ALGEBRA I

Curriculum/Content Area: Mathematics	**Course Length:** 2 Terms
Course Title: Algebra	**Date last reviewed:** 2020
Prerequisites: NA	**Board approval date:** 8/2020
Primary Resource: REVEAL Algebra Priority Math Standards - Clusters	

Desired Results

Course description and purpose:

Algebra 1 is the foundation for mathematical reasoning. Strategies and skills learned in Algebra 1 are transferred to nearly every other content area and are used in everyday life. The course is designed to use inquiry based strategies to help build conceptual understanding, vocabulary, and to help students most effectively explain their reasoning. Key concepts include solving and graphing linear equations, functions with exponents, polynomial and quadratic functions, and statistics. Students will be asked to discover and apply formulas to solve for unknowns and develop problem solving ability.

Enduring Understandings:	**Essential Questions**:
Mathematicians make sense of problems and persevere in solving them.	a. How do we as mathematicians analyze the problem in order to choose the best strategy(ies) or resource to make sense of the problem? b. How do we as mathematicians persevere in solving problems?
Mathematicians attend to precision.	How do we as mathematicians know if we fully & accurately answered the problem and does the results make sense in the context of the problem?
Mathematicians reason abstractly and quantitatively.	How do we as mathematicians make sense of quantities and situations symbolically?
Mathematicians construct viable arguments and critique the reasoning of others.	a. How can we as mathematicians justify our answer(s)? b. How can we as mathematicians evaluate and question whether a mathematical argument is accurate?
Mathematicians model with mathematics.	a. What model(s) can we as mathematicians use to solve a problem? b. How can we as mathematicians determine an effective model to use to solve a problem?
Mathematicians use appropriate tools strategically.	What tools are available and efficient for us as mathematicians to use while solving a problem?
Mathematicians look for and make use of structure	How can we as mathematicians use and apply patterns and structures to solve problems?
Mathematicians look for and express regularity	How can we as mathematicians create and apply generalizations from

in repeated reasoning.	repeated reasoning?

Mathematical Practice Standards

The Standards for Mathematical Practice are central to the teaching and learning of mathematics. These practices describe the behaviors and habits of mind that are exhibited by students who are mathematically proficient. Mathematical understanding is the intersection of these practices and mathematics content. It is critical that the Standards for Mathematical Practice are embedded in daily mathematics instruction.

Mathematical Practice Standards		Grade Level/Course
Habits of Mind	MP.1 Make sense of problems and persevere in solving them	Understand the meaning of a problem and look for entry points to its conclusion. Analyze information (givens, constraints, relationships, goals. Make conjectures and plan a solution pathway. Monitor and evaluate the progress and change course as necessary Check answers to problems and ask, “Does this make sense?”
	MP.6 Attend to precision.	Communicate precisely using clear definitions. State the meaning of symbols, carefully specifying units of measure, and providing accurate labels. State the meaning of symbols, carefully specifying units of measure, and providing accurate labels. Calculate accurately and efficiently, expressing. numerical answers with a degree of precision. Provide carefully formulated explanations. Label accurately when measuring and graphing.
Reasoning & Explaining	MP.2 Reason abstractly and quantitatively.	Make sense of quantities and relationships in problem situations. Represent abstract situations symbolically and understand the meaning of quantities. Create a coherent representation of the problem at hand. Consider the units involved. Flexibility uses properties of operations.
	MP.3 Construct viable arguments and critique the reasoning of others.	Use definitions and previously established causes/effects (results) in constructing arguments. Make conjectures and use counterexamples to build a logical progression of statements to explore and support ideas. Communicate and defend mathematical reasoning using objects, drawings, diagrams, and/or actions. Listen to or read the arguments of others. Decide if the arguments of others make sense and ask probing questions to clarify or improve the arguments.

Modeling & Using Tools	MP.4 Model with mathematics.	Apply prior knowledge to solve real world problems. Identify important quantities and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and/or formulas.Use assumptions and approximations to make a problem simpler. Check to see if an answer makes sense within the context of a situation and change a model when necessary.
	MP.5 Use appropriate tools strategically.	Make sound decisions about the use of specific tools (examples might include: calculator, concrete models, digital, technologies, pencil/paper, ruler, compass, protractor) Use technology tools to visualize the results of assumptions, explore consequences, and compare predictions with data. Identify relevant external math resources (digital content on a website) and use them to pose or solve problems. Use technological tools to explore and deepen understanding of concepts.
Seeing Structure & Generalizing	MP.7 Look for and make use of structure.	Look for patterns or structure, recognizing that quantities can be represented in different ways. Recognize the significance in concepts and models and use the patterns or structure for solving related problems. View complicated quantities both as single objects or compositions of several objects and use operations to make sense of problems.
	MP.8 Look for and express regularity in repeated reasoning.	Notice repeated calculations and look for general methods and shortcuts. Continually evaluate the reasonableness of intermediate results (comparing estimates), while attending to details, and make generalizations based on findings.

Priority Standard Clusters

N-RNA Extend the properties of exponents to rational exponents.

- *(N-RNA1)* Standard 1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- *(N-RNA2)* Standard 2: Rewrite expressions involving radicals and rational exponents using the properties of rational exponents.

N-RNB Use properties of rational and irrational numbers.

- *(N-RNB3)* Standard 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.

N-Q Reason quantitatively and use units to solve problems.

- *(N-Q1)* Standard 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.

- *(N-Q.2)* Standard 2: Define appropriate quantities for the purpose of descriptive modeling.
- *(N-Q.3)* Standard 3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

A-SSEA Interpret the structure of expressions.

- *(A-SSE-A-1a)* Interpret expressions that represent a quantity in terms of its context: Interpret parts of an expression, such as terms, factors, and coefficients
- *(A-SSE-A-1b)* Interpret expressions that represent a quantity in terms of its context: Interpret complicated expressions by viewing one or more of their parts as a single entity.
- *(A-SSE-A-2)* Use the structure of an expression to identify ways to rewrite it.

A-SSE-B Write expressions in equivalent forms to solve problems.

- *(A-SSE-B3a)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Factor a quadratic expression to reveal the zeros of the function it defines
- *(A-SSE-B3b)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- *(A-SSE-B3c)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Use the properties of exponents to transform expressions for exponential functions.

A-APR-A Perform arithmetic operations on polynomials.

- 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.

A-CED-A Creating equations that describe numbers or relationships.

- *(A-CED-1)* Create equations and inequalities in one variable and use them to solve problems
- *(A-CED-2)* Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales
- *(A-CED-3)* Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context
- *(A-CED-4)* Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations

A-REI-A Understand solving equations as a process of reasoning and explain the reasoning

- (A-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.
- (A-REI-A-2) Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise

A-REI-B Solve equations and inequalities in one variable

- *(A-REI-B-3)* Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters
- *(A-REI-B-4)* Solve quadratic equations in one variable

A-REI-C Solve systems of equations

- *(A-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
- *(A-REI-C-6)* Solve systems of linear equations exactly and approximately (with graphs) focusing on pairs of linear equations in two variables
- *(A-REI-C-7)* Solve a simple system consisting of a linear equation and a quadratic equation in two variables, algebraically and graphically

A-REI-D Represent and solve equations and inequalities graphically

- *(A-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)
- *(A-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 (use 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.

