



Grade Level: 9

Content: Algebra 1

Year: 2022-2023

**Course Description/Rationale**

This course builds on a student’s understanding of expressions, equations, inequalities, and linear functions learned in 8th grade. Operations with polynomials, factoring, radicals, exponents, quadratic functions, and quadratic equations complete the course. (2 HS credits)

Name of Unit	Time Frame	Essential Learning Target	Standard(s)
Unit 1 - Algebraic Expressions	2.5 weeks	<ul style="list-style-type: none"> <li>• <b>Students can simplify, interpret, and evaluate algebraic expressions</b></li> </ul>	<p>Interpret expressions that represent a quantity in terms of its context</p> <p>a. Interpret parts of an expression, such as terms, factors, and coefficients</p> <p>b. Interpret complicated expressions by viewing one or more of their parts as a single entity (A-SSE.A.1)</p> <p>Use the structure of an expression to identify ways to rewrite it (A-SSE.A.2)</p>
Unit 2 - Linear Equations	3 weeks	<ul style="list-style-type: none"> <li>• <b>Students can solve equations</b></li> <li>• Students can solve equations, including literal equations.</li> </ul>	Solve linear equations and inequalities in one variable, including equations with coefficients represented by

			<p>letters (A-REI.B.3)</p> <p>Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. (A-REI.A.1)</p> <p>Create equations and inequalities in one variable and use them to solve problems (A-CED.A.1)</p> <p>Rearrange formulas to highlight a quantity of interests, using the same reasoning as in solving equations. (A-CED.A.4)</p>
Unit 3 - Inequalities	2 weeks	<ul style="list-style-type: none"> <li>• <b>Students can write, graph, and solve an inequality from a context or number line.</b></li> </ul>	<p>Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters (A-REI.B.3)</p> <p>Represent constraints by</p>

			<p>equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in modeling context. (A-CED.A.3)</p>
Unit 4 - Functions	1.5 weeks	<ul style="list-style-type: none"> <li>• <b>Students can identify, evaluate, create, and graph functions.</b></li> </ul>	<p>Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If <math>f</math> is a function and <math>x</math> is an element of its domain, then <math>f(x)</math> denotes the output of <math>f</math> corresponding to the input <math>x</math>. The graph of <math>f</math> is the graph of the equation <math>y = f(x)</math>. (F-IF.A.1)</p> <p>Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (F-IF.A.2)</p>
Unit 5 - Linear Functions	3 weeks	<ul style="list-style-type: none"> <li>• <b>Students can graph and write equations of linear functions from multiple representations.</b></li> </ul>	<p>Create equations in two or more variables to</p>

represent relationships between quantities; graph equations on coordinate axes with labels and scales.  
(A-CED.A.2)

Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve or line  
(A-REI.D.10)

Write a function that describes a relationship between two quantities  
(F-FB.A.1)

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship  
(F-IF.B.4)

Calculate and interpret the average rate of change of a function  
(presented

			<p>symbolically or as a table) over a specified interval. Estimate the rate of change from a graph (F-IF.B.6)</p> <p>Graph linear and quadratic functions and show intercepts, maxima, and minima. (F-IF.C.7a)</p> <p>Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function (F-IF.C.8)</p> <p>Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). (F-LE.A.2)</p>
Unit 6 - Systems of Equations	3 weeks	<ul style="list-style-type: none"> <li>• <b>Students can create and solve a system of equations graphically and algebraically</b></li> </ul>	<p>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>

(A-CED.A.2)

Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions (A-REI.C.5)

Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables. (A-REI.C.6)

Explain why the x-coordinates of the points where the graphs of the equations  $y = f(x)$  and  $y = g(x)$  intersect are the solutions of the equation  $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. (A-REI.D.11)

Represent constraints by equations or inequalities, and by systems of

			<p>equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. (A-CED.A.3)</p>
<p>Unit 7 - Systems of Inequalities</p>	<p>2 weeks</p>	<ul style="list-style-type: none"> <li>• <b>Students can create and graph systems of inequalities</b></li> </ul>	<p>Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in modeling context (A-CED.A.3)</p> <p>Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes (A-REI.D.12)</p>
<p>Unit 8 - Radicals and Exponents</p>	<p>3 weeks</p>	<ul style="list-style-type: none"> <li>• <b>Students can simplify radical expressions.</b></li> </ul>	<p>Rewrite expressions involving radicals and rational exponents using the properties of</p>

			<p>exponents. (N-RN.A.2)</p> <p>Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. (N-RN.B.3)</p>
Unit 9 - Quadratic Expressions	3 weeks	<ul style="list-style-type: none"> <li>• <b>Students can factor algebraic expressions and polynomials</b></li> <li>• Students can perform operations with polynomials</li> </ul>	<p>Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials</p>
Unit 10 - Quadratic Functions and Equations	3 weeks	<ul style="list-style-type: none"> <li>• <b>Students can graph and explain characteristics of a quadratic function</b></li> <li>• <b>Students can solve quadratic equations</b></li> <li>• Students can produce equivalent forms of a quadratic function from multiple representations</li> <li>• Students can model and compare quadratic functions in multiple representations</li> </ul>	<p>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (A-CED.A.2)</p> <p>For a function that models a relationship between two quantities,</p>

interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. (F-IF.B.4)

Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (F-IF.B.5)

Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. (F-IF.B.6)

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts,

			<p>maxima, and minima. (F-IF.B.7a)</p>
<p>Unit 11 - Exponents and Exponential Functions</p>	<p>2-3 weeks</p>	<ul style="list-style-type: none"> <li>• <b>Students can graph, model, explain, and compare characteristics of exponential functions</b></li> <li>• Students can graph and explain characteristics of exponential functions</li> <li>• Students can model and compare with exponential functions</li> </ul>	<p>Rewrite expressions involving radicals and rational exponents using the properties of exponents (N-RN.A.1)</p> <p>Use the properties of exponents to interpret expressions for exponential functions. (F-IF.C.8)</p> <p>Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p> <p>c. Recognize situations in which a quantity grows or decays</p>

			by a constant percent rate per unit interval relative to another. (F-LE.A.1)
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