Algebra 1 Curriculum

Course Description: This class introduces students to fundamental algebraic skills such as: operations, algebraic expressions, solving equations, graphing, linear, quadratic, and exponential functions, and statistics. Students engage with relevant mathematical contexts to make math meaningful.

Unit 1 invites students to use tables, graphs, visuals, and equations to describe mathematical relationships. Students focus on equations and graphs in Unit 2 as they solve one- and two-variable equations and inequalities. They also revisit forms of linear equations when solving two-variable equations, which connects to equations of lines of best fit in Unit 3. Unit 3 also supports students in visualizing and analyzing one-variable and two-variable data.

Unit 4 introduces features of functions that students will attend to in later units (e.g., domain and range, key features). Unit 5 revisits the work of Unit 2 as students solve systems of linear equations and inequalities. Unit 6 deepens the work that students started with exponential functions in Unit 1, incorporating the language about functions from Unit 4. Unit 7 is the first of two units about quadratics, and focuses on the forms and key features of quadratic functions. The final unit of Algebra 1 (Unit 8) introduces several strategies for moving between forms of quadratic equations (e.g., factoring, completing the square, quadratic formula) to help highlight features of interest.

As students encounter challenging problems, and practice asking for help and a willingness to learn from others, they build the social emotional learning competencies of self-management, self awareness, relationship skills, and social awareness.

Grades: 8th Grade, 9th Grade

Course Resources & Materials: To be determined

Course Essential Questions:
How can we represent values using variables?
How can a real-world situation be translated into an algebraic equation?
What strategies can be used to solve and graph equations and inequalities?
How can you use functions to model and interpret real-world situations?
How can trends in data be analyzed using linear functions?
How can systems of equations be used to represent situations and solve problems?
What are real world models of exponential growth and decay?
How does understanding how to find the vertex of a quadratic function help in making decisions in real-life applications?

Course Priority Standard:
A1.SS.E.A.1 Interpret the contextual meaning of individual terms or factors from a given problem that utilizes formulas or expressions
A1.SSE.A.2 Analyze the structure of polynomials to create equivalent expressions or equations
A1.REI.A.2c Analyze different methods of solving quadratic equations
A1.REI.C.6 Explain that the graph of an equation in two variables is the set of all its solutions plotted in the Cartesian coordinate plane
A1.IF.B.3 Using tables, graphs and verbal descriptions, interpret key characteristics of a function that models the relationship between two quantities
A1.IF.C.7 Graph functions expressed symbolically and identify and interpret key features of the graph
A1.DS.A.1 Analyze and interpret graphical displays of data

Course Enduring Understandings, Goals, & Objectives (5-10):
Patterns and relationships can be represented with graphs, tables, and equations.
Functions are a mathematical way to describe relationships between two quantities that vary.
Linear equations can be used to represent the trend in a data set.
Real world situations can be represented symbolically and graphically.
The properties of integers apply to simplifying polynomial expressions.
For any quadratic function in standard form, the values of a, b, and c provide key information about its graph.
Transformations are connected to our spatial reasoning.

Course Essential Vocabulary: hypotenuse, break even point, compound inequalities, equation, graph (on number line), inequality, infinite solution, literal equations, no solution, solution, solve, coefficient, domain function, initial value, range, rate of change, term, line of best fit, ordered pairs, parallel, quadrants, rate of change, slope, slope-intercept form, solution, standard form, undefined slope, vertical line, x-intercept, y-intercept, infinite solutions, no solution, parallel lines, solution, base, decreasing, exponent, exponential decay, exponential growth, increasing, multiplier, negative exponent, zero exponent, binomial, constant, cubic, degree, linear, monomial, polynomial, quadratic, trinomial, line of symmetry, vertex, zeros, quadratic, maximum, minimum, origin, quadrant, x-axis, y-axis