- *(A-REI-D-12)* Graph the solutions to a linear inequality in two variables as a half plane and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half planes.

F-IF-A Interpret functions that arise in applications in terms of the context

- *(F-IF-A-1)* Understand that a function from one set - called the domain - to another set - called ther 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 the "f" is the graph of the equation y = f(x)
- *(F-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.
- *(F-IF-A-3)* Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers

F-IF-B Interpret functions that arise in applications in terms of the context

- *(F-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 max and mins, symmetries, end behavior and periodicity.
- *(F-IF-B-5)* Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- *(F-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.

F-IF-C Interpret functions that arise in applications in terms of the context

- *(F-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.
  a. graph linear and quadratic functions and show intercepts, maxima and minima
  b. graph square root, cube root and piecewise functions, including step functions and absolute value functions
  c. graph polynomial functions, identifying zeros when suitable factorizations are available and showing end behavior
  d. Graph rational functions identifying zeros and asymptotes when suitable factorizations are available and showing end behavior
  e. Graph exponential and logarithmic functions showing intercepts and end behavior, and trig functions showing period, midline and amplitude.
- *(F-IF-C-8)* Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  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
  b. use the properties of exponents to interpret expressions for exponential functions.
- *(F-IF-C-9)* Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

F-BF-A Build a function that models a relationship between two quantities.

- *(F-BF-A-1a)* Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context
- *(F-BF-A-1b)* Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations (F-BF-A1b).
- *(F-BF-A2)* Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms

F-LE-A Construct and compare linear, quadratic, and exponential models and solve problems.

- *(F-LE-A-1a)* Distinguish between situations that can be modeled with linear function and with exponential functions: prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals - MS.
- *(F-LE-A-1b)* Distinguish between situations that can be modeled with linear function and with exponential functions: recognize situations in which one quantity changes at a constant rate per unit interval relative to another

- *(F-LE-A-1c)* Distinguish between situations that can be modeled with linear function and with exponential functions: recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another - MS
- *(F-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
- *(F-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 - MS.

S-ID-A Summarize, represent, and interpret data on a single count or measurement variable.

- *(S-ID-A1)* Represent data with plots on the real number line (dot plots, histograms, and box plots) - MS
- *(S-ID-A2)* Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets - HS
- *(S-ID-A3)* Interpret differences in shape, center and spread in the context of data sets, accounting for possible effects of extreme data points (outliers). - MS

S-ID-C Interpret linear models.

- *(S-ID-C7)* Interpret the slope and the intercept of a linear model in the context of the data
- *(S-1D-C8)* Compute (using technology) and interpret the correlation coefficient of a linear fit
- *(S-ID-C9)* Distinguish between correlation and causation

Supporting Standard Clusters

F-BF-B Build new functions from existing functions.

- *(F-BF-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, find the value of k given the graphs.
- *(F-BF-4a)* Find inverse functions: 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.

F-LE-B Interpret expressions for functions in terms of the situation they model.

- *(F-LE-B-5)* Interpret the parameters in a linear or exponential function in terms of a context.

S-ID-B Summarize, represent, and interpret data on two categorical and quantitative variables.

- *(S-ID-B5)* Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- *(S-ID-B-6a)* Represent data on two quantitative variables on a scatter plot, and describe how the variables are related: Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
- *(S-ID-B-6b)* Represent data on two quantitative variables on a scatter plot, and describe how the variables are related: Informally assess the fit of a function by plotting and analyzing residuals
- *(S-ID-B-6c)* Represent data on two quantitative variables on a scatter plot, and describe how the variables are related: Fit a linear function for a scatter plot that suggest a linear association

Unit 1 - Expressions

Essential Questions:

1. How can we as mathematicians use and apply patterns and structures to solve problems?
2. How can we as mathematicians create and apply generalizations from repeated reasoning?
3. *How can mathematical expressions be represented and evaluated?*

Unit Standards

Priority Standards

A-SSEA Interpret the structure of expressions.

- ***(A-SSE-A-1a)*** Interpret expressions that represent a quantity in terms of its context: Interpret parts of an expression, such as terms, factors, and coefficients
- ***(A-SSE-A-1b)*** Interpret expressions that represent a quantity in terms of its context: Interpret complicated expressions by viewing one or more of their parts as a single entity.
- ***(A-SSE-A-2)*** Use the structure of an expression to identify ways to rewrite it.

N-RNB Use properties of rational and irrational numbers.

- (*N-RNB3*): 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. (N-RNB.3)

N-Q Reason quantitatively and use units to solve problems.

- *(N-Q.2)* Define appropriate quantities for the purpose of descriptive modeling.
- *(N-Q.3)* Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Supporting Standards

- *None*

Learning Targets

- I can write and evaluate numerical expressions (SSE.1b, SSE.2) L1-1
- I can write and evaluate algebraic expressions (SSE.1, SSE.2) L1-2
    - I identify individual parts of an expression as a single entity to make use of the structure of the expression
    - I explain, in my own words, using precision how specific structures are seen in different expressions resulting in different properties
    - I explain, in my own words, using precision what factor, coefficient, term and like terms mean in the context of expressions.
    - I identify factors, coefficients, different terms, and like terms in expressions
- I can apply the properties of real numbers to simplify expressions (SSE.2) L1-3
    - I explain, in my own words, how specific structures are seen in different expressions resulting in different properties
    - I supply examples and counterexamples of properties
- I can simplify expressions by using the Distributive Property (SSE.1a, SSE.2) L1-4
    - I explain, in my own words, what factor, coefficient, term and like terms mean in the context of expressions.
    - I identify factors, coefficients, different terms, and like terms in expressions.
    - I explain, in my own words, how specific structures are seen in different expressions resulting in different properties
- I can evaluate absolute value expressions (SSE.2) L1-5
    - I explain,in my own words with precision, how specific structures are seen in different expressions resulting in different properties
- I can use quantities for the purpose of modeling a situation, and report solutions with an appropriate level of accuracy. (NQ.2, NQ.3) L1-6
    - I select and properly use an existing quantity for a real-world context
    - I create an appropriate quantity for a real-world context
    - I explain the meaning of different quantities in a problem and its solution

Assessment Evidence

Performance Assessment Options & Rubrics *May include, but are not limited to the following:*	**Other assessment options** *May include, but are not limited to the following:* ● Learnsmart

• Feedback & Scoring Rubric based on Priority Standards • Summative Assessments on Practice & Content Standards • Algebra Feedback & Scoring Rubric based on Priority Standards • Module Pre-Test • End of Unit Assessment (3 differentiated versions) • End of Unit Assessment (3 differentiated versions • Mid-unit checks/quizzes • Self made assessments	• REVEAL performance tasks • LEARN Checks • Extension • Dynamic Practice Possible wicor strategies: • Quick Writes • KWL Chart - (What I Know, Want to know, Learned) • Learning Log Reflection - Daily/Weekly • I-Chart - Gather/Organize Information on a topic • Focused Note Taking • CSG - Collaborative Study Groups • Socratic Seminar/Philosophical Chairs • Think/Pair/Share • One Pagers • Sentence Stems • Costa's Questioning • Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 2 - Equations in One Variable

Essential Questions:

1. How can we as mathematicians use and apply patterns and structures to solve problems?
2. How can we as mathematicians create and apply generalizations from repeated reasoning?
3. How can writing and solving equations help you solve problems in the real world?

