ALGEBRA I

Number and Quantity

The Real Number System (N-RN)

Use properties of rational and irrational numbers | **Additional**

N-RN.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.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• The significance of rational and irrational numbers as subsets of real numbers, distinguishes between the two, and provides examples of each type when prompted. • Simplify expressions including rational terms. • Use the properties of exponents to evaluate expressions with exponents, including expressions containing negative and zero exponents. • Interpret and compare representations of square root functions. • Use the laws of exponents to find products and quotients of monomials.	• The meaning of rational exponents follow the properties of integer exponents. *For example,* $5^{\frac{1}{3}}$ *is defined as the cube root of 5 because* $\left(5^{\frac{1}{3}}\right)^3 = 5^{\frac{1}{3}} \times 5^{\frac{1}{3}} \times 5^{\frac{1}{3}} = 5.$ • Simplify and solve expressions involving radicals and rational exponents. • The sum of rational numbers is always rational, and the product of rational numbers is always rational. • The sum of a rational number and an irrational number is always irrational, and the product of a rational number and an irrational number is always irrational.	• Simplify and solve expressions involving radicals, and rational exponents. • Extend the properties of integer exponents to rational exponents. • Attend to precision (Mathematical Practice 6), using clear definitions and stating the meaning of the mathematical symbols they include in their expressions. • Explain why rational numbers are closed under addition and multiplication.

ALGEBRA I

Number and Quantity

Quantities (N-Q)*

Reason quantitatively and use units to solve problems — **Supporting**

N.Q.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. *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Select appropriate scales for graph using estimation. • Plot points on a coordinate plane. • The possible *x*- and y-values of coordinates in each quadrant of a coordinate plane. • Plot points on graph given a table, equation, or situation. • Interpret bar graphs, line graphs, and histograms.	• The meaning of slope and *y*-intercept conceptually. • Interpret the slope and *y*-intercept in statistical situations. • Interpret data displayed in graphs and make predictions in real-world context. • Relationship between tabular and graphic representations of data.	• Justify answers to problems using tables, graphs, formulas, and equations. • Measure and collect data, selecting appropriate units and degrees of precision for a given situation. • Describe the form, direction, strength, and outliers of an association using mathematical terms. For example, “predicted,” “expected” or “approximate.” • Make predictions based on linear models and interpret slope and *y*-intercept in context. • Make connections between solving equations, graphing, and manipulating expressions.

ALGEBRA I

Number and Quantity

Quantities (N-Q)*

Reason quantitatively and use units to solve problems | **Supporting**

N-Q.2
Define appropriate quantities for the purpose of descriptive modeling. *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Convert rates and units of measurement. • The appropriate unit for expressing different quantities (e.g., length, area, or volume). • Create bar graphs, line graphs, and histograms.	• Choose appropriate units by defining quantities needed to model a situation. • Express information in appropriate units and with understandable scales on graphs in modeling real-world situations. • Determine what quantity and unit to express in a final solution. • Determine which numeric form of their solution is appropriate (e.g., mixed fractions, improper fraction, decimals or negative/positive values).	• Describe data and relationships from various representations. • Determine if solution is appropriate for situation. • Derive units to represent real-world situations. • Recognize whether given quantities are discrete or continuous. • Define inputs and outputs in specific mathematical models.

ALGEBRA I

Number and Quantity

Quantities (N-Q)*

Reason quantitatively and use units to solve problems | **Supporting**

N-Q.3
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• The rules of significant digits. • Select appropriate scales for graph using estimation. • The relationship between dependent and independent variables in a given data set. • Explain and illustrate how a change in one variable results in a change in another variable.	• Determine the level of accuracy needed by reading a problem. • How accurately answers can be reported by recognizing which quantity most restricts the solution. • The tools used to collect and display data limits the accuracy of a measurement. • The analogy to univariate data is how little a median or mean really tells us about a set of data. • Why significant digits and units are important in calculations and measurement context.	• Describe the association with form, direction, strength, and outliers. • Describe the precision of a measurement tool. • Recognize trends in data and make predictions in relation to context with an understanding of accuracy and limitations. • Recognize variability in data and the need to address its presence in data.

ALGEBRA I

Algebra

Seeing Structure in Expressions (A-SSE)

Interpret the structure of expressions	Major

A-SSE.1.a **Interpret expressions that represent a quantity in terms of its context.*** **a. Interpret parts of an expression, such as terms, factors, and coefficients.**	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Use substitution to make new identities. • Use the distributive property to expand polynomials. • Evaluate numerical expressions involving parentheses, powers, and rational numbers. • Translate verbal phrases into mathematical expressions.	• The mathematical meaning of the following words: factors, coefficients, terms, exponent, base, constant, and variable. • Represent and identify factors, coefficients, terms, exponents, bases, constants, and variables components when given a mathematical expression. • Explain the effect of changing one part of an expression by analyzing its component parts. • Write and interpret complex expressions by analyzing their component parts.	• Explain the meaning of the parts of an expression as they relate to the entire expression and to the context of the problem • Extend understanding of the structure of linear, exponential and quadratic functions to radical, rational and polynomial functions. • Identify the parts of any expression as terms, factors, coefficients, exponents, quotients, divisors, dividends, remainders, and constants. • Determining the real-world context of the variables, factors, or terms in an expression.