Unit 1	**Representing Relationships** (Approximately 20 Days)
Unit 1 Big Ideas	Relationships between variables can be used to model various real-world situations. Linear and exponential patterns can be used to interpret specific relationships.
Unit 1 Guiding & Essential Questions	What are the similarities and differences between a linear and exponential equation? How can real-world situations be translated into linear and exponential equations? How can we look at tables and graphs to determine patterns and relationships?
Unit 1 Student Learning Goal(s)	● Students will use tables, equations, and graphs to describe relationships and make predictions. ● Students will distinguish between linear and exponential relationships shown in tables, graphs, equations, and situations. ● Students will write and interpret equations of linear and exponential relationships.
Unit 1 Vocabulary	constant difference, constant ratio, model, exponential relationship, linear relationship
Unit 1 Missouri Learning Standards	A1.CED.A.2: Create equations that describe linear, quadratic and exponential relationships. Create and graph linear, quadratic and exponential equations in two variables.
	A1.IF.B.3: Interpret linear, quadratic and exponential functions in terms of the context. Using tables, graphs and verbal descriptions, interpret key characteristics of a function that models the relationship between two quantities.
	A1.IF.C.7: Analyze linear, quadratic and exponential functions using different representations. Graph functions expressed symbolically and identify and interpret key features of the graph.
	A1.IF.C.8: Analyze linear, quadratic and exponential functions using different representations. Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context.
	A1.IF.C.9: Analyze linear, quadratic and exponential functions using different representations. Compare the properties of two functions given different representations.

	A1.LQE.A.1b: Construct and compare linear, quadratic and exponential models and sole problems. Distinguish between situations that can be modeled with linear or exponential functions: b.Recognize exponential situations in which a quantity grows or decays by a constant percent rate per unit interval.
	A1.LQE.A.3: Construct and compare linear, quadratic and exponential models and sole problems. Construct linear, quadratic and exponential equations given graphs, verbal descriptions or tables.
Unit 1 Common Core State Standards	CCSS.MATH.CONTENT.HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
	CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
	CCSS.MATH.CONTENT.HSF.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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.
	CCSS.MATH.CONTENT.HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
	CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.
	CCSS.MATH.CONTENT.HSF.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context.
	CCSS.MATH.CONTENT.HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context
	CCSS.MATH.CONTENT.HSA.REI.D.10 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 (which could be a line).
	CCSS.MATH.CONTENT.HSF.LE.A.1

	Distinguish between situations that can be modeled with linear functions and with exponential functions.
	CCSS.MATH.CONTENT.HSF.LE.A.1.A Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
	CCSS.MATH.CONTENT.HSF.LE.A.1.B Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
	CCSS.MATH.CONTENT.HSF.LE.A.2 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).
	CCSS.MATH.CONTENT.HSF.LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
	CCSS.MATH.CONTENT.HSF.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.
Unit 1 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)
Curricular Resources Utilized in Unit 1	Main resource to be determined in Spring 2023 Unit 1 Family Resource Unit 1 Learning Goals and Glossary

Unit 2	**Linear Equations and Inequalities** (Approximately 20 Days)
Unit 2 Big Ideas	● Equations and inequalities may be used as models to solve mathematical and real world problems. ● An inequality can be used to describe a greater than/less than relationship between expressions.

	● Solutions to linear equations and inequalities can have constraints.
Unit 2 Guiding & Essential Questions	● How can we represent values using variables? ● How can a real-world situation be translated into an algebraic equation? ● What strategies can be used to solve and graph equations and inequalities?
Unit 2 Student Learning Goal(s)	● Students will solve linear equations with one variable, including equations with no solution or many solutions. ● Students will solve multi-variable equations for a given variable. ● Students will write and solve equations to represent linear situations. ● Students will determine solutions to an inequality algebraically and graphically. ● Students will write inequalities in one and two variables to represent constraints.
Unit 2 Vocabulary	Constraint, equivalent equations, solution, standard form
Unit 2 Missouri Learning Standards	A1.SSE.A.1 Interpret the contextual meaning of individual terms or factors from a given problem that utilizes formulas or expressions.
	A1.SSE.A.2 Analyze the structure of polynomials to create equivalent expressions or equations.
	A1.CED.A.1: Create equations that describe linear, quadratic and exponential relationships. Create equations and inequalities in one variable and use them to model and/or solve problems.
	A1.CED.A.2 Create and graph linear, quadratic and exponential equations in two variables.
	A1.CED.A.3: Create equations that describe linear, quadratic and exponential relationships. Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context.
	A1.CED.A.4: Create equations that describe linear, quadratic and exponential relationships. Solve literal equations and formulas for a specified variable that highlights a quantity of interest.
	A1.REI.A.1: Understand solving equations as a process, and solve equations and inequalities in one variable. Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original.