Unit Standards

Priority Standards

A-CED-A Creating equations that describe numbers or relationships.

- ***(A-CED-1)*** Create equations and inequalities in one variable and use them to solve problems

A-REI-A Understand solving equations as a process of reasoning and explain the reasoning

- **(A-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.

A-REI-B Solve equations and inequalities in one variable

- ***(A-REI-B-3)*** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters

A-CED-A Creating equations that describe numbers or relationships.

- *(A-CED-3)* Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context

- *(A-CED-4)* Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations

N-Q Reason quantitatively and use units to solve problems.

- *(N-Q1)* Standard 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.

Supporting Standards

- *None*

Learning Targets

- I can create and interpret **equations** that describe relationships (A.CED.1, A.CED.3) L2-1
  - I create an equation to model a situation with one variable.
  - I explain with precision, my reasoning and steps when creating an equationI
  - use contexts to determine constraints for equations
  - I explain with precision, my reasoning for stating constraints for equations .
  - I determine if a solution is viable for a given context, and explain why or why not.
  - I check contextually, analytically, and graphically a solution set of equations to determine the viability of a solution.
- I can solve **equations** by using addition, subtraction, multiplication, and division (A.CED.1, AREI.1, A.REI.3) L2-2
  - I explain with precision, my reasoning and steps when creating an equation.
- I can solve **multi-step equations and equations for specific lettered coefficients** by applying properties of equality. (A.CED.1, A.REI.3) L2-3
  - I create an equation to model a situation with one variable.
  - I explain with precision, my reasoning and steps when creating an equation
  - I can solve multi-step linear equations in one variable including equations with coefficients represented by letters.
- I can solve **equations** with the variable on each side by applying the properties of equality and the Distributive Property (A.CED.1, A.REI.3) L2-4
  - I create an equation or inequality to model a situation with one variable.
  - I explain with precision, my reasoning and steps when creating an equation
  - I can solve multi-step linear equations in one variable including equations with coefficients represented by letters.
- I can solve absolute value **equations** (A.CED.1, A.REI.3) L2-5
  - I create an equation to model a situation with one variable.
  - I explain with precision, my reasoning and steps when creating an equation
  - I check contextually, analytically, and graphically a solution set of equations to determine the viability of a solution.
- I can solve **equations** involving proportions (A.CED.1, A.REI.3) L2-6
  - I create an equation to model a situation with one variable.
  - I explain with precision, my reasoning and steps when creating an equation
  - I can solve multi-step linear equations in one variable including equations with coefficients represented by letters.
  - I can solve multi-step linear inequalities in one variable.
- I can solve **equations** for specific variables and convert (A.CED.4, A.REI.3) L2-7
  - I explain, in my own words using precision, the steps used to rearrange a formula to highlight a variable of interest.
  - I make connections between solving equations and rearranging formulas.

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test
- End of Unit Assessment (3 differentiated versions)
- End of Unit Assessment (3 differentiated versions
- Mid-unit checks/quizzes
- Self made individualized assessments

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- LEARN Checks
- Extension
- Dynamic Practice

Possible wicor strategies:

- Quick Writes
- KWL Chart - (What I Know, Want to know, Learned)
- Learning Log Reflection - Daily/Weekly
- I-Chart - Gather/Organize Information on a topic
- Focused Note Taking
- CSG - Collaborative Study Groups
- Socratic Seminar/Philosophical Chairs
- Think/Pair/Share
- One Pagers
- Sentence Stems
- Costa's Questioning
- Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 3 - Relations and Functions

Essential Questions:
1. How do we as mathematicians make sense of quantities and situations symbolically?
2. How can we as mathematicians determine an effective model to use to solve a problem?
3. Why are representations of relations and functions useful?

Unit Standards

Priority Standards
F-IF-A Interpret functions that arise in applications in terms of the context

- ***(F-IF-A-1)*** Understand that a function from one set - called the domain - to another set - called ther 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 the "f" is the graph of the equation y = f(x)
- ***(F-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.

F-IF-B Interpret functions that arise in applications in terms of the context

- ***(F-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 max and mins, symmetries, end behavior and periodicity.
- *(F-IF-B-5)* Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F-IF-C Interpret functions that arise in applications in terms of the context

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

N-Q Reason quantitatively and use units to solve problems.

- *(N-Q1)* Standard 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.

Supporting Standards

- *None*

Learning Targets

- I can represent relations with graphs, ordered pairs, tables, and mappings. (N.Q.1, F.IF.1) L3-1
  - I determine and/or explain why a specific scale was chosen for a graph
  - I can determine if a relation is a function.
  - I can represent a function using a graph, table, and equation and describe the relationship between each form using function notation
- I can determine whether a relation is a function and find function values. (F.IF.1, F.IF.2) L3-2
  - I can determine if a relation is a function.
  - I can represent a function using a graph, table, and equation and describe the relationship between each form using function notation
  - I can evaluate a function using function notation and interpret the value in context.
  - I can determine the domain and range of a function
- I can identify linear and nonlinear functions and continuous and discrete functions. (F.IF.4, F.IF.5) L3-3
- I can identify intercepts and functions and solve equations by graphing. (A.REI.10, F.IF.4) L3-4
  - I can interpret the graphical representation of linear and nonlinear functions.
    - I can interpret key elements of the graph, including the y-intercept and x-intercept(s).
    - I can estimate solutions from a graph
- I can identify symmetry, extrema, and end behavior of functions. (F.IF.4) L3-5
  - I can interpret the graphical representation of linear and nonlinear functions (key elements of the graph, including the intercepts, increasing and decreasing intervals, and extrema).
- I can sketch graphs of functions and compare two or more functions. (F.IF.4, F.IF.9) L3-6
  - I can interpret the graphical representation of linear and nonlinear functions.
    - I can sketch a graph showing key features given a particular scenario or context.

Assessment Evidence

Performance Assessment Options & Rubrics *May include, but are not limited to the following:* ● Feedback & Scoring Rubric based on Priority Standards	**Other assessment options** *May include, but are not limited to the following:* ● Learnsmart ● REVEAL performance tasks ● LEARN checks

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Digital Tools & Supplementary Resources

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- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 4 - Linear and Nonlinear Functions

Essential Questions:

1. How can we as mathematicians use and apply patterns and structures to solve problems?
2. How can we as mathematicians create and apply generalizations from repeated reasoning?
3. What can a function tell you about the relationship that it represents?

Unit Standards

Priority Standards

F-IF-C Interpret functions that arise in applications in terms of the context

- ***(F.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.
  a. graph linear and quadratic functions and show intercepts, maxima and minima
  b. graph square root, cube root and piecewise functions, including step functions and absolute value functions

A-CED-A Creating equations that describe numbers or relationships.

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

F-IF-B Interpret functions that arise in applications in terms of the context

- *(F-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 max and mins, symmetries, end behavior and periodicity.
- *(F.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.

F-BF-A Build a function that models a relationship between two quantities.

