

Waverly Math Curriculum 7-8

<u>7th Grade</u>	<u>8th Grade</u>
<u>Number and Operations: Understand derived quantities</u>	<u>Number and Operations: Understand real number concepts</u>
<u>Number and Operations: Understand and solve problems involving rates, ratios, and proportions</u>	<u>Number and Operations: Solve problems</u>
<u>Number and Operations: Recognize irrational numbers</u>	<u>Algebra: Understand the concept of non-linear functions using basic examples</u>
<u>Number and Operations: Compute with rational numbers</u>	<u>Algebra: Understand and represent quadratic functions</u>
<u>Algebra: Understand & apply directly proportional relationships & relate to linear relationships</u>	<u>Algebra: Recognize, represent, and apply common formulas</u>
<u>Algebra: Understand and represent linear functions</u>	<u>Algebra: Understand solutions & solve equations, simultaneous equations, & linear inequalities</u>
<u>Algebra: Understand and solve problems about inversely proportional relationships</u>	<u>Geometry: Understand and use the Pythagorean Theorem</u>
<u>Algebra: Apply basic properties of real numbers in algebraic contexts</u>	<u>Geometry: Solve problems about geometric figures</u>
<u>Algebra: Combine algebraic expressions and solve equations</u>	<u>Geometry: Understand concepts of volume and surface area, and apply formulas</u>
<u>Geometry: Draw and construct geometric objects</u>	<u>Geometry: Visualize solids</u>
<u>Geometry: Understand the concept of similar polygons, and solve related problems</u>	<u>Geometry: Understand and apply concepts of transformation and symmetry</u>
<u>Data and Probability: Represent data and interpret</u>	<u>Data and Probability: Data and Probability</u>
<u>Data and Probability: Compute statistics about datasets</u>	<u>Data and Probability: Understand probability concepts for simple and compound events</u>

7th Grade Math Curriculum

7th Grade Math	The Student Will	Assessments/Resources:
Number and Operations Understand derived quantities	Understand derived quantities such as density, velocity, and weighted averages. (N.ME.07.01)	
	Solve problems involving derived quantities. (N.FL.07.02)	
Understand and solve problems involving rates, ratios, and proportions	Calculate rates of change including speed. (N.FL.07.03)	
	Convert ratio quantities between different systems of units such as feet per second to miles per hour. (N.MR.07.04)	
	Solve simple proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$; know how to see patterns about proportional situations in tables. (N.FL.07.05)	
Recognize irrational numbers	Understand the concept of square root and cube root, and estimate using calculators. (N.MR.07.06)	

Compute with rational numbers	Solve problems involving operations with integers. (N.FL.07.07)	
	Add, subtract, multiply and divide negative rational numbers. (N.FL.07.08)	
	Estimate results of computations with rational numbers. (N.FL.07.09)	
Algebra Understand & apply directly proportional relationships & relate to linear relationships	Recognize when information given in a table, graph, or formula suggests a proportional or linear relationship. (A.PA.07.01)	
	Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations. (A.RP.07.02)	
	Given a directly proportional or linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate $y = kx$ for specific values, given k , e.g., weight vs. volume of water, base cost	

plus cost per unit.
(A.PA.07.03)

For directly proportional or linear situations, solve applied problems using graphs and equations, e.g., the heights and volume of a container with uniform cross-section, height of water in a tank being filled at a constant rate, degrees Celsius and degrees Fahrenheit, distance and time under constant speed.
(A.PA.07.04)

Understand and use directly proportional relationships of the form $y = mx$, and distinguish from linear relationships of the form $y = mx + b$, b non-zero; understand that in a directly proportional relationships between two quantities one quantity is a constant multiple of the other quantity.
(A.PA.07.05)

Understand and represent linear functions	Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change. (A.PA.07.06)	
	Represent linear functions in the form $y = x + b$, $y = mx + b$, and graph, interpreting slope and y-intercept. (A.PA.07.07)	
	Know that the solution to a linear equation corresponds to the point at which its graph crosses the x-axis. (A.FO.07.08)	
Understand and solve problems about inversely proportional relationships	Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant, e.g., the length and width of a rectangle with fixed area and that an inversely proportional relationship is of the form $y = k/x$ where k is some non-zero	

	number. (A.PA.07.09)	
	Know that the graph of $y = k/x$ is not a line; know its shape; and know that it crosses neither the x nor the y axis. (A.RP.07.10)	
Apply basic properties of real numbers in algebraic contexts	Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition. (A.PA.07.11)	
Combine algebraic expressions and solve equations	Add, subtract, and multiply simple algebraic expressions of the first degree, e.g., $(92x + 8y) - 5x + y$, or $-2x(5x - 4)$, and justify using properties of real numbers. (A.FO.07.12)	
	From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions. (A.FO.07.13)	