	A1.REI.C.6: Represent and solve linear and exponential equations and inequalities graphically. Explain that the graph of an equation in two variables is the set of all its solutions plotted in the Cartesian coordinate plane.
	A1.REI.C.7: Represent and solve linear and exponential equations and inequalities graphically. Graph the solution to a linear inequality in two variables.
Unit 2 Common Core State Standards	CCSS.MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	CCSS.MATH.CONTENT.HSA.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*.
	CCSS.MATH.CONTENT.HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
	CCSS.MATH.CONTENT.HSA.REI.D.10 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 (which could be a line).

	CCSS.MATH.CONTENT.HSA.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.
Unit 2 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)
Curricular Resources Utilized in Unit 2	Main resource to be determined in Spring 2023 Unit 2 Family Resource Unit 2 Learning Goals and Glossary

Unit 3	**Describing Data** (Approximately 20 Days)
Unit 3 Big Ideas	• Considering real-world data can strategically inform the decision making process • Data can be represented in different ways to appropriately describe specific situations • Visual Representations can be used to model and interpret data. • Data can be analyzed using various measurements
Unit 3 Guiding & Essential Questions	• How is data interpreted? • How can data be used to represent a situation? • Why is analyzing data important to the decision making process?
Unit 3 Student Learning Goal(s)	• Students will represent data with a dot plot, histogram, or box plot. • Students will calculate the mean and standard deviation or median and IQR for a data set. • Students will use shape, center, spread, and outliers to compare data sets. • Students will describe data using correlation coefficients and lines of best fit. • Students will use technology to generate lines of best fit and make predictions.

Unit 3 Vocabulary	Bell shaped, bimodal, box plot, categorical data, causation, correlation, correlation coefficient, dot plot, histogram, interquartile range, line of best fit, linear association, mean, measure of center, measure of spread, median, negative association, outlier, positive association, quantitative data, quartile, residual, residual plot, scatter plot, slope, skewed, standard deviation, statistic, symmetric, uniform
Unit 3 Missouri Learning Standards	A1.DS.A.1: Summarize, represent and interpret data. Analyze and interpret graphical displays of data.
	A1.DS.A.2: Summarize, represent and interpret data. Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets.
	A1.DS.A.3: Summarize, represent and interpret data. Interpret differences in shape, center and spreads in the context of the data sets, accounting for possible effects of outliers.
	A1.DS.A.4a: Summarize, represent and interpret data. Summarize data in two-way frequency tables: a.Interpret relative frequencies in the context of the data.
	A1.DS.A.4b: Summarize, represent and interpret data. Summarize data in two-way frequency tables: b.Recognize possible associations and trends in the data.
	A1.DS.A.5a: Summarize, represent and interpret data. Construct a scatter plot of bivariate quantitative data describing how the variables are related; determine and use a function that models the relationship: a.Construct a linear function to model bivariate data represented on a scatter plot that minimizes residuals.
	A1.DS.A.5b: Summarize, represent and interpret data. Construct a scatter plot of bivariate quantitative data describing how the variables are related; determine and use a function that models the relationship: b.Construct an exponential function to model bivariate data represented on a scatter plot that minimizes residuals.
	A1.DS.A.6: Summarize, represent and interpret data. Interpret the slope (rate of change) and the y-intercept (constant term) of a linear model in the context of the data.
	A1.DS.A.7: Summarize, represent and interpret data. Determine and interpret the correlation coefficient for a linear association.
	A1.DS.A.8: Summarize, represent and interpret data. Distinguish between correlation and causation.
Unit 3 Common Core	CCSS.MATH.CONTENT.HSS.ID.A.1