- *(F-BF-A.1a)* Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context
- *(F-BF-A2)* Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms

F-LE-A Construct and compare linear, quadratic, and exponential models and solve problems.

- *(F-LE-A-1a)* Distinguish between situations that can be modeled with linear function and with exponential functions:
- *(F-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

Supporting Standards

F-BF-B Build new functions from existing functions.

- ***(F.BF.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, find the value of k given the graphs.*

F-LE-B Interpret expressions for functions in terms of the situation they model.

- *(F.LE.B.5) Interpret the parameters in a linear or exponential function in terms of a context.*

Learning Targets

- I can graph linear functions by using tables and intercepts. (A.REI.10, F.IF.7a, F.LE.5) L4-1
  - I can graph linear expressions that are expressed symbolically.
  - When given a linear model, I can explain the intercepts in context.
  - I can choose appropriate domain values when creating a table.
- I can find and interpret the rate of change and slopes of lines. (F.IF.6, F.LE.5) L4-2
  - I can use a graph to describe how a function is changing (rate of change) over a given interval.
  - I can find and estimate the rate of change over a given interval from a graph, table and set of ordered pairs
  - When given a linear model, I can explain the slope and the y-intercept in context.
- I can graph equations in slope-intercept form. (A.CED.2, F.IF.7a, F.LE.5) L4-3
  - I can write and graph linear functions that are expressed symbolically.
  - When given a linear model, I can explain the slope and the intercepts in context.
- I can identify the effects of transformations of the graphs of linear functions. (F.IF.7a, F.BF.3) L4-4
  - I explore different expressions for transformations of f(x) and generalize the effects.
  - I explain how each of these affect the graph of f(x) : f(x) + k, kf(x), f(kx) and f(x + k)
  - I recognize even and odd symmetry in graphs and in the symbolic forms of functions.
- I can write and graph equations of arithmetic sequences.(F.BF.1a, F.BF.2, F.LE.2) L4-5
  - I create verbal, recursive and explicit rules for the arithmetic sequence.
    I translate between recursive and explicit definitions of arithmetic sequence.
  - I can use arithmetic sequences to solve contextual problems.
  - I explain the process of obtaining the sequence and how the sequence affects the input and output (consecutive integers for the input, such as the row of the display: discrete outputs)
  - I connect learning about arithmetic sequences to create models for a graph, description, or table derived from a contextual situation. .
- I can graph piecewise-defined and step functions (F.IF.4, F.IF.7b) L4-6
  - I can graph piecewise-defined functions, including step functions
- I can identify the effects of transformations of the graphs of absolute value functions. (F.IF.7b, F.BF.3) L4-7
  - I can graph absolute value functions
  - I explore different expressions for transformations of f(x) and generalize the effects.

- I explain how each of these affect the graph of f(x) : f(x) + k, kf(x), f(kx) and f(x + k).

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test
- End of Unit Assessment (3 differentiated versions)
- End of Unit Assessment (3 differentiated versions
- Mid-unit checks/quizzes
- Self made individualized assessments

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- LEARN checks
- Extension
- Dynamic Practice

Possible wicor strategies:

- Quick Writes
- KWL Chart - (What I Know, Want to know, Learned)
- Learning Log Reflection - Daily/Weekly
- I-Chart - Gather/Organize Information on a topic
- Focused Note Taking
- CSG - Collaborative Study Groups
- Socratic Seminar/Philosophical Chairs
- Think/Pair/Share
- One Pagers
- Sentence Stems
- Costa's Questioning
- Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DEMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 5 - Creating Linear Equations

Essential Questions:
1. How do we as mathematicians analyze the problem in order to choose the best strategy(ies) or resource to make sense of the problem?
2. How do we as mathematicians make sense of quantities and situations symbolically?
3. What can a function tell you about the relationship that it represents?

Unit Standards

Priority Standards
A-CED-A Creating equations that describe numbers or relationships.

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

S-ID-C Interpret linear models.

- ***(S-ID-C7)*** Interpret the slope and the intercept of a linear model in the context of the data
- *(S-1D-C8)* Compute (using technology) and interpret the correlation coefficient of a linear fit
- *(S-ID-C9)* Distinguish between correlation and causation

Supporting Standards

S-ID-B Summarize, represent, and interpret data on two categorical and quantitative variables.

- *(S-ID-B-6a)* Represent data on two quantitative variables on a scatter plot, and describe how the variables are related: Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
- ***(S-ID-B-6c)*** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related: Fit a linear function for a scatter plot that suggest a linear association

F-BF-B Build new functions from existing functions.

- *(F-BF-4a)* Find inverse functions: 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.

Learning Targets

- I can create linear equations in slope intercept form. (A.CED.2, S.ID.7) L5-1
    - I create an equation to model a situation with two variables given slope and one point or given two points
    - I explain with precision, my reasoning and steps when creating an equation.
    - I explain with precision, the slope and intercept estimates in terms of problem context
    - I extend connections from linear functions to making connections to contextual situations
    - I explain with precision, reasoning for slope and y-intercept parameters in terms of predicted values.
- I can create linear equations in point-slope form and standard form. (A.CED.2, A.CED.3) L5-2
    - I create an equation to model a situation with two variables.
    - I explain with precision, my reasoning and steps when creating an equation
- I can use scatter plots to make and evaluate predictions. (S.ID.6a, S.ID.6c) L5-3
    - I use relative frequencies to make inferences about associations or trends in data.
    - I interpret relative frequencies in terms of a subset of a conditioned event.
    - I use technology to make inferences about associations in data sets.
    - I use technology to test conjectures about and explore the correlation between two quantitative variables.
    - I create my own best-fit lines and discuss reasons for choosing the associated lines.
    - I use purposeful terminology to imply association rather than causation
- I can determine whether a situation illustrates correlation or causation. (S.ID9) L5-4
    - I use precision in the wording of relationships between two variables using words such as correlated or associated for two variables that are linearly related.
    - I justify, explain and provide reasons for the difference between correlation and causation
- I can use best-fit lines and correlation coefficients to determine how well linear functions fit sets of data. (S.ID.6, S.ID.8) L5-5
    - I use technology to compare different models and their respective correlations coefficients.
    - I reason and make sense of different correlation coefficients and their relationship to different situations.I analyze different residual plots for different predictive models
    - I deduce that points randomly distributed above and below the horizontal line at zero on a residual plot imply appropriate fits for a model.
    - I interpret points in relationship to the means of the x and y values by graphing a vertical and horizontal line to represent the mean of both x and y variables
- I can find inverses of functions. (**A.CED.2**, F.BF.4a) L5-6
    - I create an equation to model a situation with two variables.
    - I explain my reasoning and steps when creating an equation.
    - I create an equation to model a situation with two variables.

