Curriculum Development Course at a Glance
Planning for High School Mathematics

Content Area	Mathematics	**Grade Level**	High School
Course Name/Course Code	Algebra I		

Standard	Grade Level Expectations (GLE)	GLE Code
1. Number Sense, Properties, and Operations	1. The complex number system includes real numbers and imaginary numbers	MA10-GR.HS-S.1-GLE.1
	2. Quantitative reasoning is used to make sense of quantities and their relationships in problem situations	MA10-GR.HS-S.1-GLE.2
2. Patterns, Functions, and Algebraic Structures	1. Functions model situations where one quantity determines another and can be represented algebraically, graphically, and using tables	MA10-GR.HS-S.2-GLE.1
	2. Quantitative relationships in the real world can be modeled and solved using functions	MA10-GR.HS-S.2-GLE.2
	3. Expressions can be represented in multiple, equivalent forms	MA10-GR.HS-S.2-GLE.3
	4. Solutions to equations, inequalities and systems of equations are found using a variety of tools	MA10-GR.HS-S.2-GLE.4
3. Data Analysis, Statistics, and Probability	1. Visual displays and summary statistics condense the information in data sets into usable knowledge	MA10-GR.HS-S.3-GLE.1
	2. Statistical methods take variability into account supporting informed decisions making through quantitative studies designed to answer specific questions	MA10-GR.HS-S.3-GLE.2
	3. Probability models outcomes for situations in which there is inherent randomness	MA10-GR.HS-S.3-GLE.3
4. Shape, Dimension, and Geometric Relationships	1. Objects in the plane can be transformed, and those transformations can be described and analyzed mathematically	MA10-GR.HS-S.4-GLE.1
	2. Concepts of similarity are foundational to geometry and its applications	MA10-GR.HS-S.4-GLE.2
	3. Objects in the plane can be described and analyzed algebraically	MA10-GR.HS-S.4-GLE.3
	4. Attributes of two- and three-dimensional objects are measurable and can be quantified	MA10-GR.HS-S.4-GLE.4
	5. Objects in the real world can be modeled using geometric concepts	MA10-GR.HS-S.4-GLE.5

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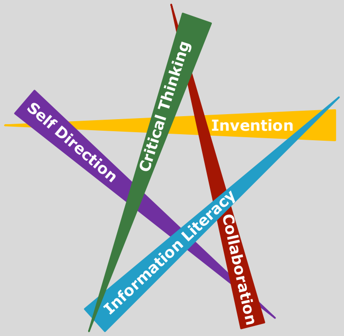
Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Mathematical Practices:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Home on the Range – Part 1	2 weeks	1
Power to the variable	6 weeks	2
Statistics Lie—Find out how	5 weeks	3
Finding your roots	5 weeks	4
Home on the Range – Part 2	3 weeks	5
All Systems Go	5 weeks	6