<p>Geometry Draw and construct geometric objects</p>	<p>Use a ruler and other tools to draw squares, rectangles, triangles and parallelograms with specified dimensions. (G.SR.07.01)</p>	
	<p>Use compass and straightedge to perform basic geometric constructions the perpendicular bisector of a segment, an equilateral triangle, and the bisector of an angle; understand informal justifications. (G.SR.07.02)</p>	
<p>Understand the concept of similar polygons, and solve related problems</p>	<p>Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concept of similar figures and scale factor. (G.TR.07.03)</p>	
	<p>Solve problems about similar figures and scale drawings. (G.TR.07.04)</p>	

	<p>Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments. (G.TR.07.05)</p>	
	<p>Understand and use the fact that when two triangles are similar with scale factor of r, their areas are related by a factor of r^2. (G.TR.07.06)</p>	
<p>Data and Probability Represent data and interpret</p>	<p>Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots and select appropriate representation to address specific questions. (D.RE.07.01)</p>	

	Create and interpret scatter plots and use an estimated line of best fit to answer questions about the data. (D.AN.07.02)	
Compute statistics about datasets	Calculate and interpret relative frequencies and cumulative frequencies for given data sets. (D.AN.07.03)	
	Find and interpret the median, quartiles, and interquartile ranges of a given set of data. (D.AN.07.04)	

8th Grade Math Curriculum

8 th Grade Math	The Student Will	Assessments/Resources:
Number and Operations Understand real number concepts	Understand the meaning of a square root of a number and its connection to the square whose area is the number; understand the meaning of a cube root and its connection to the volume of a cube. (N.ME.08.01)	
	Understand meanings for zero and negative integer exponents. (N.ME.08.02)	

Understand that in decimal form, rational numbers either terminate or eventually repeat and that calculators truncate or round repeating decimals; locate rational numbers on the number line; know fraction forms of common repeating decimals, e.g., $0.\overline{1} = 1/9$; $0.\overline{3} = 1/3$.
(N.ME.08.03)

Understand that irrational numbers are those that cannot be expressed as the quotient of two integers, and cannot be represented by terminating or repeating decimals; approximate the position of familiar irrational numbers, (e.g., $\sqrt{2}$, $\sqrt{3}$, π) on the number line.
(N.ME.08.04)

Estimate and solve problems with square roots and cube roots using calculators. (N.ME.08.05)

	<p>Find square roots of perfect squares and approximate the square roots of non-perfect squares by locating between consecutive integers, e.g., $\sqrt{130}$ is between 11 and 12. (N.ME.08.06)</p>	
Solve problems	<p>Understand percent increase and percent decrease in both sum and product form, e.g., 3% increase of a quantity x is $x + .03x = 1.03x$. (N.MR.08.07)</p>	
	<p>Solve problems involving percent increases and decreases. (N.MR.08.08)</p>	
	<p>Solve problems involving compounded interest or multiple discounts. (N.MR.08.09)</p>	
	<p>Calculate weighted averages such as course grades, consumer price indices, and sports ratings. (N.MR.08.10)</p>	
	<p>Solve problems involving ratio units such as miles per hour, dollars per pound, or persons per square mile. (N.MR.08.11)</p>	

<p>Algebra</p> <p>Understand the concept of non-linear functions using basic examples</p>	<p>Identify and represent linear functions, quadratic functions, and other simple functions including inverse functions: $y = k/x$, cubics ($y = ax$ to the third power) roots ($y = \sqrt{x}$), and exponentials ($y = a$ to the x power, $a > 0$), using tables, graphs, and equations. (A.RP.08.01)</p>	
	<p>For basic functions, e.g., simple quadratics, direct and indirect variation, and population growth, describe how changes in one variable affect the others. (A.PA.08.02)</p>	
	<p>Recognize basic functions in a problem context; e.g., area of a circle is πr^2, volume of a sphere is $\frac{4}{3}\pi r^3$, and represent them using tables, graphs, and formulas. (A.PA.08.03)</p>	
	<p>Use the vertical line test to determine if a graph represents a function in one variable. (A.RP.08.04)</p>	

<p>Understand and represent quadratic functions</p>	<p>Relate quadratic functions in factored form and vertex form to their graphs and vice versa; in particular, note that solutions of a quadratic equation are the x-intercepts of the corresponding quadratic function. (A.RP.08.05)</p>	
	<p>Graph factorable quadratic functions, finding where the graph intersects the x axis and the coordinates of the vertex; use words "parabola" and "roots"; include functions in vertex form and those with leading coefficient -1; $y = x$ to the 2nd power - 36, $y = (x - 2)$ to the second power - 9; $y = -x$ to the second power; $y = -(x - 3)$ to the second power. (A.RP.08.06)</p>	