- I explain my reasoning and steps when creating an equation

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test
- End of Unit Assessment (3 differentiated versions)
- End of Unit Assessment (3 differentiated versions
- Mid-unit checks/quizzes
- Self made individualized assessments

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- Learn Checks
- Extension
- Dynamic Practice

Possible wicor strategies:

- Quick Writes
- KWL Chart - (What I Know, Want to know, Learned)
- Learning Log Reflection - Daily/Weekly
- I-Chart - Gather/Organize Information on a topic
- Focused Note Taking
- CSG - Collaborative Study Groups
- Socratic Seminar/Philosophical Chairs
- Think/Pair/Share
- One Pagers
- Sentence Stems
- Costa's Questioning
- Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 6 - Linear Inequalities

Essential Questions:
1. How can we as mathematicians use and apply patterns and structures to solve problems?
2. What model(s) can we as mathematicians use to solve a problem?
3. How can writing and solving inequalities help you solve problems in the real world?

Unit Standards

Priority Standards
A-CED-A Creating equations that describe numbers or relationships.

- ***(A-CED-1)*** Create equations and inequalities in one variable and use them to solve problems
- *(A-CED-3)* Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context

A-REI-B Solve equations and inequalities in one variable

- ***(A-REI-B-3)*** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters

A-REI-D Represent and solve equations and inequalities graphically

- *(A-REI-D-12)* Graph the solutions to a linear inequality in two variables as a half plane and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half planes.

Supporting Standards

- None

Learning Targets

- I can solve inequalities by using addition, subtraction, multiplication, and division. (**A.CED.**1, **A.REI.3**) L6-1
  - I create an inequality to model a situation with one variable.
  - I explain my reasoning and steps when creating an inequality.
- I can solve inequalities by using more than one step. (**A.CED.1, A.REI.3**) L6-2
  - I create an inequality to model a situation with one variable.
  - I explain my reasoning and steps when creating an inequality.
  - I can solve multi-step linear inequalities in one variable.
- I can write and solve combinations of two inequalities joined by "*and*" or "*or*. "(**A.CED.1**, A.CED.3) L6-3
  - I create an inequality to model a situation with one variable.
  - I explain my reasoning and steps when creating an inequality.
  - I use contexts to determine constraints for inequalities.
  - I explain my reasoning for stating constraints for inequalities.
  - I determine if a solution is viable for a given context, and explain why or why not.
  - I check contextually, analytically, and graphically a solution set of inequalities to determine the viability of a solution.
- I can solve absolute value inequalities. (A.CED.1, A.CED.3) L6-4
  - I create an inequality to model a situation with one variable.
  - I explain my reasoning and steps when creating an inequality.
  - I use contexts to determine constraints for inequalities.
  - I explain my reasoning for stating constraints for inequalities and by systems of inequalities.
  - I determine if a solution is viable for a given context, and explain why or why not.
  - I check contextually, analytically, and graphically a solution set of inequalities to determine the viability of a solution.
- I can graph linear inequalities on the coordinate plane. (A.CED.3, A.REI.12) L6-5
  - I explain my reasoning and steps when creating an inequality.
  - I can describe and interpret the solutions to a system of linear inequalities graphically

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- Learn Checks
- Extension
- Dynamic Practice

Possible wicor strategies:

- Quick Writes

• End of Unit Assessment (3 differentiated versions) • End of Unit Assessment (3 differentiated versions • Mid-unit checks/quizzes • Self made individualized assessments	• KWL Chart - (What I Know, Want to know, Learned) • Learning Log Reflection - Daily/Weekly • I-Chart - Gather/Organize Information on a topic • Focused Note Taking • CSG - Collaborative Study Groups • Socratic Seminar/Philosophical Chairs • Think/Pair/Share • One Pagers • Sentence Stems • Costa's Questioning • Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 7 - Systems of Linear Equations and Inequalities

Essential Questions:

1. How can we as mathematicians determine an effective model to use to solve a problem?
2. How can we as mathematicians use and apply patterns and structures to solve problems?
3. How are systems of equations useful in the real world?

Unit Standards

Priority Standards

A-CED-A Creating equations that describe numbers or relationships.

- ***(A-CED-3)*** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context

A-REI-CSolve systems of equations

- *(A-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
- ***(A-REI-C-6)*** Solve systems of linear equations exactly and approximately (with graphs) focusing on pairs of linear equations in two variables

A-REI-D Represent and solve equations and inequalities graphically

- *(A-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 (use 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.
- ***(A-REI-D-12)*** Graph the solutions to a linear inequality in two variables as a half plane and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half planes.

Supporting Standards

- *None*

Learning Targets

- I can solve systems of equations by graphing (A.REI.6, A.REI.11) M7 - L1
    - I can write, solve, interpret (number and types of solutions), and justify my solution method for systems of linear equations using graphing manually and with technology.
- I can solve systems of equations by using substitution (A.CED.3, A.REI.6) M7 -L 2
    - I use contexts to determine constraints for equations and by systems of equations
    - I explain my reasoning for stating constraints for equations and by systems of equations.
    - I will determine if a solution is viable for a given context, and explain why or why not.
    - I can write, solve, interpret, and justify my solution method for systems of linear equations.
- I can solve systems of equations by using elimination with addition or subtraction (A.CED.3, A.REI.6) M7- L3
    - I use contexts to determine constraints for equations and by systems of equations.
    - I explain my reasoning for stating constraints for equations and by systems of equations.
    - I can determine if a solution is viable for a given context, and explain why or why not.
    - I can write, solve, interpret, and justify my solution method for systems of linear equations using linear combination and substitution.
- I can solve systems of equations by using elimination with multiplication (A.REI.5, A.REI.6) M7 - L4
    - I can write, solve, interpret, and justify my solution method for systems of linear equations using elimination (linear combination).
- I can solve systems of inequalities by graphing (A.CED.3, A.REI.12) M7 - L5
    - I use contexts to determine constraints for systems of inequalities.
    - I explain my reasoning for stating constraints for systems of inequalities.
    - I determine if a region of solution is viable for a given context, and explain why or why not.
    - I check contextually, analytically, and graphically a solution set of inequalities to determine the viability of a solution.
    - I can describe and interpret the solutions to a system of linear inequalities graphically

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test
- End of Unit Assessment (3 differentiated versions)
- End of Unit Assessment (3 differentiated versions
- Mid-unit checks/quizzes
- Self made individualized assessments

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- Learn Checks
- Extension
- Dynamic Practice

Possible wicor strategies:

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- Socratic Seminar/Philosophical Chairs
- Think/Pair/Share
- One Pagers
- Sentence Stems
- Costa's Questioning
- Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 8 - Exponents and Roots

Essential Questions:

1. How can we as mathematicians determine an effective model to use to solve a problem?
2. How can we as mathematicians use and apply patterns and structures to solve problems?
3. *How do you perform operations and represent real-world situations with exponents?*

Unit Standards

Priority Standards

A-SSEA Interpret the structure of expressions.

- ***(A-SSE-A-2)*** Use the structure of an expression to identify ways to rewrite it.

A-SSE-B Write expressions in equivalent forms to solve problems.

- *(A-SSE-B3c)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Use the properties of exponents to transform expressions for exponential functions.

N-RNA Extend the properties of exponents to rational exponents.

- ***(N-RNA1)*** Standard 1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- ***(N-RNA2)*** Standard 2: Rewrite expressions involving radicals and rational exponents using the properties of rational exponents.

N-RNB Use properties of rational and irrational numbers.

- *(N-RNB3)* Standard 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.

Supporting Standards

Standard number (space) Supporting Standard Cluster that is taught IN THIS UNIT.