State Standards	Represent data with plots on the real number line (dot plots, histograms, and box plots).
	CCSS.MATH.CONTENT.HSS.ID.A.2 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.
	CCSS.MATH.CONTENT.HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
	CCSS.MATH.CONTENT.HSS.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
	CCSS.MATH.CONTENT.HSS.ID.B.6.A 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.
	CCSS.MATH.CONTENT.HSS.ID.B.6.B Informally assess the fit of a function by plotting and analyzing residuals.
	CCSS.MATH.CONTENT.HSS.ID.B.6.C Fit a linear function for a scatter plot that suggests a linear association.
	CCSS.MATH.CONTENT.HSS.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
	CCSS.MATH.CONTENT.HSS.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.
	CCSS.MATH.CONTENT.HSS.ID.C.9 Distinguish between correlation and causation.
Unit 3 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)

Curricular Resources Utilized in Unit 3	Main resource to be determined in Spring 2023 Unit 3 Family Resource Unit 3 Learning Goals and Glossary

Unit 4	**Describing Functions** (Approximately 20 Days)
Unit 4 Big Ideas	● Functional relationships between independent and dependent variables can be used to model real-world examples. ● Situations can be represented using different categories of functions. ● Functions can have limitations such as domain and range.
Unit 4 Guiding & Essential Questions	● How does a relationship between variables become a function? ● What are the ways that a function can model a real-world situation? ● Can there be constraints on a function? If so, how would they be calculated?
Unit 4 Student Learning Goal(s)	● Students will model real-world situations with the use of a function. ● Students will use multiple function types to further explore the relationship between independent and dependent variables. ● Students will write functions in various ways, including the use of function notation. ● Students will use domain and range to interpret constraints on a function.
Unit 4 Vocabulary	Piecewise function, domain, range, function notation, absolute value function, maximum, minimum, inverse function, rate of change
Unit 4 Missouri Learning Standards	A1.CED.A.4: Create equations that describe linear, quadratic and exponential relationships. Solve literal equations and formulas for a specified variable that highlights a quantity of interest.
	A1.REI.A.1: Understand solving equations as a process, and solve equations and inequalities in one variable. Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original.
	A1.IF.A.1a: Understand the concept of a function and use function notation. Understand that a function from one set (domain) to another set (range) assigns to each element of the domain exactly one element of the range: a.Represent a function using function notation.

	A1.IF.A.1b: Understand the concept of a function and use function notation. Understand that a function from one set (domain) to another set (range) assigns to each element of the domain exactly one element of the range: b.Understand that the graph of a function labeled f is the set of all ordered pairs (x, y) that satisfy the equation y=f(x).
	A1.IF.A.2: Understand the concept of a function and use function notation. Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
	A1.IF.B.4: Interpret linear, quadratic and exponential functions in terms of the context. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes
	A1.IF.B.5: Interpret linear, quadratic and exponential functions in terms of the context. Determine the average rate of change of a function over a specified interval and interpret the meaning.
	A1.IF.B.6: Interpret linear, quadratic and exponential functions in terms of the context. Interpret the parameters of a linear or exponential function in terms of the context.
	A1.IF.C.7: Analyze linear, quadratic and exponential functions using different representations. Graph functions expressed symbolically and identify and interpret key features of the graph.
	A1.IF.C.8: Analyze linear, quadratic and exponential functions using different representations. :Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context.
	A1.IF.C.9: Analyze linear, quadratic and exponential functions using different representations. Compare the properties of two functions given different representations.
	A1.BF.A.1: Build new functions from existing functions (limited to linear, quadratic and exponential). Analyze the effect of translations and scale changes on functions.
Unit 4 Common Core State Standards	CCSS.MATH.CONTENT.HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.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.

	CCSS.MATH.CONTENT.HSF.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*).
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.
	CCSS.MATH.CONTENT.HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.C.7.B Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
	CCSS.MATH.CONTENT.HSF.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
	CCSS.MATH.CONTENT.HSF.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
	CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.