Curriculum Development Overview
Unit Planning for High School Mathematics

Unit Title	Home on the Range – Part 1	**Length of Unit**	2 weeks

Focusing Lens(es)	Representation	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.2-GLE.1 MA10-GR.HS-S.2-GLE.4
Inquiry Questions (Engaging-Debatable):	• Can all real-world situations be modeled with a function? (MA10-GR.HS-S.2-GLE.2-EO.b)		
Unit Strands	Number and Quantity: Quantities Algebra: Creating Equations Functions: Building Functions Functions: Interpreting Functions		
Concepts	Function, contexts, quantity, input, output, domains, range, generate, equivalent, exponential, properties of exponents, relationships, tables, graphs, equations, model, representations		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Functions describe contexts where one quantity, an input, determines another, the output. (MA10-GR.HS-S.2-GLE.1-EO.a)	Given an input and output, how do you determine a rule? What notation is used to write a function? What does y=f(x) denote?	Why is only one output permissible for every input in a function? Why is possible to have two inputs for one output? Why are functions an important tool in mathematical modeling?
Mathematicians limit domains of a function to ensure both the domain and range make sense in a given context. (MA10-GR.HS-S.2-GLE.2-EO.b)	What is another name for the inputs of a function? Outputs? What is the relationship between domain and range of a function? How do you express domain and range?	How do you determine a reasonable domain and range for a context? Why is it necessary to constrain the domain and range of a function model?
Functions model relationships between quantities through tables, graphs and equations. (MA10-GR.HS-S.2-GLE.2-EO.b, d)	What are examples of linear, quadratic, and exponential contexts?	Why are two variable equations helpful in modeling a variety of contexts? Why do linear and exponential functions model so many situations?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Understand 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 and the graph of f is the graph of the equation $y = f(x)$ (MA10-GR.HS-S.2-GLE.1-EO.a.i)
- Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (MA10-GR.HS-S.2-GLE.4-EO.a.ii)
- Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (MA10-GR.HS-S.2-GLE.1-EO.a.ii)
- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (MA10-GR.HS-S.2-GLE.1-EO.b.ii)
- Determine an explicit expression, a recursive process, or steps for calculation from contexts including linear, quadratic, and exponential with integer domain. (MA10-GR.HS-S.2-GLE.2-EO.d.i.1)
- Describe the factors affecting take-home pay and calculate the impact. (MA10-GR.HS-S.1-GLE.2-EO.a.iv) *
- Design and use the budget, including income (i.e., net take-home pay) and expenses to demonstrate how living within your means is essential for a secure financial future. (MA10-GR.HS-S.1-GLE.2-EO.a.v) *

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*The domain is the set of all values that can be used as an input in the function and the range is the set of all values that are possible outputs from a function.* *When using functions to model real world phenomena it is important to constrain the domain and range to inputs and outputs that make sense within the context of the model.* *Not all relationships are functions.*
Academic Vocabulary:	Input, output, relationship, limit, constrain, contexts, explain, create, determine, generate, tables, model, representations, graphs
Technical Vocabulary:	Coordinate plane, axes, set, function, quantity, domains, range, equivalent, exponential, properties of exponents, equations,

*** Denotes a connection to Personal Financial Literacy (PFL)**

Unit Title	Power to the variable		**Length of Unit**	6 weeks
Focusing Lens(es)	Modeling	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.1-GLE.2 MA10-GR.HS-S.2-GLE.2 MA10-GR.HS-S.2-GLE.3 MA10-GR.HS-S.2-GLE.4	
Inquiry Questions (Engaging-Debatable):	• What are the parameters that affect gas mileage in a car and how would you model them? (MA10-GR.HS-S.2-GLE.2-EO.b.i) • What are the consequences of a population that grows exponentially?			
Unit Strands	Algebra: Reasoning with Equations and Inequalities Algebra: Creating Equations Algebra: Seeing Structure in Expressions Functions: Interpreting Functions Functions: Linear and Exponential Models			
Concepts	Models, quantity, growth, decay, constant rate of change, constant rate of growth, functions, linear functions, exponential functions, exponentially, linearly, quadratically, polynomial function, arithmetic sequence, geometric sequence, relationships, tables, graphs, equations, parameters, equations, inequalities, real world contexts			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Linear and exponential functions provide the means to model constant rates of change and constant rates of growth, respectively (MA10-GR.HS-S.2-GLE.2-EO.a)	How do you determine from an equation whether an exponential function models growth or decay? How do you determine whether a situation can be modeled by a linear function, an exponential function, or neither? What are typical situations modeled by linear functions? What are typical situations modeled by exponential functions?	Why are differences between linear and exponential functions visible in equations, tables and graphs? Why does a common difference indicate a linear function and common ratio an exponential function?
A quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. (MA10-GR.HS-S.2-GLE.3-EO.a.iii)	How does the rate of growth in linear and exponential functions differ? How can you determine when an exponential function will exceed a linear function?	Why can so many situations be modeled by exponential growth? Why is important to consider the limitations of an exponential model?