- *Standard number* Grade level standard under the above cluster that is taught IN THIS UNIT

Learning Targets

- I can apply the multiplication properties of exponents to simplify expressions. (A.SSE.2, A.SSE.3c) M8 - L1
  - I can use precision to explain, in my own words, how specific structures are seen in different expressions resulting in different properties
- I can apply the division properties of exponents to simplify expressions. (A.SSE.2, A.SSE.3c) M8 -L 2
  - I can use precision to explain, in my own words, how specific structures are seen in different expressions resulting in different properties
- I can apply the properties of zero and negative exponents to simplify expressions. (A.SSE.2) M8 - L3
  - I can use precision to explain, in my own words, how specific structures are seen in different expressions resulting in different properties

- I can apply the properties of rational exponents to simplify expressions. (NRN.1, N.RN.2) M8 - L4
    - I can use precision to explain the meaning of rational exponents using integer exponent properties
    - I can use precision to explain the meaning of rational exponents in terms of radicals and roots
    - I translate fluently between radical and exponential forms
    - I can use precision to explain my reasoning when simplifying radical and rational exponent expressions to solve problems.
- I can simplify radical expressions. (N.RN.2) M8 - L5
    - I can use prime factorization to simplify radicals
    - I can use precision to explain the meaning of rational exponents in terms of radicals and roots
    - I can use precision to explain my reasoning when simplifying radical and rational exponent expressions to solve problems.
- I can perform operations with radical expressions. (N.RN.2, N.RN.3) M8 - L6
    - I can use precision to explain the meaning of rational exponents in terms of radicals and roots
    - I can use precision to explain my reasoning when simplifying radical and rational exponent expressions using addition and multiplication to solve problems.
    - I can apply the closure property of addition when adding two rationals numbers numbers or two irrationals and the closure property of multiplication when multiplying rational numbers.
    - I supply examples and counterexamples of properties
- I can solve exponential equations (N.RN.2, A.SSE.2) M8 - L7
    - I can use precision to explain my reasoning when simplifying radical and rational exponent expressions to solve problems.
    - I can apply the closure property of addition when adding two rationals numbers numbers or two irrationals and the closure property of multiplication when multiplying rational numbers.
    - I supply examples and counterexamples of properties

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
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Other assessment options
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- REVEAL performance tasks
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- Dynamic Practice

Possible wicor strategies:

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- Take Another Look
- Dynamic Practice

Unit 9 - Exponential Functions

Essential Questions:

1. How can we as mathematicians evaluate and question whether a mathematical argument is accurate?
2. How can we as mathematicians create and apply generalizations from repeated reasoning?
3. *When and how can exponential functions represent real-world situations?*

Unit Standards

Priority Standards

F-IF-A Interpret functions that arise in applications in terms of the context

- *(F-IF-A-3)* Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

F-IF-C Interpret functions that arise in applications in terms of the context

- ***(F-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.
  e. Graph exponential and logarithmic functions showing intercepts and end behavior, and trig functions showing period, midline and amplitude.
- *(F-IF-C-8)* Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  b. use the properties of exponents to interpret expressions for exponential functions.

F-LE-A Construct and compare linear, quadratic, and exponential models and solve problems.

- *(F-LE-A-1c)* Distinguish between situations that can be modeled with linear function and with exponential functions: recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another - MS
- ***(F-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

A-SSE-B Write expressions in equivalent forms to solve problems.

- *(A-SSE-B3c)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Use the properties of exponents to transform expressions for exponential functions.

F-BF-A Build a function that models a relationship between two quantities.

- *(F-BF-A-21b)* Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations (F-BF-A1b).
- *(F-BF-A2)* Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms

Supporting Standards

F-LE-B Interpret expressions for functions in terms of the situation they model.

- *(F-LE-B-5)* Interpret the parameters in a linear or exponential function in terms of a context.

F-BF-B Build new functions from existing functions.

- *(F-BF-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, find the value of k given the graphs.

Learning Targets

- I can graph exponential functions. (F.IF.7e, F.IF.1c, F.LE.5) M9 - L1
    - I can graph exponential functions that are expressed symbolically.
    - I use mathematical structure and repeated reasoning to recognize an exponential function is one in which an equal factor is multiplied for each equal-sized interval.
    - When given an exponential model, I explain the meaning of the base, the exponent, and the coefficient in context.
    - I can identify the relevant domain and range of an exponential function.
- I can identify the effects of transformations of the graphs of exponential functions. (F.IF.7e, F.BF.3) M9 - L2
    - I explore different expressions for transformations of f(x) and generalize the effects.
    - I apply my knowledge of geometric transformations to a function.
    - I explain how each of these affect the graph of f(x) : f(x) + k, kf(x), f(kx) and f(x + k)
- I can create exponential functions and solve problems involving exponential growth and decay. (F.LE.2, F.LE.5) M9 - L3
    - I connect learning from Interpreting and Building Functions to constructing linear and exponential functions.
    - I apply my learning to constructing functions for information from a graph, description, or set of ordered pairs.
    - I differentiate between growth and decay models, and specify the percentage growth or decay from a model.
    - When given a graph, verbal description, or a set of ordered pairs, I can explain why the function is linear or exponential using rates of change in the justification.
- I can use the properties of exponents to transform expressions for exponential functions. (A.SSE.3c. F.IF.8b) M9 - L4
    - I solve contextual problems using equivalent forms of expressions
- I can write and graph equations of geometric sequences. (F.BF.2, F.LE.2) M9 - L5
    - I create verbal, recursive and explicit rules for the arithmetic and geometric sequences.
    - I connect learning about arithmetic and geometric sequences to create models for a graph, description, or table derived from a contextual situation.
    - I use geometric sequences to solve contextual problems.
    - I explain the process of obtaining the sequence and how the sequence affects the input and output (consecutive integers for the input, such as the row of the display: discrete outputs)
- I can write geometric sequences recursively. (F.IF.3, F.BF.2) M9 - L6
    - I can write exponential functions from a sequence
    - I create verbal, recursive and explicit rules for the geometric sequences.
    - I translate between recursive and explicit definitions of geometric sequences.
    - I use geometric sequences to solve contextual problems.
    - I explain the process of obtaining the sequence and how the sequence affects the input and output (consecutive integers for the input, such as the row of the display: discrete outputs)

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- LEARN checks
- Extension
- Dynamic Practice

Possible wicor strategies:

• End of Unit Assessment (3 differentiated versions) • End of Unit Assessment (3 differentiated versions • Mid-unit checks/quizzes • Self made individualized assessments	• Quick Writes • KWL Chart - (What I Know, Want to know, Learned) • Learning Log Reflection - Daily/Weekly • I-Chart - Gather/Organize Information on a topic • Focused Note Taking • CSG - Collaborative Study Groups • Socratic Seminar/Philosophical Chairs • Think/Pair/Share • One Pagers • Sentence Stems • Costa's Questioning • Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 10 - Polynomials

Essential Questions:

1. How can we as mathematicians use and apply patterns and structures to solve problems?
2. How do we as mathematicians make sense of quantities and situations symbolically?
3. How can you perform operations on polynomials and use them to represent real-world situations?