	CCSS.MATH.CONTENT.HSF.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context.
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.BF.B.4.A Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse.
	CCSS.MATH.CONTENT.HSS.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
	CCSS.MATH.CONTENT.HSS.ID.B.6.A 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.
	CCSS.MATH.CONTENT.HSS.ID.B.6.B Informally assess the fit of a function by plotting and analyzing residuals.
	CCSS.MATH.CONTENT.HSS.ID.B.6.C Fit a linear function for a scatter plot that suggests a linear association.
Unit 4 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)
Curricular Resources Utilized in Unit 4	Main resource to be determined in Spring 2023 Student Glossary Family Resource

Unit 5	**Systems of Linear Equations and Inequalities** (Approximately 20 Days)
Unit 5 Big Ideas	● Systems of linear equations and inequalities can be used to model problems and can be solved using different methods.
Unit 5 Guiding & Essential Questions	● What does the number of solutions of a system of linear equations represent? ● Which method is most efficient when solving a system of linear equations? ● How can systems of equations be used to represent situations and solve problems?
Unit 5 Student Learning Goal(s)	● Students will solve a system by graphing ● Students will solve a system using substitution ● Students will solve a system using elimination ● Students will solve problems of applications of systems ● Students will determine the most efficient method when solving a system of linear equations. ● Students will explain what is meant by the solution to a system of linear equations. ● Students will explain what is meant by the solutions to a system of inequalities.
Unit 5 Vocabulary	Infinite solutions, no solution, parallel lines, solution
	A1.REI.A.1: Understand solving equations as a process, and solve equations and inequalities in one variable. Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original.
	A1.REI.A.2a: Understand solving equations as a process, and solve equations and inequalities in one variable. Solve problems involving quadratic equations: a.Use the method of completing the square to create an equivalent quadratic equation.
Unit 5 Missouri Learning Standards	A1.REI.B.3: Solve systems of equations. Solve a system of linear equations algebraically and/or graphically.
	A1.REI.B.4: Solve systems of equations. Solve a system consisting of a linear equation and a quadratic equation algebraically and/or graphically.
	A1.REI.C.6: Represent and solve linear and exponential equations and inequalities graphically. Explain that the graph of an equation in two variables is the set of all its solutions plotted in the Cartesian coordinate plane.

	A1.REI.C.8: Represent and solve linear and exponential equations and inequalities graphically. Solve problems involving a system of linear inequalities.
	A1.CED.A.3: Create equations that describe linear, quadratic and exponential relationships.: Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context.: ~.~
Unit 5 Common Core State Standards	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
	CCSS.MATH.CONTENT.HSA.REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
Unit 5 Assessments *(Minimum 1 Summative,*	To be created in Implementation Year 1 (2023-24)

1 Formative)	
Curricular Resources Utilized in Unit 5	Main resource to be determined in Spring 2023 Student Glossary Family Resource