Linear and exponential functions model arithmetic and geometric sequences respectively. (MA10-GR.HS-S.2-GLE.2-EO.a.ii)	How can you determine the slope and y-intercept of an arithmetic sequence? How can you determine the ratio for a geometric sequence? How do you know whether a sequence is arithmetic or geometric?	Why do linear and exponential functions model so many situations? Why is the domain of a sequence a subset of the integers?
The interpretation of the parameters of equations and inequalities must consider real world contexts. (MA10-GR.HS-S.2-GLE.2-EO.b.i)	What is a coefficient? How do you choose coefficients given a set of data?	Why are coefficients sometimes represented with letters? Why does changing coefficients affect a model? Why would you model a context with an inequality rather than an equation?
The generation of equivalent exponential functions by applying properties of exponents sheds light on a problem context and the relationships between. (MA10-GR.HS-S.2-GLE.3-EO.b.i.3)	How do properties of exponents simplify exponential expressions?	Why does a number raised to the power of zero equal one? Why do exponential patterns explain negative exponents?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- 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. (MA10-GR.HS-S.1-GLE.2-EOa.i.1,2)
- Use the properties of exponents to transform expressions for exponential functions with integer exponents. (MA10-GR.HS-S.2-GLE.3-EO.b.i.3)
- Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (MA10-GR.HS-S.2-GLE.4-EO.c.i)
- Create equations and inequalities in one variable and use them to solve problems; include equations arising from linear, quadratic, and exponential function with integer exponents. (MA10-GR.HS-S.2-GLE.4-EO.a.i)
- Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. (MA10-GR.HS-S.2-GLE.2-EO.a.i.1)
- Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. (MA10-GR.HS-S.2-GLE.2-EO.a.i.2)
- Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. (MA10-GR.HS-S.2-GLE.2-EO.a.i.3)
- 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). (MA10-GR.HS-S.2-GLE.2-EO.a.ii)
- Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. (MA10-GR.HS-S.2-GLE.2-EO.a.iii)
- Interpret the parameters in a linear or exponential (domain of integers) function in terms of a real world context and prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. (MA10-GR.HS-S.2-GLE.2-EO.b.i)

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EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*In a linear function, as the coefficient of x increases, the slope gets steeper.* *Exponential functions model situations where a quantity has a constant rate of growth, such as doubling every year.*
Academic Vocabulary:	Transform, model, create, interpret, situations, real world contexts, growth, decay, relationships, tables, graphs,
Technical Vocabulary:	Quantity, constant rate of change, constant rate of growth, functions, linear functions, exponential functions, exponentially, linearly, quadratically, polynomial function, arithmetic sequence, geometric sequence, equations, parameters, equations, inequalities, common difference, common ratio, properties, parameter, coefficient,

Unit Title	Statistics Lie – Find out how		**Length of Unit**	5 weeks
Focusing Lens(es)	Communication	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.1-GLE.2 MA10-GR.HS-S.3-GLE.1	
Inquiry Questions (Engaging-Debatable):	• Most people who die of lung cancer have an ashtray at home. Do ashtrays cause cancer? • What makes a statistic believable? What makes a statistic accurate? Is there a difference between the two? • What makes data meaningful or actionable? 3.1.IQ.1			
Unit Strands	Number and Quantity: Quantities Statistics and Probability: Interpreting Categorical and Quantitative Data			
Concepts	Shape, center, spread, comparison, data, representations, correlation, causation, communicate, difference, findings, two-way frequency tables, categorical, association, outliers, statistical measures, correlations coefficients, linear, predictions, slope, y-intercept, standard deviation			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Knowledge of shape, center and spread facilitates comparison of two sets of data. (MA10-GR.HS-S.3-GLE.2-EO.a.ii)	What is difference between mean and median? What is the relationship between the two in skewed data? What do plots with the same mean but different standard deviations look like? How can you use technology to find center and spread for a set of data? What can be inferred about two sets of data with large differences in measures of spread?	Why is mean by itself not a complete summary of a set of data? How can summary statistics or data displays be accurate but misleading? Why is it important to analyze the spread of data?
The analysis of a variety of data representations helps determine the appropriate measures of center and spread to describe a set of data. (MA10-GR.HS-S.3-GLE.1-EO.a.i)	What is the best way to display data? How does your choice of how to display data affect what information other people will understand?	When would median be a more appropriate measure of center than mean? How can summary statistics or data displays be accurate but misleading? (MA10-GR.HS-S.3-GLE.1-IQ.3)
Correlation does not imply causation. (MA10-GR.HS-S.3-GLE.1-EO.c.iii)	What is the difference between correlation and causation?	How can the results of a statistical investigation be used to support an argument? (MA10-GR.HS-S.3-GLE.1-IQ.1)
Mathematicians consider the influence of outliers when selecting and interpreting statistical measures. (MA10-GR.HS-S.3-GLE.1-EO.a.iiii)	What is an outlier?	Why do outliers affect some measures of center more than others? Why do outliers affect some measures of spread more than others?