Unit Standards

Priority Standards

A-APR-A Perform arithmetic operations on polynomials.

- 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.

A-SSEA Interpret the structure of expressions.

- *(A-SSE-A-1a)* Interpret expressions that represent a quantity in terms of its context: Interpret parts of an expression, such as terms, factors, and coefficients
- *(A-SSE-A-2)* Use the structure of an expression to identify ways to rewrite it.

A-REI-CSolve systems of equations

- *(A-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

Supporting Standards

- *None*

Learning Targets

- I can add and subtract polynomials by combining like terms. (A.SS.E.1a, A.APR.1) M10 - L1
    - I explain, using precision, in my own words, what factor, coefficient, term and like terms mean in the context of expressions.
    - I identify factors, coefficients, different terms, and like terms in expressions.

- I can write a polynomial in standard form and use it to classify it by degree and # of terms
- I relate integer arithmetic to polynomial arithmetic and become fluent with polynomial arithmetic
- I use connections with arithmetic of polynomials and function to explore equivalent expressions and creating functions that meet specific conditions (such as multiplying binomials to create a function with specified zeros)

- I can multiply polynomials by monomials. (A.APR.1) M10 - L2
  - I use connections with arithmetic of polynomials and functions to explore equivalent expressions and create functions that meet specific conditions. I can multiply polynomials by polynomials. (A.APR.1)
  - I use connections with arithmetic of polynomials and function to explore equivalent expressions and creating functions that meet specific conditions
- I can multiply polynomials by polynomials (A.APR.1) M10 - L3
  - I use connections with arithmetic of polynomials and functions to explore equivalent expressions and create functions that meet specific conditions. I can multiply polynomials by polynomials. (A.APR.1)
  - I use connections with arithmetic of polynomials and function to explore equivalent expressions and creating functions that meet specific conditions
- I can multiply binomials by applying special patterns. (A.APR.1) M10 - L4
  - I use connections with arithmetic of polynomials and function to explore equivalent expressions and creating functions that meet specific conditions (such as multiplying binomials to create a function with specified zeros)
  - I can multiply varying size polynomials against each other
- I can factor polynomials by using the Distributive Property. (A.SSE.2, A.REI.5) M10 - L5
  - I explain, in my own words, how specific structures are seen in different expressions resulting in different properties
  - I can use greatest common factor and grouping to factor a polynomial.
- I can factor trinomials into two binomials. (A.SSE.2) M10 - L6
  - I explain using precision, in my own words, how specific structures are seen in different expressions resulting in different properties
- I can factor polynomials by applying special patterns. (A.SSE.2) M10 - L7
  - I explain using precision,, in my own words, how specific structures are seen in different expressions resulting in different properties

Assessment Evidence

Performance Assessment Options & Rubrics
May include, but are not limited to the following:

- Feedback & Scoring Rubric based on Priority Standards
- Summative Assessments on Practice & Content Standards
- Algebra Feedback & Scoring Rubric based on Priority Standards
- Module Pre-Test
- End of Unit Assessment (3 differentiated versions)
- End of Unit Assessment (3 differentiated versions
- Mid-unit checks/quizzes

Other assessment options
May include, but are not limited to the following:

- Learnsmart
- REVEAL performance tasks
- LEARN checks
- Extension
- Dynamic Practice

Possible wicor strategies:

- Quick Writes
- KWL Chart - (What I Know, Want to know, Learned)
- Learning Log Reflection - Daily/Weekly
- I-Chart - Gather/Organize Information on a topic
- Focused Note Taking
- CSG - Collaborative Study Groups

• Self made individualized assessments	• Socratic Seminar/Philosophical Chairs • Think/Pair/Share • One Pagers • Sentence Stems • Costa's Questioning • Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad (DESMOS and etools)
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 11- Quadratic Functions

Essential Questions:

1. How do we as mathematicians make sense of quantities and situations symbolically?
2. *Why is it helpful to have different methods to analyze quadratic functions and solve quadratic equations?*

Unit Standards

Priority Standards

F-IF-B Interpret functions that arise in applications in terms of the context

- *(F-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 max and mins, symmetries, end behavior and periodicity.

A-REI-A Understand solving equations as a process of reasoning and explain the reasoning

- (A-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.

A-REI-B Solve equations and inequalities in one variable

- *(A-REI-B-4)* Solve quadratic equations in one variable

A-REI-CSolve systems of equations

- *(A-REI-C-7)* Solve a simple system consisting of a linear equation and a quadratic equation in two variables, algebraically and graphically

A-REI-DRepresent and solve equations and inequalities graphically

- *(A-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)

A-SSEA Interpret the structure of expressions.

- *(A-SSE-A-1a)* Interpret expressions that represent a quantity in terms of its context: Interpret parts of an expression, such as terms, factors, and coefficients

A-SSE-B Write expressions in equivalent forms to solve problems.

- *(A-SSE-B3a)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Factor a quadratic expression to reveal the zeros of the function it defines
- *(A-SSE-B3b)* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

A-CED-A Creating equations that describe numbers or relationships.

- *(A-CED-1)* Create equations and inequalities in one variable and use them to solve problems
- *(A-CED-2)* Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales

F-IF-B Interpret functions that arise in applications in terms of the context

- *(F-IF-B-5)* Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F-IF-C Interpret functions that arise in applications in terms of the context

- *(F-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.
  a. graph linear and quadratic functions and show intercepts, maxima and minima
- *(F-IF-C-8)* Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  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
- *(F-IF-C-9)* Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

F-LE-A Construct and compare linear, quadratic, and exponential models and solve problems.

- *(F-LE-A-1a)* Distinguish between situations that can be modeled with linear function and with exponential functions: prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals - MS.
- *(F-LE-A-1b)* Distinguish between situations that can be modeled with linear function and with exponential functions: recognize situations in which one quantity changes at a constant rate per unit interval relative to another
- *(F-LE-A-1c)* Distinguish between situations that can be modeled with linear function and with exponential functions: recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another - MS
- *(F-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 - MS.

F-BF-A Build a function that models a relationship between two quantities.

- *(F-BF-A-1b)* Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations (F-BF-A1b).

S-ID-B Summarize, represent, and interpret data on two categorical and quantitative variables.

- *(S-ID-B5)* Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- *(S-ID-B-6a)* Represent data on two quantitative variables on a scatter plot, and describe how the variables are related: Fit a function to the data; use functions fitted to data to solve problems in the context of the data.

Supporting Standards

F-BF-B Build new functions from existing functions.

- *(F-BF-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, find the value of k given the graphs.

F-LE-B Interpret expressions for functions in terms of the situation they model.

- *(F-LE-B-5)* Interpret the parameters in a linear or exponential function in terms of a context.

Learning Targets

- I can analyze and graph quadratic functions. (F.IF.4, F.IF.7a) M11 - L1
  - I can graph quadratic functions that are expressed symbolically (intercept, axis of symmetry, end behavior, relationships of x and y, standard form, extrema)
  - I can interpret the key features of a quadratic graph from a real world situation and use them to make sense of the problem
- I can identify the effects of transformations of the graphs of quadratic functions. (F.IF.7a, F.BF.3) M11 - L2

- I can graph quadratic functions that are expressed symbolically.
- I apply my knowledge of geometric transformations to a function.
- I explain how each of these affect the graph of f(x) : f(x) + k, kf(x), f(kx) and f(x + k)
- I recognize symmetry in graphs and in the symbolic forms of functions.