Unit 6	**Exponential Functions** (Approximately 20 Days)
Unit 6 Big Ideas	● Exponential functions can be represented in a variety of ways. ● Linear and exponential functions have similarities and differences. ● Real world situations can be represented using an exponential function.
Unit 6 Guiding & Essential Questions	● What characterizes exponential functions? ● What are real world models of exponential growth and decay? ● How can one differentiate an exponential model from a linear model given a real world set of data?
Unit 6 Student Learning Goal(s)	● Students will use equations and graphs to compare exponential functions. ● Students will interpret situations that change exponentially. ● Students will construct exponential equations and use them to model situations and solve problems. ● Students will learn that the output of an increasing exponential function is eventually greater than the output of an increasing linear function for the same input. ● Students will study graphs of exponential functions in terms of real-world contexts.
Unit 6 Vocabulary	Exponential growth, exponential decay, compound interest, increasing, decreasing, growth factor, decay factor
	A1.IF.A.2: Understand the concept of a function and use function notation. Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Unit 6 Missouri Learning Standards	A1.IF.B.4: Interpret linear, quadratic and exponential functions in terms of the context. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes.
	A1.IF.B.5: Interpret linear, quadratic and exponential functions in terms of the context. Determine the average rate of change of a function over a specified interval and interpret the meaning.
	A1.IF.B.6: Interpret linear, quadratic and exponential functions in terms of the context. Interpret the parameters of a linear or exponential function in terms of the context.
	A1.IF.C.7: Analyze linear, quadratic and exponential functions using different representations. Graph functions expressed symbolically and identify and interpret key features of the graph.
	A1.IF.C.8: Analyze linear, quadratic and exponential functions using different representations. Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context.
	A1.IF.A.1a: Understand the concept of a function and use function notation. Understand that a function from one set (domain) to another set (range) assigns to each element of the domain exactly one element of the range: a.Represent a function using function notation.
	A1.NQ.B.3a: Use units to solve problems. Use units of measure as a way to understand and solve problems involving quantities: a.Identify, label and use appropriate units of measure within a problem.
	A1.NQ.B.3b: Use units to solve problems. Use units of measure as a way to understand and solve problems involving quantities: b.Convert units and rates.
	A1.NQ.B.3c: Use units to solve problems. Use units of measure as a way to understand and solve problems involving quantities: c.Use units within problems.
	A1.BF.A.1: Build new functions from existing functions (limited to linear, quadratic and exponential). Analyze the effect of translations and scale changes on functions.
	A1.LQE.A.1a: Construct and compare linear, quadratic and exponential models and sole problems. Distinguish between situations that can be modeled with linear or exponential functions: a.Determine that linear functions change by equal differences over equal intervals.
	A1.LQE.A.1b: Construct and compare linear, quadratic and exponential models and sole problems. Distinguish between situations that can be modeled with linear or exponential functions: b.Recognize exponential situations in which a quantity grows or decays by a constant percent rate per unit interval.
	A1.LQE.A.2: Construct and compare linear, quadratic and exponential models and sole problems. Describe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.

	A1.LQE.A.3: Construct and compare linear, quadratic and exponential models and sole problems. Construct linear, quadratic and exponential equations given graphs, verbal descriptions or tables.
Unit 6 Common Core State Standards	CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
	CCSS.MATH.CONTENT.HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
	CCSS.MATH.CONTENT.HSA.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients.
	CCSS.MATH.CONTENT.HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity.
	CCSS.MATH.CONTENT.HSA.SSE.B.3.C Use the properties of exponents to transform expressions for exponential functions.
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.simple cases and using technology for more complicated cases.
	CCSS.MATH.CONTENT.HSF.IF.C.7.E Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
	CCSS.MATH.CONTENT.HSF.IF.C.8.B Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.
	CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.
	CCSS.MATH.CONTENT.HSF.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context.
	CCSS.MATH.CONTENT.HSF.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.
	CCSS.MATH.CONTENT.HSF.LE.A.1.A Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
	CCSS.MATH.CONTENT.HSF.LE.A.1.B Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
	CCSS.MATH.CONTENT.HSF.LE.A.1.C Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
	CCSS.MATH.CONTENT.HSF.LE.A.2 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).

	CCSS.MATH.CONTENT.HSF.LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
	CCSS.MATH.CONTENT.HSF.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.
	CCSS.MATH.CONTENT.HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
	CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
	CCSS.MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	CCSS.MATH.CONTENT.HSS.ID.B.6.A 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.
Unit 6 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)
Curricular Resources Utilized in Unit 6	Main resource to be determined in Spring 2023

Unit 7	**Quadratic Functions** (Approximately 20 Days)
Unit 7 Big Ideas	● Real world situations can be represented by quadratic graphs.

