

8th Grade Mathematics Course Description

8th Grade Math: For students in 8th grade, this course will focus on solving linear equations by solving, graphing and writing. It will also cover linear functions by comparing them, solving systems of equations, and identifying function relationships. In the statistics unit, the focus will be on comparing bivariate data. In the category of real numbers; students will learn about exponents, roots, scientific notation, and rational and irrational numbers. Within the angles and triangles unit, students will engage in the Pythagorean Theorem. The transformations unit includes similar figures. Lastly, volume is discussed with cylinders, cones, and spheres.

Domain/ Conceptual Category	Standard	Standard Statement
Big Idea #1: Solving Linear Equations		
Expressions and Equations	8.EE.7	<p>Analyze and solve linear equations and pairs of simultaneous linear equations.</p> <p>8.EE.7 Solve linear equations in one variable.</p> <p>a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).</p> <p>b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.</p>
Big Idea #2: Graphing Linear Equations		
Expressions and Equations	8.EE.5	<p>Understand the connections between proportional relationships, lines, and linear equations.</p> <p>8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p>
Expressions and Equations	8.EE.6	<p>Understand the connections between proportional relationships, lines, and linear equations.</p> <p>8.EE.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.</p>
Functions	8.F.4	<p>Use functions to model relationships between quantities.</p> <p>8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p>

Big Idea #3: Writing Linear Equations

Expressions and Equations	8.EE.6	<p>Understand the connections between proportional relationships, lines, and linear equations.</p> <p>8.EE.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.</p>
Functions	8.F.4	<p>Use functions to model relationships between quantities.</p> <p>8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p>

Big Idea #4: Systems of Equations

Expressions and Equations	8.EE.7	<p>Analyze and solve linear equations and pairs of simultaneous linear equations.</p> <p>8.EE.7 Solve linear equations in one variable.</p> <p>a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).</p> <p>b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.</p>
Expressions and Equations	8.EE.8	<p>Analyze and solve linear equations and pairs of simultaneous linear equations.</p> <p>8.EE.8 Analyze and solve pairs of simultaneous linear equations graphically.</p> <p>a. Understand that the solution to a pair of linear equations in two variables corresponds to the point(s) of intersection of their graphs, because the point(s) of intersection satisfy both equations simultaneously.</p> <p>b. Use graphs to find or estimate the solution to a pair of two simultaneous linear equations in two variables. Equations should include all three solution types: one solution, no solution, and infinitely many solutions. Solve simple cases by inspection. <i>For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.</i></p>

		c. Solve real-world and mathematical problems leading to pairs of linear equations in two variables. <i>For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</i> (Limit solutions to those that can be addressed by graphing.)
Big Idea #5: Comparing Linear Functions		
Expressions and Equations	8.EE.8	Analyze and solve linear equations and pairs of simultaneous linear equations. 8.EE.8 Analyze and solve pairs of simultaneous linear equations graphically. c. Solve real-world and mathematical problems leading to pairs of linear equations in two variables. <i>For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</i> (Limit solutions to those that can be addressed by graphing.)
Expressions and Equations	8.EE.5	Understand the connections between proportional relationships, lines, and linear equations. 8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i>
Functions	8.F.2	Define, evaluate, and compare functions. 8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</i>
Functions	8.F.4	Use functions to model relationships between quantities. 8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
Big Idea #6: Function Relationships		

