ST. VRAIN VALLEY SCHOOLS
academic excellence by design

Algebra 1
Year at a Glance
2014-2015

Course Description:

Algebra 1 focuses on four critical areas: (1) using units and relationships between quantities; (2) reasoning with equations and expressions; (3) analyzing and using linear, exponential, and quadratic functions; and (4) interpreting and displaying data using descriptive statistics. These concepts and associated skills are aligned with the Colorado Academic Standards for mathematics, incorporating 21st century skills and postsecondary and workforce readiness competencies.

Prerequisite(s):

Eighth Grade Mathematics or Advanced Seventh Grade Mathematics and teacher recommendation or Seventh Grade Mathematics and teacher recommendation

Credit:

1.0 (year class)

Mathematics
Grade Level Expectations at a Glance

Standard	Grade Level Expectation
High School	
1. Number Sense, Properties, and Operations	1. The complex number system includes real numbers and imaginary numbers 2. Quantitative reasoning is used to make sense of quantities and their relationships in problem situations
2. Patterns, Functions, and Algebraic Structures	1. Functions model situations where one quantity determines another and can be represented algebraically, graphically, and using tables 2. Quantitative relationships in the real world can be modeled and solved using functions 3. Expressions can be represented in multiple, equivalent forms 4. Solutions to equations, inequalities and systems of equations are found using a variety of tools
3. Data Analysis, Statistics, and Probability	1. Visual displays and summary statistics condense the information in data sets into usable knowledge

ST. VRAIN VALLEY SCHOOLS
academic excellence by design

Algebra 1
Year at a Glance
2014-2015

Note: The Year at a Glance reflects the order of the Unit Plans and does not necessarily reflect the precise instructional order of evidence outcomes.

Algebra 1 Families of Functions *The following evidence outcomes apply to the families of functions that are the Major Work of Algebra 1: Linear, Exponential, and Quadratic Functions*	
CO Code	Evidence Outcome
2.1.a.ii	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
2.1.a.iii	Demonstrate that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
2.1.b.i	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.
2.1.b.ii	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
2.1.b.iii	Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from a graph.
2.1.c.i	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
2.1.c.vi.3	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
2.1.d.i.1	Determine an explicit expression, a recursive process, or steps for calculation from a context.
2.1.e.i	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k, and find the value of k given the graphs.
2.1.e.ii	Experiment with cases and illustrate an explanation of the effects on the graph using technology.
2.3.a.i.1	Interpret parts of an expression, such as terms, factors, and coefficients.
2.3.a.i.2	Interpret complicated expressions by viewing one or more of their parts as a single entity.
2.4.a.i	Create equations and inequalities in one variable and use them to solve problems.
2.4.a.ii	Create equations in two or more variables to represent relationships between quantities and graph equations on coordinate axes with labels and scales.
2.4.b.i	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.
2.4.e.i	Explain 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.
2.4.e.ii	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

Algebra 1
Year at a Glance
2014-2015

	the solutions approximately.
3.1.b.ii.1	Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

1st Semester	
CO Code	Evidence Outcome
1.1.b.i	Explain why the sum or product of two rational numbers is rational.
1.1.b.ii	Explain why the sum of a rational number and an irrational number is irrational.
1.1.b.iii	Explain why the product of a nonzero rational number and an irrational number is irrational.
1.2.a.i.1	Choose and interpret units consistently in formulas.
1.2.a.ii	Define appropriate quantities for the purpose of descriptive modeling ***(with PFL)***.
1.2.a.iii	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
1.2.a.iv	Describe factors affecting take-home pay and calculate the impact (PFL)
1.2.a.v	Design and use a budget, including income (net take-home pay) and expenses (mortgage, car loans, and living expenses) to demonstrate how living within your means is essential for a secure financial future (PFL)
2.4.a.iii	Represent constraints by equations or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
2.4.a.iv	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
2.4.b.i	Explain each step in solving a simple ***(linear)*** equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.
2.4.c.i	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
2.1.a.i	Explain that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range.
2.1.c.iii	Graph piecewise-defined functions including step functions.
2.1.c.ii	Graph linear functions and show intercepts.
2.1.c.iii	Graph absolute value functions.

ST. VRAIN VALLEY SCHOOLS
academic excellence by design

Algebra 1
Year at a Glance
2014-2015

2.2.a.i.1	Prove that linear functions grow by equal differences over equal intervals.
2.2.a.i.2	Identify situations in which one quantity changes at a constant rate per unit interval relative to another.
2.2.a.ii	Construct linear functions, including arithmetic sequences, given a graph, a description of a relationship, or two input-output pairs.
2.2.b.i	Interpret the parameters in a linear function in terms of a context.
3.1.b.ii.2	Informally assess the fit of a function by plotting and analyzing residuals.
3.1.b.ii.3	Fit a linear function for a scatter plot that suggests a linear association.
3.1.c.i	Interpret the slope and the intercept of a linear model in the context of the data.
3.1.c.ii	Using technology, compute and interpret the correlation coefficient of a linear fit.
3.1.c.iii	Distinguish between correlation and causation.
2.4.a.iii	Represent constraints by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
2.4.d.i	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.
2.4.d.ii	Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.
2.4.e.iii	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.

2nd Semester	
CO Code	Evidence Outcome
2.2.a.i.1	Prove that exponential functions grow by equal factors over equal intervals.
2.2.a.i.3	Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
2.2.a.ii	Construct exponential functions, including geometric sequences, given a graph, a description of a relationship, or two input-output pairs.
2.2.b.i	Interpret the parameters in an exponential function in terms of a context.
2.3.b.i.3	Use the properties of exponents to transform expressions for exponential functions.

ST. VRAIN VALLEY SCHOOLS
academic excellence by design

Algebra 1
Year at a Glance
2014-2015

2.1.c.ii	Graph quadratic functions and show intercepts, maxima, and minima.
2.1.c.iii	Graph square root, cube root functions.
2.1.c.vi.1	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
2.2.a.iii	Use graphs and tables to describe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
2.3.a.ii	Use the structure of an expression to identify ways to rewrite it.
2.3.b.i.1	Factor a quadratic expression to reveal the zeros of the function it defines.
2.3.b.i.2	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
2.3.c.i	Explain 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.
2.3.d.ii	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
2.4.c.ii.1	Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
2.4.c.ii.2	Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.
2.4.c.ii.3	Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
1.2.a.i.2	Choose and interpret the scale and the origin in graphs and data displays.
1.2.a.ii	Define appropriate quantities for the purpose of descriptive modeling.
3.1.a.i	Represent data with plots on the real number line (dot plots, histograms, and box plots).
3.1.a.ii	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
3.1.a.iii	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
3.1.b.i	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.