Correlation coefficients can determine the usefulness of linear models for describing data and making predictions. (MA10-GR.HS-S.3-GLE.1-EO.c.ii)	What is a correlation coefficient? Where do I find correlation coefficient on the graphing calculator? What are residuals and how do I calculate them? How do I determine if I have a strong or weak linear correlation? How do you quantify the strength of a correlation?	Why is important to know the strength of a correlation for a set of data? Why does correlation not imply a causal relationship? Why is a linear model not always the best choice for all data sets?
Mathematicians focus on slope and the y-intercept when interpreting a linear model in the context of the data. (MA10-GR.HS-S.3-GLE.1-EO.c.i)	What do the slope and intercept of a linear model mean?	Why does the slope and y-intercept help interpret linear models?
Two-way frequency tables provide the necessary structure to make conclusions about the association of categorical variables. (MA10-GR.HS-S.3-GLE.1-EO.b.i)	What is categorical data? What does joint, marginal and conditional frequency mean?	Why is it appropriate to use a two-way frequency table with categorical data?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Represent data with plots on the real number line (dot plots, histograms, and box plots). (MA10-GR.HS-S.3-GLE.1-EO.1.a.i)
- 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. (MA10-GR.HS-S.3-GLE.1-EO.a.ii)
- Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). (MA10-GR.HS-S.3-GLE.1-EO.a.iii)
- 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) and recognize possible associations and trends in the data. (MA10-GR.HS-S.3-GLE.1-EO.b.i)
- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. (MA10-GR.HS-S.3-GLE.1-EO.b.ii)
- Fit a function to the data; use functions fitted to data to solve problems in the context of the data. (MA10-GR.HS-S.3-GLE.1-EO.b.ii.1)
- Informally assess the fit of a function by plotting and analyzing residuals. (MA10-GR.HS-S.3-GLE.1-EO.b.ii.2)
- Fit a linear function for a scatter plot that suggests a linear association. (MA10-GR.HS-S.3-GLE.1-EO.b.ii.3)
- Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. (MA10-GR.HS-S.3-GLE.1-EO.c.1)
- Compute (using technology) and interpret the correlation coefficient of a linear fit. (MA10-GR.HS-S.3-GLE.1-EO.c.ii)
- Distinguish between correlation and causation. (MA10-GR.HS-S.3-GLE.1-EO.c.iii)
- Define appropriate quantities for the purpose of descriptive modeling. (MA10-GR.HS-S.1-GLE.2-EO.a.ii)
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (MA10-GR.HS-S.1-GLE.2-EO.a.iii)

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A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*Correlation does not imply causation.* *Statistics can sometimes be misleading.*
Academic Vocabulary:	Represent, quantities, fit, assess, accuracy, recognize, trends, interpret, shape, center, spread, comparison, data, representations, communicate, difference, findings, predictions
Technical Vocabulary:	Variables, scatter plot, relative frequency; joint, marginal, and conditional frequencies; mean, median, interquartile range, standard deviation, dot plot, histogram, box plot, correlation, causation, two-way frequency tables, categorical, association, outliers, statistical measures, correlations coefficients, linear, slope, y-intercept, skewed distribution