<p>Recognize, represent, and apply common formulas</p>	<p>Recognize and apply the common formulas: $(a + b)$ to the 2nd power = a to the 2nd power + $2ab$ + b to the 2nd power; $(a - b)$ to the 2nd power = a to the 2nd power - $2ab$ + b to the 2nd power; $(a + b)(a - b) = a$ to the 2nd power - b to the 2nd power and represent these geometrically. (A.FO.08.07)</p>	
	<p>Factor simple quadratic expressions with integer coefficients, e.g., x to the 2nd power + $6x + 9$, x to the 2nd power + $2x - 3$ and x to the 2nd power - 4; solve simple quadratic equations, e.g., x to the 2nd power = 16 or x to the 2nd power = 5 (by taking square roots); x to the 2nd power - $x - 6 = 0$, x to the 2nd power - $2x = 15$ (by factoring); verify solutions by evaluation. (A.FO.08.08)</p>	
	<p>Solve applied problems involving simple quadratic equations. (A.FO.08.09)</p>	
<p>Understand solutions & solve equations, simultaneous equations, & linear inequalities</p>	<p>Understand that to solve the equations $f(x) = g(x)$ means to find all values of x for which the equation is true, e.g., determine whether a given value, or values from a given set, is a solution of an equation (0 is a solution of $3x$ to the 2nd power + $2 = 4x + 2$, but 1 is not a solution). (A.FO.08.10)</p>	

	Solve simultaneous linear equations in two variables by graphing, by substitution, and by linear combination; estimate solutions using graphs; include examples with no solutions and infinitely many solutions. (A.FO.08.11)	
	Solve linear inequalities in one and two variables, and graph the solution sets. (A.FO.08.12)	
	Set up and solve applied problems involving simultaneous linear equations and linear inequalities. (A.FO.08.13)	
Geometry Understand and use the Pythagorean Theorem	Understand at least one proof of the Pythagorean Theorem; use the Pythagorean Theorem and its converse to solve applied problems including perimeter; area, and volume problems. (G.GS.08.01)	
	Find the distance between two points on the coordinate plane using the distance formula; recognize that the distance formula is an application of the Pythagorean Theorem. (G.LO.08.02)	
Solve problems about geometric figures	Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems. (G.SR.08.03)	
	Find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles). (G.SR.08.04)	
	Solve applied problems involving areas of triangles, quadrilaterals, and circles. (G.SR.08.05)	

Understand concepts of volume and surface area, and apply formulas	Know the volume formulas for generalized cylinders((area of base) x height), generalized cones and pyramids ($\frac{1}{3}$ (area of base) x height) and spheres ($\frac{4}{3} \cdot (\text{radius})^3$) and apply them to solve problems. (G.SR.08.06)	
	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders. (G.SR.08.07)	
Visualize solids	Sketch a variety of two-dimensional representations of three-dimensional solids including orthogonal views (top, front, and side), picture views (projective or isometric), and nets, use such two-dimensional representations to help solve problems. (G.SR.08.08)	
Understand and apply concepts of transformation and symmetry	Understand the definition of a dilations from a point in the plane, and relate it to the definition of similar polygons. (G.TR.08.09)	

	Understand and use reflective and rotational Symmetries of two-dimensional shapes, and relate them to transformations to solve problems. (G.TR.08.10)	
Data and Probability	Determine which measure of central technology (mean, median, mode) best represents a data set, e.g., salaries, home prices for answering certain questions; justify the choice made. (D.AN.08.01)	
	Recognize practices of collecting and displaying data which may bias the presentation of analysis. (D.AN.08.02)	
Understand probability concepts for simple and compound events	Compute relative frequencies from a table of experimental results for a repeated event, and be able to answer questions about the result, using relationship of probability to relative frequency. (D.PR.08.03)	

	<p>Apply the Basic Counting Principle to find total number of outcomes possible for independent and dependent events, and calculate the probabilities using organized lists or tree diagrams. (D.PR.08.04)</p>	
	<p>Understand the relationship of probability to relative frequency. (D.PR.08.05)</p>	
	<p>Understand the difference between independent and dependent events, and recognize common misconceptions involving probability, e.g., Alice rolls a 6 on a die three times in a row; she is just as likely to roll a 6 on the fourth roll as she was on any previous roll. (D.PR.08.06)</p>	

Compute relative frequencies from a table of experimental results for a repeated event; understand the relationship of experimental probability to relative frequency; answer questions regarding the results.
(D.AN.08.07)