	● The domain and range of quadratic functions can have constraints.
Unit 7 Guiding & Essential Questions	● How does understanding how to find the vertex of a quadratic function help in making decisions in real-life applications? ● Which method is most efficient when solving a quadratic equation? ● How is a quadratic situation used to model a situation?
Unit 7 Student Learning Goal(s)	● Students will justify whether a function is linear, quadratic, exponential, or none. ● Students will identify and interpret key features of quadratics in graphs and tables. ● Students will graph quadratics in standard form and factored form. ● Students will write quadratic equations in factored form from a graph or description. ● Students will use key features to graph quadratics in vertex form. ● Students will write quadratic functions in factored form or vertex form.
Unit 7 Vocabulary	Concave down, concave up, factored form, line of symmetry, parabola, quadratic, second difference, standard form, translation, vertex, vertex form, vertical stretch, maximum, minimum
Unit 7 Missouri Learning Standards	A1.SSE.A.1: Interpret and use structure. Interpret the contextual meaning of individual terms or factors from a given problem that utilizes formulas or expressions.
	A1.SSE.A.2: Interpret and use structure. Analyze the structure of polynomials to create equivalent expressions or equations.
	A1.IF.A.2: Understand the concept of a function and use function notation. Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
	A1.IF.B.4: Interpret linear, quadratic and exponential functions in terms of the context. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes
	A1.IF.B.5: Interpret linear, quadratic and exponential functions in terms of the context. Determine the average rate of change of a function over a specified interval and interpret the meaning.
	A1.IF.C.7: Analyze linear, quadratic and exponential functions using different representations.Graph functions expressed symbolically and identify and interpret key features of the graph.
	A1.IF.C.8: Analyze linear, quadratic and exponential functions using different representations Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context.

	A1.IF.C.9: Analyze linear, quadratic and exponential functions using different representations. Compare the properties of two functions given different representations.
	A1.BF.A.1: Build new functions from existing functions (limited to linear, quadratic and exponential). Analyze the effect of translations and scale changes on functions.
	A1.LQE.A.1a: Construct and compare linear, quadratic and exponential models and sole problems. Distinguish between situations that can be modeled with linear or exponential functions: a.Determine that linear functions change by equal differences over equal intervals.
	A1.LQE.A.3: Construct and compare linear, quadratic and exponential models and sole problems. Construct linear, quadratic and exponential equations given graphs, verbal descriptions or tables.
Unit 7 Common Core State Standards	CCSS.MATH.CONTENT.HSF.LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	CCSS.MATH.CONTENT.HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.simple cases and using technology for more complicated cases.
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
	CCSS.MATH.CONTENT.HSF.IF.C.8.B

	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.
	CCSS.MATH.CONTENT.HSA.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients.
	CCSS.MATH.CONTENT.HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity.
	CCSS.MATH.CONTENT.HSF.IF.C.7.A Graph linear and quadratic functions and show intercepts, maxima, and minima.
	CCSS.MATH.CONTENT.HSF.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
	CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.
	CCSS.MATH.CONTENT.HSF.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context.
	CCSS.MATH.CONTENT.HSF.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.
Unit 7 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)
Curricular Resources Utilized in Unit 7	Main resource to be determined in Spring 2023 Unit 7 Family Resource Unit 7 Learning Goals and Glossary

Unit 8	**Quadratic Equations** (Approximately 20 Days)
Unit 8 Big Ideas	● Quadratics can be used to solve real-world application problems. ● Quadratic equations can be solved using more than one method.
Unit 8 Guiding & Essential Questions	● How can a quadratic equation model a situation? ● Which method is most efficient to use when solving a quadratic equation? ● What does a solution to a quadratic equation represent? ● How many solutions can a quadratic equation have?
Unit 8 Student Learning Goal(s)	● Students will explain the meaning of a solution to an equation in terms of a situation. ● Students will write a quadratic equation that represents a situation. ● Students will interpret, write, and solve quadratic equations. ● Students will solve quadratic equations by reasoning, by rewriting expressions in factored form and using the zero product property, by completing the square, and by applying the quadratic formula. ● Students will rewrite expressions in vertex form to solve problems about the maximum or minimum value of a function. ● Students will understand that quadratic equations may have 2,1, or 0 solutions, and that the solutions may be rational or irrational.
Unit 8 Vocabulary	Zeros, quadratic formula, zero product property, completing the square, discriminant
Unit 8 Missouri Learning Standards	A1.REI.A.2a: Understand solving equations as a process, and solve equations and inequalities in one variable. Solve problems involving quadratic equations: a.Use the method of completing the square to create an equivalent quadratic equation.
	A1.REI.A.2b: Understand solving equations as a process, and solve equations and inequalities in one variable. Solve problems involving quadratic equations: b.Derive the quadratic formula.
	A1.REI.A.2c: Understand solving equations as a process, and solve equations and inequalities in one variable. Solve problems involving quadratic equations: c.Analyze different methods of solving quadratic equations.