Unit Title	Finding your roots		**Length of Unit**	5 weeks
Focusing Lens(es)	Form Equivalence	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.1-GLE.1 MA10-GR.HS-S.2-GLE.1 MA10-GR.HS-S.2-GLE.3 MA10-GR.HS-S.2-GLE.4	
Inquiry Questions (Engaging-Debatable):	• What is the best way to model simple projectile motion? (MA10-GR.HS-S.2-GLE.1-EO.c.v.1) • How would shooting a basketball on the moon be different from Earth?			
Unit Strands	Algebra: Seeing Structure in Expressions Algebra: Reasoning with Equations and Inequalities Algebra: Arithmetic with Polynomials and Rational Functions Function: Interpreting Functions			
Concepts	Expression, structure, interpretation, single entity, quadratic, functions, graph, model, real world applications, roots, maximum, minimum, symmetry, equations, solutions,			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Parts of an expression, interpreted as a single entity, reveal the underlying structure of an expression and illuminate ways to rewrite it. (MA10-GR.HS-S.2-GLE.3-EO.a.i)	What are the benefits of simplifying complicated expressions? What patterns exist when factoring quadratic equations?	How do you know if rewriting an expression will provide the information needed to solve the contextual problem?
The choice of an appropriate way to rewrite a quadratic expression can aid efficiency and accuracy when solving quadratic equations. (MA10-GR.HS-S.2-GLE.3-EO.b.i)	What is the difference between the methods for solving a quadratic equation? What does it mean if a function is not factorable? What information does completing the square for a quadratic function reveal? How do you know when a quadratic has a maximum or minimum?	Why is it beneficial to write quadratics in different forms? Why would you use a particular method for solving a quadratic equation?
Quadratic functions and their graphs model real-world applications by helping visualize symmetry and extreme values. (MA10-GR.HS-S.2-GLE.1-EO.c.v)	What do the zeros of a quadratic equation represent in terms of a model? How can you see the symmetry of a quadratic in its equation?	Why is a quadratic a good model for projectile motion and are there limits to its application? Why might you want to solve for the zeros of a quadratic?

Polynomials form a closed system under the operations of addition, subtraction, and multiplication analogous to the integers. (MA10-GR.HS-S.2-GLE.3-EO.c.i)	What operations can be done to two polynomials that will result in another polynomial? How are rational and irrational numbers similar and different from integers with respect to closure?	Why is it important to know that polynomials are closed under these operations?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Interpret parts of an expression, such as terms, factors, and coefficients in terms of its context. (MA10-GR.HS-S.2-GLE.3-EO.a.i.1)
- Interpret numerical expressions and polynomial expressions in one variable by viewing one or more of their parts as a single entity. (MA10-GR.HS-S.2-GLE.3-EO.a.i.2)
- Use the structure of an expression to identify ways to rewrite it. (MA10-GR.HS-S.2-GLE.3-EO.a.ii)
- Factor a quadratic expression to reveal the zeros of the function it defines. (MA10-GR.HS-S.2-GLE.3-EO.b.i.1)
- Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. (MA10-GR.HS-S.2-GLE.3-EO.b.i.2)
- Explain each step in solving a simple quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution and construct a viable argument to justify a solution method. (MA10-GR.HS-S.2-GLE.4-EO.b.i)
- Solve quadratic equations in one variable using 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 and derive the quadratic formula from this form. (MA10-GR.HS-S.2-GLE.4-EO.c.ii.1)
- 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. (MA10-GR.HS-S.2-GLE.4-EO.c.ii.2)
- 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; including quadratic and cubic in which linear and quadratic factors are available. (MA10-GR.HS-S.2-GLE.3-EO.d.ii)
- 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. (MA10-GR.HS-S.2-GLE.1-EO.c.vi.1)
- 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. (MA10-GR.HS-S.1-GLE.1-EO.b)
- 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. (MA10-GR.HS-S.2-GLE.3-EO.c.i)

