












High School - Algebra 1

North Boone CUSD 200

UNITS (11/11 SELECTED)

SUGGESTED DURATION

 Unit 1: Quantities and Modeling	<i>24 lessons</i>
 Unit 2: Functions	<i>18 lessons</i>
 Unit 3: Linear Functions, Equations, & Inequalities	<i>28 lessons</i>
 Unit 4: Statistical Models	<i>5 lessons</i>
 Unit 5: Linear Systems & Piecewise-Defined Functions	<i>24 lessons</i>
 Unit 6: Polynomial Operations	<i>13 lessons</i>
 Unit 7: Quadratic Equations & Modeling Part 1	<i>7 lessons</i>
 Unit 8: Quadratic Functions	<i>13 lessons</i>
 Unit 9: Exponential Relationships Part 1	<i>4 lessons</i>
 Unit 10: Quadratic Equations & Modeling Part 2	<i>15 lessons</i>
 Unit 11: Exponential Relationships Part 2	<i>9 lessons</i>

Unit 1: Quantities and Modeling

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

SSE.A.1a: Interpret parts of an expression, such as terms, factors, and coefficients.

CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

REI.A.1: 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.

CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.

PRIORITY STANDARDS

A.REI.1	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.SSE.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A.CED.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

Unit 1: Quantities and Modeling

High School - Algebra 1 - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Quantitative reasoning and algebraic models are used to solve real-world problems.</p> <p>Algebraic equations and inequalities are used to model real-world problems. Solving these equations and inequalities provides helpful information for solving the real-world problem.</p> <p>Creating and solving equations in Algebra develops the reasoning process and the ability to explain reasoning.</p> <p>Seeing and interpreting structure in Algebraic expressions facilitates the reasoning process</p>	<p>How do you use quantitative reasoning to solve real-world problems?</p> <p>How can you use algebraic models to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key vocabulary associated with quantities and modeling, including: conversion factor, equation, rate, ratio, solution of an equation, literal equation, algebraic expression, coefficient, expression, inequality, numerical expression, term	<ul style="list-style-type: none">• Correctly use key vocabulary associated with quantities and modeling in discussion and explanations of problem solving,• Solve an equation in one variable• Use algebraic models to solve real-world problems• Use significant digits when reporting the results of calculations involving measurement• Interpret algebraic expressions in terms of their context• Use an equation to model and solve a real-world problem• Rewrite formulas and literal equations• Write and solve an inequality that represents a real-world situation• Solve compound inequalities and graph the solution set

Unit 2: Functions

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

IF.B.4: 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.

IF.A.1: 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 f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

PRIORITY STANDARDS

IF.A.1	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 f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.
IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Unit 2: Functions

High School - Algebra 1 - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Most relations that describe real-world situations are functions.</p> <p>A real-world functional relationship can be modeled using a two-variable equation or rule, a graph, a table, or a word description.</p>	<p>How can you use functions to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with functions, including: continuous graph, dependent variable, discrete graph, domain, function, function notation, independent variable, range, relation• What function notation is• How to use functions to model real-world situations	<ul style="list-style-type: none">• Correctly use key concepts and vocabulary associated with functions in discussions and explanations of problem solving• Describe a relationship given a graph• Sketch a graph given a description of a relationship• Represent relations and functions• Graph functions

Unit 3: Linear Functions, Equations, & Inequalities

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

REI.D.11: 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. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

REI.D.12: 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.

IF.B.6: 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.

IF.C.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

BF.B.3: 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 (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

LE.A.1b: Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

IF.C.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

PRIORITY STANDARDS

IF.B.6	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.
CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Unit 3: Linear Functions, Equations, & Inequalities

High School - Algebra 1 - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Many real-world relationships can be represented by linear functions where the rate of change is the slope of the line.</p> <p>Real-world situations can be modeled by the slope-intercept form of linear equations when the rate of change and an initial value are known. When the rate of change and a non-initial value are known, the point-slope form of linear equations models that real-world situation.</p> <p>Real world problems involving linear relationships can be solved by writing and solving an equation or inequality that models the problem.</p> <p>Graphs are frequently used when analyzing raw data from an experiment. If the data can be fitted to a linear model, then drawing valid conclusions from the experiment is straightforward. Many nonlinear functions can be modeled using a linear relationship known as the line of best fit.</p>	<p>How can you use a linear function to solve real-world problems?</p> <p>How can you use different forms of linear equations to solve real-world problems?</p> <p>How can you use linear equations and inequalities to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with linear functions, equations, and inequalities, including: continuous function, discrete function, linear function, slope, family of functions, parameter, parent function, linear inequality in two variables, solution of an inequality in two variables• Ways in which the graph of a linear function can be transformed	<ul style="list-style-type: none">• Correctly use key concepts and vocabulary associated with linear functions in discussions and explanations of problem solving• Identify and use intercepts in linear relationships• Relate rate of change and slope in linear relationships• Represent a linear function in a way that reveals its slope and y-intercept• Represent a linear function in a way that reveals its slope and a point on its graph