- I can write quadratic equations and solve them by graphing. (F.IF.7a, F.IF.8a) M11 - L3
  - I can analyze a quadratic function by changing the format of a function to reveal particular attributes of its graph
- I can solve quadratic equations by factoring and by using the Square Root Property. (A.SSE.3a, A.REI.4b, F.IF.8a) M11 - L4
  - I use equivalent forms of quadratic expressions to determine important components of a quadratic function (and its graph) by factoring a quadratic to reveal the zeros of the function it defines.
  - I can determine whether the solution of a quadratic equation will be real or complex.
  - I can find real solutions to quadratic equations in one variable using multiple methods and justify my solution method
- I can solve quadratic equations by completing the square. (A.SSE.3a, A.REI.4, F.IF.8a) M11 - L5.
  - I can transform a quadratic equation from standard form to vertex form using complete the square.
  - I can interpret key features of vertex form and its graphical implications
  - I can find real solutions to quadratic equations in one variable using multiple methods and justify my solution method
  - I can analyze a quadratic function by changing the form of a function to reveal particular attributes of its graph.
- I can solve quadratic equations by using the Quadratic Formula. (A.CED.1, A.REI.4) M11 - L6
  - I create an equation to model a situation with one variable.
  - I explain my reasoning and steps when creating an equation
  - I can determine the # of solutions and whether the solution of a quadratic equation will be real or complex.
  - I can find real solutions to quadratic equations in one variable using multiple methods and justify my solution method
- I can solve systems of linear and quadratic equations. (A.CED.2, A.REI.4) M11 - L7
  - I create and solve, algebraically and graphically, a system of linear and quadratic equations to model a situation with two variables.
  - I explain, using precision, my reasoning and steps when creating a system of linear and quadratic equations

- I can model data with linear, exponential, and quadratic functions. (F.LE.1, F.LE.3, F.LE.1a) M11 - L8
  - I choose an appropriate function (linear, exponential, etc.) for modeling a situation.
  - I use mathematical structure and repeated reasoning to recognize an exponential function is one in which an equal factor is multiplied for each equal-sized interval.
  - I use multiple representations to examine the rates of change over equal-sized intervals to create a function. (The function could be represented as a table, a graph, a verbal rule, or symbolically)
- I can combine standard function types. (F.BF.1b) M11 - L9
  - I apply my knowledge of different families of functions to build functions that describe contexts.
  - I apply knowledge of the arithmetic expressions to combine functions.
  - I explain the process I used to build a new function from existing functions.

Assessment Evidence

Performance Assessment Options & Rubrics *May include, but are not limited to the following:*	**Other assessment options** *May include, but are not limited to the following:*

• Feedback & Scoring Rubric based on Priority Standards • Summative Assessments on Practice & Content Standards • Algebra Feedback & Scoring Rubric based on Priority Standards • Module Pre-Test • End of Unit Assessment (3 differentiated versions) • End of Unit Assessment (3 differentiated versions • Mid-unit checks/quizzes • Self made individualized assessments	• Learnsmart • REVEAL performance tasks • LEARN checks • Extension • Dynamic Practice Possible wicor strategies: • Quick Writes • KWL Chart - (What I Know, Want to know, Learned) • Learning Log Reflection - Daily/Weekly • I-Chart - Gather/Organize Information on a topic • Focused Note Taking • CSG - Collaborative Study Groups • Socratic Seminar/Philosophical Chairs • Think/Pair/Share • One Pagers • Sentence Stems • Costa's Questioning • Vocabulary Building

Digital Tools & Supplementary Resources

- Aleks
- Web Sketch Pad
- Spiral Review (Reveal)
- Take Another Look
- Dynamic Practice

Unit 12- Statistics

Essential Questions:

1. How can we as mathematicians determine an effective model to use to solve a problem?
2. How can we as mathematicians use and apply patterns and structures to solve problems?
3. How do you summarize and interpret data?

Unit Standards

Priority Standards

S-ID-A Summarize, represent, and interpret data on a single count or measurement variable.

- *(S-ID-A1)* Represent data with plots on the real number line (dot plots, histograms, and box plots) - MS
- *(S-ID-A2)* Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets - HS
- *(S-ID-A3)* Interpret differences in shape, center and spread in the context of data sets, accounting for possible effects of extreme data points (outliers). - MS

N-Q Reason quantitatively and use units to solve problems.

- *(N-Q1)* Standard 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.

Supporting Standards

S-ID-B Summarize, represent, and interpret data on two categorical and quantitative variables.

- *(S-ID-B5)* Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Learning Targets

- I can represent sets of data using measures of center and percentiles. (Prep for S.ID.2) M12 - L1
- I can represent data using dot plots, histograms, and bar graphs. (NQ.1, S.ID.1) M12 - L2
    - I produce dot plots, histograms, either by hand or with technology.
    - I explain what the display is telling the viewer in the context of the situation.
    - I understand how extreme cases are represented based on the creation of each display.
    - I select and properly use an existing quantity for a real-world context
    - I create an appropriate quantity for a real-world context
    - I explain the meaning of different quantities in a problem and its solution
- I can analyze data collection and representation methods to determine bias or identify misleading information. (Prep for S.IC.1, Prep for S.IC6) M12 - L3
- I can represent sets of data using measures of spread. (N.Q.1, S.ID.1) M12 - L4
    - I produce box plots, either by hand or with technology.
    - I explain what the display is telling the viewer in the context of the situation.
    - I understand how extreme cases are represented based on the creation of each display.
    - I select and properly use an existing quantity for a real-world context
    - I create an appropriate quantity for a real-world context
    - I explain the meaning of different quantities in a problem and its solution
- I can analyze the shapes of distributions to determine appropriate statistics and identify extreme data points. (S.ID.3) M12 - L5
    - I recognize and name different shapes and their characteristics of center, shape and spread.
    - I recognize the tendency of the mean to be toward a skew or extreme value.
    - I understand and am able to identify which measures of center and spread are appropriate when given certain distributional characteristics
- I can use statistics appropriate to the shapes of the distributions to compare the measures of center and spread of two data sets. (S.ID.2, S.ID.3) M12 - L6
    - I describe distributions in terms of shape, center, dispersion, and unusual features and unusual features.
    - I justify the appropriateness of measures of center based on distributional shape and unusual features.
    - I relate the appropriate measures of dispersion by the best method for measure of center because measures of dispersion are described by the measure of center.
- I can summarize and interpret categorical data using frequency tables. (S.ID.5) M12 - L7
    - I use relative frequencies to make inferences about associations or trends in data.
    - I interpret relative frequencies in terms of a subset of a conditioned event.
    - I use probabilistic independence as a way to show and justify no association.

Assessment Evidence

Performance Assessment Options & Rubrics *May include, but are not limited to the following:* ● Feedback & Scoring Rubric based on Priority Standards ● Summative Assessments on Practice & Content	**Other assessment options** *May include, but are not limited to the following:* ● Learnsmart ● REVEAL performance tasks

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