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A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):		*I completed the square of the quadratic in order to find the vertex of the parabola. I also could find the line of symmetry by completing the square.* *I factored this equation in order to solve for its roots.*
Academic Vocabulary:	Identify, symmetry, reveal, interpret, justify, explain, structure, graph, model, real world applications,	
Technical Vocabulary:	Quadratic, parabola, complete the square, factor, expression, zeros, roots, square root, polynomial, extreme values, maximum, minimum, closed, vertex, equivalent, functions, roots, equations, solutions, axis of symmetry	

Unit Title	Home on the Range – Part 2	**Length of Unit**	3 weeks
Focusing Lens(es)	Representation	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.2-GLE.1 MA10-GR.HS-S.2-GLE.4
Inquiry Questions (Engaging-Debatable):	• How does the same melody in a different key relate to a function being translated or scaled? (MA10-GR.HS-S.2-GLE.1-EO.e.i)		
Unit Strands	Number and Quantity: Quantities Algebra: Reasoning with Equations and Inequalities Functions: Interpreting Functions Functions: Building Functions		
Concepts	Functions, translations, scaling, graph, equations, coordinate plane, set of all solutions, curve, line, coordinate plane, key features, domain, range, maxima, minima, intercepts, symmetry, end behavior, average rate of change, prediction, effects, values of k, f(x) by f(x) + k, k f(x), f(kx), f(x + k), quantity		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
Functions, translated and scaled, enhance the application of similar functions to multiple situations. (MA10-GR.HS-S.2-GLE.1-EO.e.i)	How do you shift a function up or down? How do you shift a function right or left? How do you stretch a function?	When a melody repeats in music, is that analogous to a function being translated or scaled? What does the same melody in a different key represent?
Equations graphed in the coordinate plane provide a visual representation of the set of all solutions to the equation as curve (which could be a line). (MA10-GR.HS-S.2-GLE.4-EO.e.i	How do graphs represent all the solutions to an equation?	Why are graphs important tools for visualizing the solutions to an equation?

The visualization of a variety of functions on a coordinate plane helps interpretation of key features, such as domain, range, maxima, minima, intercepts, symmetry, end behavior and average rate of change. (MA10-GR.HS-S.2-GLE.1-EO.c)	What are important characteristics of a function that can be seen on a graph? What do the graphs of linear, exponential, square root, cube root, step and absolute value functions look like? What is the relationship between an average rate of change of any function and the slope of a linear function? How can you identify zeros of polynomial functions from a graph?	Why are multiple types of functions needed to model real world phenomena? How does visualizing a function help interpret the relationship between two variables? How is the graph of an equation related to its solutions?
Mathematicians can predict the effects on a graph when 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). (MA10-GR.HS-S.2-GLE.1-EO.e.i)	What is the impact 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)?	Why are the effects on a graph predictable when 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)?
Mathematicians interpret the average rate of change of a function over a specified interval to investigate the rate at which one quantity changes with respect to another quantity. (MA10-GR.HS-S.2-GLE.1-EO.b.iii)	How can you investigate the average rate of when a function is presented graphically, symbolically or as a table? What is average rate of change? What is another name for the average rate of change of linear functions?	Why is the average rate of change important when investigating a function? Why do some functions require average rates of change to be investigating over a specified interval versus the entire function? Why is average of change not synonymous with slope?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- Interpret key features of graphs and tables in terms of the quantities, for functions that model a relationship between two quantities (linear, quadratic, square root, cube root, piece wise, exponential with a domain in integers), 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. (MA10-GR.HS-S.2-GLE.1-EO.b.i)
- 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. (MA10-GR.HS-S.2-GLE.1-EO.b.iii)
- Graph linear and quadratic functions and show intercepts, maxima and minima. (MA10-GR.HS-S.2-GLE.1-EO.c.ii)
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (MA10-GR.HS-S.2-GLE.1-EO.c.iii)
- Compare properties of two functions (linear, quadratic, square root, cube root, piece wise, exponential with a domain in integers) each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (MA10-GR.HS-S.2-GLE.1-EO.c.vi.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 and experiment with cases and illustrate an explanation of the effects on the graph using technology for linear and quadratic functions. (MA10-GR.HS-S.2-GLE.1-EO.e.i)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline. EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*	
A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*Key features of a graph include domain, range, maxima, minima, intercepts and rate of change.* *Functions can be shifted, stretched, or shrunk.*
Academic Vocabulary:	Relationship, increasing, decreasing, graph, line, key features, prediction, effects, identity, compare, calculate, interpret, estimate, illustrate, experiment,
Technical Vocabulary:	Functions, scale, translate, translations, scaling, equations, coordinate plane, set of all solutions, curve, coordinate plane, domain, range, maxima, minima, intercepts, symmetry, average rate of change, values of k, transformation, units, algebraically, graphically, verbally, axes, intervals,