Unit 3: Linear Functions, Equations, & Inequalities

High School - Algebra 1 - Last Updated on June 4, 2019

Students will know (Knowledge):	Students will be able to (Skills):
	<ul style="list-style-type: none">• Write a linear equation in standard form given properties of the line including its slope and points on the line• Compare linear functions that are represented in different ways• Model linear relationships given limited information• Use functions to solve one-variable equations• Write and graph linear inequalities in two variables

Unit 4: Statistical Models

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

ID.B.6b: Informally assess the fit of a function by plotting and analyzing residuals.

ID.B.6c: Fit a linear function for a scatter plot that suggests a linear association.

PRIORITY STANDARDS

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Existing data can be used to create a trend line which can be used in turn to make a prediction that fits the original data.</p> <p>Scatter plots provide an efficient way to present, analyze, and describe large quantities of data. As such, they are one of the most important applications of relations.</p>	<p>How can you use linear modeling and regressions to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with statistical models, including: correlation, line of best fit, linear regression, scatter plot	<ul style="list-style-type: none">• Correctly use key concepts and vocabulary associated with statistical models in discussions and explanations of problem solving• Describe the relationship between two variables and use it to make predictions• Use the linear regression function on a graphing calculator to find the line of best fit for a two-variable data set

Unit 5: Linear Systems & Piecewise-Defined Functions

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

REI.C.5: 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.

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

REI.D.12: 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.

IF.C.7b: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

PRIORITY STANDARDS

REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
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Unit 5: Linear Systems & Piecewise-Defined Functions

High School - Algebra 1 - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Many problem situations are more easily translated into two equations than one equation. Systems of linear equations can be solved by graphing, by substitution, by adding or subtracting, or by multiplying first.</p> <p>Graphing is an intuitive way to solve systems, and it visually reinforces the meaning of a solution.</p> <p>Once a problem situation is represented by equations, the solution can be found by graphing the equations and looking for the point of intersection.</p> <p>Piecewise-defined functions can be used to determine total cost for situations where rates change, such as when a cable service has a special introductory rate and then a higher rate.</p>	<p>How can you use a system of linear equations to solve real-world problems?</p> <p>How can you model with linear systems to solve real-world problems?</p> <p>How can you use piecewise defined functions to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none"> • Key concepts and vocabulary associated with linear systems and piecewise-defined functions, including: elimination method, substitution method, system of linear equations, system of linear inequalities, solution of a system of inequalities, absolute value equation, absolute-value function, mean, greatest integer function, piecewise function, step function • How piecewise-defined functions are different from other functions • The effects of parameter changes on the graph of $y = a x - h + k$ • Two ways to solve an absolute value inequality 	<ul style="list-style-type: none"> • Correctly use key concepts and vocabulary associated with linear systems and piecewise-defined functions in discussions and explanations of problem solving • Find the solution of a system of linear equations by graphing • Solve a system of linear equations by using substitution • Solve a system of linear equations by adding and subtracting • Solve a system of linear equations by using multiplication and elimination • Use systems of linear equations to model and solve real-world problems

Unit 5: Linear Systems & Piecewise-Defined Functions

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Students will know (Knowledge):	Students will be able to (Skills):
	<ul style="list-style-type: none">• Use systems of linear equations or inequalities to model and solve contextual problems• Solve a system of linear inequalities• Solve an absolute value equation

Unit 6: Polynomial Operations

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

SSE.A.1a: Interpret parts of an expression, such as terms, factors, and coefficients.

APR.A.1: 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.

PRIORITY STANDARDS

SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
APR.A.1	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.

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Polynomials can be used to model real-world quantities such as profit or loss.	How can you use adding and subtracting polynomials to solve real-world problems?
Multiplying polynomials has applications in fields such as business, engineering, and science.	How can you use multiplying polynomials to solve real-world problems?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">Key concepts and vocabulary associated with polynomial operations, including: binomial, degree of a polynomial, leading coefficient, monomial, polynomial, standard form of a polynomial, trinomial, difference of two squares, FOIL, perfect-square trinomialWhat polynomial expressions are and how to simplify them	<ul style="list-style-type: none">Correctly use key concepts and vocabulary associated with polynomial operations in discussion and explanations of problem solvingAdd polynomial expressionsSubtract polynomial expressionsMultiply polynomials by monomialsMultiply binomials and polynomialFind special products of binomials

Unit 7: Quadratic Equations & Modeling Part 1

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

SSE.B.3a: Factor a quadratic expression to reveal the zeros of the function it defines.

REI.B.4b: Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .

PRIORITY STANDARDS

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Real world situations involving topics such as height of an object thrown, velocity, and profit, can sometimes be modeled by factorable quadratic equations in standard form.	How can you use factoring a quadratic equation to solve real-world problems?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">Key concepts and vocabulary associated with quadratic equations and modeling, including: difference of two squares, perfect-square trinomial	<ul style="list-style-type: none">Correctly use key concepts and vocabulary associated with quadratic equations and modeling in discussions and explanations of problem solvingUse factoring to solve quadratic equations in standard form for which $a = 1$Use factoring to solve quadratic equations in standard form for which $a \neq 1$Use special products to aid in solving quadratic equations by factoring

Unit 8: Quadratic Functions

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

IF.B.4: 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.

IF.C.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

BF.B.3: 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 (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

APR.B.3: 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.

REI.B.4b: Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .

PRIORITY STANDARDS

Unit 8: Quadratic Functions

High School - Algebra 1 - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>The path of projectiles that are thrown, shot, or launched into the air and then fall to the earth follow the graph of a quadratic function.</p> <p>Quadratic functions are used to solve real-world problems with the dimensions of the problem representing a linear factor of the quadratic function and the solution to the problem representing the intercepts of the function.</p>	<p>How can you use the graph of a quadratic function to solve real-world problems?</p> <p>How can you use intercepts of a quadratic function to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with quadratic functions, including: axis of symmetry, parabola, quadratic function, standard form of a quadratic equation, vertex, Zero Product Property, zero of a function• The effect of the constant a on the graph of $f(x) = ax^2$• How the x-intercepts of a quadratic function and its linear factors are related	<ul style="list-style-type: none">• Correctly use key concepts and vocabulary associated with quadratic functions in discussions and explanations of problem solving• Obtain the graph of $a(x - h)^2 + k$ from the graph of $f(x) = x^2$• Change the vertex form of a quadratic function to standard form• Use the graph of a quadratic function to solve its related quadratic equation• Use the Zero Product Property to solve quadratic equations in factored form

Unit 9: Exponential Relationships Part 1

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

RN.A.1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

RN.A.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.

PRIORITY STANDARDS

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Rational Exponents can be changed into radicals when solving problems with a rational exponent in a formula.	How can you use rational exponents and radicals to solve real-world problems?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with exponential relationships, including: index, radical expression, radicand, rational exponent• How radicals and rational exponents are related	<ul style="list-style-type: none">• Correctly use key concepts and vocabulary in discussions and explanations of problem solving• Write a radical expression with a rational exponent?

Unit 10: Quadratic Equations & Modeling Part 2

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

REI.B.4a: 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.

REI.B.4b: Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .

REI.C.7: Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

SSE.B.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

LE.A.1b: Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

PRIORITY STANDARDS

CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
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Unit 10: Quadratic Equations & Modeling Part 2

High School - Algebra 1 - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Square roots, factoring, completing the square, and the quadratic formula are useful tools for solving equations written from real-world problems.</p> <p>Tables of values and graphing a model are useful real-world problem solving tools for seeing how the values of a function change as the x-values increase.</p>	<p>How can you use quadratic equations to solve real-world problems?</p> <p>How can you use linear, exponential, and quadratic models to solve real-world problems?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with quadratic equations and modeling, including: completing the square, discriminant, quadratic formula, square root, quadratic regression• The quadratic formula	<ul style="list-style-type: none">• Correctly use key concepts and vocabulary associated with quadratic equations and modeling in discussions and explanations of problem solving• Solve quadratic equations using square roots• Use completing the square to solve a quadratic equation• Use the quadratic formula to solve quadratic equations• Choose a method for solving a given quadratic equation• Solve a system of equations when one equation is linear and the other is quadratic• Use tables to recognize quadratic functions and use technology to create them• Determine whether a given data set is best modeled by a linear, quadratic, or exponential function

Unit 11: Exponential Relationships Part 2

High School - Algebra 1 - Last Updated on June 4, 2019

STANDARDS

CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

IF.C.7e: Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

LE.A.1c: Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

ID.B.6a: Fit a function to the data; use functions fitted to data to solve problems in the context of the data.

PRIORITY STANDARDS

CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
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DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Many real-world situations cannot be represented by linear functions. Exponential equations can be used to represent situations in which the output values increase or decrease by a constant ratio for each unit increase in the input value.	How can you use exponential equations to represent real-world situations?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">Key concepts and vocabulary associated with exponential relationships, including: exponential decay, exponential growth, exponential regression	<ul style="list-style-type: none">Correctly use key concepts and vocabulary associated with exponential relationships in discussions and explanations of problem solvingSolve equations involving variable exponentsUse exponential functions to model the increase or decrease of a quantity over timeUse exponential regression to model dataRecognize when to use a linear model or an exponential model