Functions	8.F.1	<p>Define, evaluate, and compare functions.</p> <p>8.F.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. Function notation is not required in Grade 8.</p>
Functions	8.F.3	<p>Define, evaluate, and compare functions.</p> <p>8.F.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. <i>For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1, 1)$, $(2, 4)$ and $(3, 9)$, which are not on a straight line.</i></p>
Functions	8.F.5	<p>Use functions to model relationships between quantities.</p> <p>8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph, e.g., where the function is increasing or decreasing, linear or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.</p>
Big Idea #7: Bivariate Data		
Statistics and Probability	8.SP.1	<p>Investigate patterns of association in bivariate data.</p> <p>8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering; outliers; positive, negative, or no association; and linear association and nonlinear association. (GAISE Model, steps 3 and 4)</p>
Statistics and Probability	8.SP.2	<p>Investigate patterns of association in bivariate data.</p> <p>8.SP.2 Understand that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. (GAISE Model, steps 3 and 4)</p>
Statistics and Probability	8.SP.3	<p>Investigate patterns of association in bivariate data.</p> <p>8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. <i>For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.</i> (GAISE Model, steps 3 and 4)</p>

Statistics and Probability	8.SP.4	<p>Investigate patterns of association in bivariate data.</p> <p>8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. <i>For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</i></p>
Functions	8.F.4	<p>Use functions to model relationships between quantities.</p> <p>8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p>
Big Idea #8: Exponents (& Roots)		
Expressions and Equations	8.EE.1	<p>Work with radicals and integer exponents.</p> <p>8.EE.1 Understand, explain, and apply the properties of integer exponents to generate equivalent numerical expressions. <i>For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.</i></p>
Expressions and Equations	8.EE.2	<p>Work with radicals and integer exponents.</p> <p>8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.</p>
Big Idea #9: Scientific Notation		
Expressions and Equations	8.EE.3	<p>Work with radicals and integer exponents.</p> <p>8.EE.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. <i>For example, estimate the population of the United States as 3×10^8; and the population of the world as 7×10^9; and determine that the world population is more than 20 times larger.</i></p>

Expressions and Equations	8.EE.4	<p>Work with radicals and integer exponents.</p> <p>8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities, e.g., use millimeters per year for seafloor spreading. Interpret scientific notation that has been generated by technology.</p>
Big Idea #10: Rational & Irrational Numbers		
The Number System	8.NS.1	<p>Know that there are numbers that are not rational, and approximate them by rational numbers.</p> <p>8.NS.1 Know that real numbers are either rational or irrational. Understand informally that every number has a decimal expansion which is repeating, terminating, or is non-repeating and non-terminating.</p>
The Number System	8.NS.2	<p>Know that there are numbers that are not rational, and approximate them by rational numbers.</p> <p>8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions, e.g., π^2. <i>For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</i></p>
Expressions and Equations	8.EE.5	<p>Understand the connections between proportional relationships, lines, and linear equations.</p> <p>8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p>
Big Idea #11: Angles		
Geometry	8.G.5	<p>Understand congruence and similarity using physical models, transparencies, or geometry software.</p> <p>8.G.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. <i>For example, arrange three copies of the same</i></p>

		<i>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.</i>
Big Idea #12: Pythagorean Theorem		
Geometry	8.G.6	Understand and apply the Pythagorean Theorem. 8.G.6 Analyze and justify an informal proof of the Pythagorean Theorem and its converse.
Geometry	8.G.7	Understand and apply the Pythagorean Theorem. 8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
Geometry	8.G.8	Understand and apply the Pythagorean Theorem. 8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
Big Idea #13: Transformations		
Geometry	8.G.1	Understand congruence and similarity using physical models, transparencies, or geometry software. 8.G.1 Verify experimentally the properties of rotations, reflections, and translations (include examples both with and without coordinates). a. Lines are taken to lines, and line segments are taken to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.
Geometry	8.G.2	Understand congruence and similarity using physical models, transparencies, or geometry software. 8.G.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. (Include examples both with and without coordinates.)

Geometry	8.G.3	<p>Understand congruence and similarity using physical models, transparencies, or geometry software.</p> <p>8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.</p>
Geometry	8.G.4	<p>Understand congruence and similarity using physical models, transparencies, or geometry software.</p> <p>8.G.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. (Include examples both with and without coordinates.)</p>
<p>Big Idea #14: Volume</p>		
Geometry	8.G.9	<p>Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</p> <p>8.G.9 Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres.</p>