Unit Title	All Systems Go	**Length of Unit**	5 weeks
Focusing Lens(es)	Modeling Concurrence	**Standards and Grade Level Expectations Addressed in this Unit**	MA10-GR.HS-S.2-GLE.4
Inquiry Questions (Engaging-Debatable):	• How do you determine when a hybrid car would pay for itself in gas savings compared to a less expensive conventional car? (MA10-GR.HS-S.2-GLE.4-EO.d)		
Unit Strands	Algebra: Reasoning with Equations and Inequalities Algebra: Creating Equations		
Concepts	Systems, constraint, linear, equations, inequalities, solutions, viable, non-viable, intersections, graph, model, approximation, half-plane, substitution, elimination		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
When solving systems of linear equations mathematicians can determine the type of solution set (one solution, no solutions, or infinite solutions) both graphically and algebraically. (MA10-GR.HS-S.2-GLE.4-EO.d)	What do the different types of solutions for a system of linear equations look like on a graph? How are solutions to systems of equations visualized or approximated on a graph? Is it possible for a system of equations to have no solution, what would this look like on a graph?	Why does graphing a pair of lines describe the possible solution sets for a system of a pair of linear equations?
The characteristics of the equations in a system determine the most efficient strategy for finding a solution. (MA10-GR.HS-S.2-GLE.4-EO.d)	What are the different types of solution processes for solving systems of linear equations?	Why do different types of systems require different types of solution processes? Why if you use an inefficient method will you still get the correct solution to system of equations? Why is substitution sometimes more efficient than elimination for solving a system of linear equations algebraically and vice versa?
The intersection of two half-planes provides a means to visualize and represent the solution to a system of linear inequalities. (MA10-GR.HS-S.2-GLE.4-EO.e.iii)	What would a graph of a system of linear inequalities with no solution look like?	Why are solutions to linear inequalities better represented graphically than algebraically?

Mathematicians evaluate mathematical solutions for their relevance to a model; not all solutions to a system are viable in context. (MA10-GR.HS-S.2-GLE.4-EO.a.iii)	What are characteristics of non-viable solutions? How do you know when a solution will be viable?	Why is it important to evaluate all solutions within the original context?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

- 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. (MA10-GR.HS-S.2-GLE.4-EO.d.i)
- Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. (MA10-GR.HS-S.2-GLE.4-EO.d.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 the solutions approximately of polynomials using technology to graph the functions, make tables of values, or find successive approximations; and, include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value. (MA10-GR.HS-S.2-GLE.4-EO.e.ii)
- 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. (MA10-GR.HS-S.2-GLE.4-EO.e.iii)
- 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. (MA10-GR.HS-S.2-GLE.4-EO.a.iii)
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (MA10-GR.HS-S.2-GLE.4-EO.a.iv)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in ______________ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*The intersection of two linear equations is their solution set; and, if the lines do not intersect, there are no viable solutions.*
Academic Vocabulary:	Intersection, efficiency, characteristics, solutions, one solution, no solutions, infinite solutions, viable, non-viable, approximation, constraints, relevance, context
Technical Vocabulary:	Systems of equations, linear equations, solution set, graphically, algebraically, equations, inequalities, system of inequalities, half-plane, model, elimination, substitution, function, linear