

## **Algebra 1 Big Ideas**

### Course Description:

Prerequisite: Pre-Algebra

The main goal of Algebra 1 is to develop fluency in working with linear equations. Students will extend their experiences with tables, graphs, and equations and solve linear equations and solve linear equations and inequalities and systems of linear equations and inequalities. Students will extend their knowledge of the number system to include irrational numbers. Students will generate equivalent expressions and use formulas. Students will simplify polynomials and begin to study quadratic relationships. Students will use technology and models to investigate and explore mathematical ideas and relationships and develop multiple strategies for analyzing complex situations. Students will analyze situations verbally, numerically, graphically, and symbolically. Students will apply mathematical skills and make meaningful connections to life's experiences.

Algebra 1 students learn to use and understand the following five fundamental concepts:

1. Simplify expressions
2. Solve equations/inequalities
3. Use numerical representations
4. Use graphical representations
5. Use algebraic notation

Through the topics presented in this course students solidify understandings introduced in Pre-Algebra and extend these concepts. In addition, several new topics are introduced. A student completing both Pre-Algebra and Algebra 1 should be confident and competent in using algebra to represent and analyze real situations.

The following matrix lists topics covered in Algebra 1 and is designed to show flow of understanding for students as they progress from other math classes to this course. The two columns following each big idea detail how this topic should be covered. "Solidify" indicates students have seen this concept in a previous course (see the Pre-Algebra core); it is not intended to be an exhaustive list of all topics previously covered. These concepts may need to be reviewed and should be used throughout the course so that students have mastery by the end of this class. "Develop" indicates new aspects of the big idea presented in this course and it is expected that students successfully completing Algebra 1 will have facility with these new topics. The USOE Core is linked to big ideas and sub topics, and should be referenced for clarification of concepts. In addition, a blank column is included for textbook alignment. It is suggested that each school match this curriculum with their text book and other instructional resources for alignment.

Indicators have been created in outline form for each "develop" topic and are included as an attachment to this document. These indicators provide clarification for each topic.

<u>Big Idea</u>	<u>Solidify</u>	<u>Develop</u>	<u>State Core Correlation</u>	<u>Textbook Alignment</u>
Number Systems	<ul style="list-style-type: none"> <li>• Use operations with rational numbers, including integers.</li> <li>• Use order of operations</li> <li>• Compare and order real numbers</li> </ul>	<ul style="list-style-type: none"> <li>• Define a rational number as a point on the number line that can be expressed as the ratio of two integers, and points that cannot be so expressed as irrational.</li> <li>• Classify numbers as rational or irrational, knowing that rational numbers can be expressed as terminating or repeating decimals and irrational numbers can be expressed as non-terminating, non-repeating decimals.</li> <li>• Classify <math>\pi</math> and square roots of non-perfect square numbers as irrational.</li> <li>• Place rational and irrational numbers on a number line between two integers.</li> </ul>	<ul style="list-style-type: none"> <li>• 1.1.a</li> <li>• 1.1.b</li> <li>• 1.1.c</li> <li>• 1.1.d</li> </ul>	
		<ul style="list-style-type: none"> <li>• Simplify, add, subtract, multiply, and divide expressions with square roots (radicals)</li> </ul>	<ul style="list-style-type: none"> <li>• 1.2.a</li> </ul>	
		<ul style="list-style-type: none"> <li>• Evaluate and simplify numerical expressions containing rational numbers and square roots using the order of operations.</li> </ul>	<ul style="list-style-type: none"> <li>• 1.2.b</li> </ul>	
		<ul style="list-style-type: none"> <li>• Calculate the measures of the sides of a right triangle using the Pythagorean Theorem.</li> </ul>	<ul style="list-style-type: none"> <li>• 1.2.d</li> </ul>	
Rate of change	<ul style="list-style-type: none"> <li>• Identify rates and ratios.</li> <li>• Find the slope from a graph or a table</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the slope of a line when given points, a graph, or an equation.</li> <li>• Identify horizontal (zero slope) and vertical lines (undefined slope) given the equations or slopes.</li> </ul>	<ul style="list-style-type: none"> <li>• 2.1.a</li> <li>• 2.1.b</li> </ul>	

		<ul style="list-style-type: none"> <li>• Interpret the slope of a linear function as a rate of change in real-world situations.</li> <li>• Solve real-world problems involving constant rates of change</li> </ul>	<ul style="list-style-type: none"> <li>• 2.2.d</li> <li>• 3.2.b</li> </ul>	
<p>Writing &amp; Graphing Linear Equations and Inequalities</p>	<ul style="list-style-type: none"> <li>• Graph ordered pairs</li> <li>• Graph from a table</li> <li>• Write equations to model situations</li> </ul>	<ul style="list-style-type: none"> <li>• Write algebraic expressions or equations to generalize visual patterns, numerical patterns, relations, data sets, or scatter plots.</li> <li>• Determine the effect of changes in slope or y-intercept in <math>y = mx + b</math>.</li> <li>• Identify horizontal and vertical lines given the equations or slopes.</li> <li>• Determine and explain the meaning of slopes and intercepts using real-world examples.</li> <li>• Represent linear equations in slope-intercept form <math>y = mx + b</math> and standard form, <math>Ax + By = C</math>.</li> <li>• Write the equation of a line when given two points or the slope and a point on the line.</li> <li>• Approximate the equation of a line given the graph of a line.</li> <li>• Identify the <math>x</math>- and <math>y</math>-intercepts from an equation or graph of a line or a table of values.</li> <li>• Graph linear relations and inequalities by plotting points, by finding <math>x</math>- and <math>y</math>- intercepts, or by using the slope and any point on the line.</li> </ul>	<ul style="list-style-type: none"> <li>• 2.2.a</li> <li>• 2.1.c</li> <li>• 2.1.b</li> <li>• 2.1.d</li> <li>• 2.2.b</li> <li>• 2.3.a</li> <li>• 2.3.b</li> <li>• 2.3.c</li> <li>• 2.3.d</li> </ul>	