	A1.REI.A.1: Understand solving equations as a process, and solve equations and inequalities in one variable. Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original.
	A1.REI.B.4: Solve systems of equations. Solve a system consisting of a linear equation and a quadratic equation algebraically and/or graphically.
	A1.REI.C.7: Represent and solve linear and exponential equations and inequalities graphically. Graph the solution to a linear inequality in two variables.
	A1.SSE.A.2: Interpret and use structure. Analyze the structure of polynomials to create equivalent expressions or equations.
	A1.SSE.A.1: Interpret and use structure. Interpret the contextual meaning of individual terms or factors from a given problem that utilizes formulas or expressions.
	A1.CED.A.1: Create equations that describe linear, quadratic and exponential relationships. Create equations and inequalities in one variable and use them to model and/or solve problems.
	A1.CED.A.3: Create equations that describe linear, quadratic and exponential relationships. Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context.
	A1.IF.A.2: Understand the concept of a function and use function notation. Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
	A1.IF.B.4: Interpret linear, quadratic and exponential functions in terms of the context. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes.
	A1.IF.B.5: Interpret linear, quadratic and exponential functions in terms of the context. Determine the average rate of change of a function over a specified interval and interpret the meaning.
	A1.IF.C.7: Analyze linear, quadratic and exponential functions using different representations. Graph functions expressed symbolically and identify and interpret key features of the graph.
	A1.IF.C.8: Analyze linear, quadratic and exponential functions using different representations. Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context.
	A1.IF.C.9: Analyze linear, quadratic and exponential functions using different representations. Compare the properties of two functions given different representations.
Unit 8 Common Core State Standards	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSA.REI.B.4 Solve quadratic equations in one variable.
	CCSS.MATH.CONTENT.HSA.REI.B.4.B Solve quadratic equations by inspection (e.g., for $x2 = 49$), 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.
	CCSS.MATH.CONTENT.HSA.REI.B.4.A 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.
	CCSS.MATH.CONTENT.HSA.REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x2 + y2 = 3$.
	CCSS.MATH.CONTENT.HSA.REI.D.10 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 (which could be a line).
	CCSS.MATH.CONTENT.HSA.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
	CCSS.MATH.CONTENT.HSA.SSE.B.3.A Factor a quadratic expression to reveal the zeros of the function it defines.
	CCSS.MATH.CONTENT.HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. *For example, see x4 - y4 as (x2)2 - (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 - y2)(x2 + y2)*.
	CCSS.MATH.CONTENT.HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

	CCSS.MATH.CONTENT.HSA.SSE.B.3.B Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
	CCSS.MATH.CONTENT.HSA.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*.
	CCSS.MATH.CONTENT.HSA.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.
	CCSS.MATH.CONTENT.HSF.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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.*
	CCSS.MATH.CONTENT.HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.**
	CCSS.MATH.CONTENT.HSF.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.
	CCSS.MATH.CONTENT.HSF.IF.C.7.A Graph linear and quadratic functions and show intercepts, maxima, and minima.
	CCSS.MATH.CONTENT.HSF.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
	CCSS.MATH.CONTENT.HSF.IF.C.8.A 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.

	CCSS.MATH.CONTENT.HSN.RN.B.3 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.
Unit 8 Assessments *(Minimum 1 Summative, 1 Formative)*	To be created in Implementation Year 1 (2023-24)
Curricular Resources Utilized in Unit 8	Main resource to be determined in Spring 2023