		<ul style="list-style-type: none"> <li>Estimate the equation of a line of best fit to make and test conjectures.</li> <li>Predict <math>y</math>-values for given <math>x</math>-values when appropriate using a line fitted to bivariate numerical data.</li> </ul>	<ul style="list-style-type: none"> <li>4.2.a</li> <li>4.2.c</li> </ul>	
Solving Linear Equations and Inequalities	<ul style="list-style-type: none"> <li>Solve one- &amp; two-step equations and inequalities</li> <li>Determine scale factors</li> <li>Write proportions</li> </ul>	<ul style="list-style-type: none"> <li>Compute solutions to problems, represent answers in exact form, and determine the reasonableness of answers.</li> <li>Solve single-variable linear equations and inequalities algebraically and graphically.</li> <li>Solve equations (literal equations) for a specified variable.</li> <li>Solve proportions that include algebraic first-degree expressions.</li> </ul>	<ul style="list-style-type: none"> <li>1.2.c</li> <li>3.2.a</li> <li>3.2.c</li> <li>3.3.d</li> </ul>	
Quadratics	<ul style="list-style-type: none"> <li>Take square roots of perfect squares</li> </ul>	<ul style="list-style-type: none"> <li>Solve quadratic equations that can be simplified to the form <math>x^2 = a</math> where <math>a \geq 0</math> by taking square roots.</li> </ul>	<ul style="list-style-type: none"> <li>3.5.a</li> </ul>	
		<ul style="list-style-type: none"> <li>Solve quadratic equations using factoring.</li> </ul>	<ul style="list-style-type: none"> <li>3.5.b</li> </ul>	
		<ul style="list-style-type: none"> <li>Write a quadratic equation when given the solutions.</li> </ul>	<ul style="list-style-type: none"> <li>3.5.c</li> </ul>	

Systems of Equations & Inequalities	<ul style="list-style-type: none"> <li>• Graph a line &amp; an inequality</li> </ul>	<ul style="list-style-type: none"> <li>• Solve systems of two linear equations graphically and algebraically with and without technology.</li> <li>• Determine the number of possible solutions for a system of two linear equations.</li> <li>• Graph a system of linear inequalities and identify the solution.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.3.a</li> <li>• 3.3.b</li> <li>• 3.3.c</li> </ul>	
Data & Statistics	<ul style="list-style-type: none"> <li>• Collect and organize data in tables and graphs</li> <li>• Mean, Median &amp; Mode</li> </ul>	<ul style="list-style-type: none"> <li>• Collect, record, organize, and display a set of data with at least two variables.</li> <li>• Determine whether the relationship between two variables is approximately linear or non-linear by examination of a scatter plot.</li> <li>• Characterize the relationship between two linear related variables as having positive, negative, or approximately zero correlation.</li> <li>• Estimate the equation of a line of best fit to make and test conjectures.</li> <li>• Interpret the slope and y-intercept of a line through data.</li> <li>• Predict y-values for given x-values when appropriate using a line fitted to bivariate numerical data.</li> </ul>	<ul style="list-style-type: none"> <li>• 4.1.a</li> <li>• 4.1.b</li> <li>• 4.1.c</li> <li>• 4.2.a</li> <li>• 4.2.b</li> <li>• 4.2.c</li> </ul>	

Polynomials	<ul style="list-style-type: none"> <li>• Identify like terms</li> <li>• Use the Distributive Property</li> <li>• Simplify algebraic expressions using exponent rules</li> </ul>	<ul style="list-style-type: none"> <li>• Simplify and evaluate monomial expressions and formulas.</li> <li>• Add and subtract polynomials.</li> <li>• Multiply monomials by a polynomial.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.1.a</li> <li>• 3.1.b</li> <li>• 3.1.c</li> </ul>	
		<ul style="list-style-type: none"> <li>• Multiply binomials.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.1.d</li> </ul>	
		<ul style="list-style-type: none"> <li>• Simplify the quotient of monomials using positive exponents.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.1.e</li> </ul>	
		<ul style="list-style-type: none"> <li>• Find the greatest common monomial factor of a polynomial.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.4.a</li> </ul>	
		<ul style="list-style-type: none"> <li>• Factor trinomials with integer coefficients of the form <math>x^2 + bx + c</math>.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.4.b</li> </ul>	
		<ul style="list-style-type: none"> <li>• Factor the difference of two squares and perfect square trinomials.</li> </ul>	<ul style="list-style-type: none"> <li>• 3.4.c</li> </ul>	
Nonlinear Relationships	<ul style="list-style-type: none"> <li>• Identify linearity from a table or a graph</li> </ul>	<ul style="list-style-type: none"> <li>• Distinguish between linear and non-linear functions by examining a table, equation, or graph.</li> </ul>	<ul style="list-style-type: none"> <li>• 2.2.c</li> </ul>	