ALGEBRA I

Algebra

Seeing Structure in Expressions (A-SSE)

Interpret the structure of expressions — **Major**

A-SSE.1.b

Interpret expressions that represent a quantity in terms of its context.*

b. Interpret complicated expressions by viewing one or more of their parts as a single entity. ***For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.***

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Use substitution to make new identities. • Evaluate numerical expressions involving parentheses, powers, and rational numbers. • Use the distributive property to expand polynomials. • Translate verbal phrases into mathematical expressions. • Recognize and use the properties of identity and equality.	• The mathematical meaning of the following words: factors, coefficients, terms, exponent, base, constant, and variable. • Represent and identify factors, coefficients, terms, exponents, bases, constants, and variables components when given a mathematical expression. • Explain the effect of changing one part of an expression by analyzing its component parts. • Write and interpret complex expressions by analyzing their component parts.	• Write an expression containing identical factors as an expression using exponents. • Evaluate open sentences by performing operations. • Write formulas using two or more variables. • Explain the meaning of the parts of an expression as they relate to the entire expression and to the context of the problem. • Extend understanding of the structure of linear, exponential and quadratic functions to radical, rational and polynomial functions. • Determining the real-world context of the variables, factors, or terms in an expression.

ALGEBRA I

Algebra

Seeing Structure in Expressions (A-SSE)

Interpret the structure of expressions — **Major**

A-SSE.2

Use the structure of an expression to identify ways tor rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$ *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Apply properties of exponents to simplify expressions. • Add, subtract, multiply and divide polynomials.	• Polynomial or rational expressions can sometimes be simplified to binomials or quadratic factors. • Find patterns in repeated calculations, and make conjectures based on these patterns. • Expand powers and products of expressions. • Factor expressions completely. • Compare the equivalence relationship between the original form of an expression and its expanded form.	• Use algebraic methods and mathematical properties to transform expressions to determine whether expressions are equivalent. • Rearrange terms to rewrite an equivalent expression. • Write expressions in equivalent forms by factoring. • Apply the difference of squares theorem to polynomial expressions and numerical examples. • Factor polynomials.

ALGEBRA I

Algebra

Seeing Structure in Expressions (A-SSE)

Write expressions in equivalent forms to solve problems — **Supporting**

A-SSE.3.a
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
a. Factor a quadratic expression to reveal the zeros of the function it defines.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Solve multiple step equations including variations of the distributive property. • Apply properties of exponents to simplify and rewrite expressions. • Add, subtract, multiply, and divide polynomial expressions.	• Expand the product of linear factors into polynomials and compare the two expressions and look for patterns. • Rewrite expression in different forms using mathematical properties. • The best form to write an expression given the context of an expression. • The relationship between the factorization of a quadratic expression and the solutions of a quadratic equation.	• Factor expressions completely using various factoring skills. • Apply the zero-property to factored expressions. • Use algebra to simplify long computations, such as computing large sums of consecutive numbers. • Factor expressions by identifying a common factor. • Use difference of squares factoring to solve equations. • Use factoring to solve equations. • Explain and justify the relationship between the factorization of a quadratic expression and the solutions of a quadratic equation.

ALGEBRA I

Algebra

Seeing Structure in Expressions (A-SSE)

Write expressions in equivalent forms to solve problems | **Supporting**

A-SSE.3.b
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Solve multiple step equations including variations of the distributive property. • Apply properties of exponents to simplify and rewrite expressions. • Add, subtract, multiply, and divide polynomial expressions.	• Completing the square is a part of a process that transforms a quadratic polynomial into a difference of squares. • Graph quadratic functions and examine the graph to find the vertex. • Use their knowledge of quadratics to optimize quadratic functions. • Expand the product of linear factors into polynomials and compare the two expressions and look for patterns. • Rewrite expression in different forms using mathematical properties. • The optimal form to write an expression given the context.	• Factor expressions completely. • Apply the zero-property to factored expressions. • Convert the equation of a parabola into graphing form by completing the square. • Write expressions in equivalent forms by completing the square to convey the vertex form, to find the maximum or minimum value of a quadratic function, and to identify and explain the meaning of the vertex. • Use difference of squares and factoring to solve equations. • Explain and justify the relationship between the factorization of a quadratic expression and the solutions of a quadratic equation.

ALGEBRA I

Algebra

Seeing Structure in Expressions (A-SSE)

Write expressions in equivalent forms to solve problems — **Supporting**

A-SSE.3.c

Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

c. Use the properties of exponents to transform expressions for exponential functions.

For example, the expression 1.15^{t} ***can be written as*** $\left[1.15^{\frac{1}{12}}\right]^{12t} \approx 1.012^{12t}$ ***to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.***

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Solve multiple step equations including variations of the distributive property. • Apply properties of exponents to simplify and rewrite expressions. • Add, subtract, multiply, and divide polynomial expressions.	• Use properties of exponents to create equivalent expressions. • Expand the product of linear factors into polynomials and compare the two expressions and look for patterns. • Represent exponential decay in multiple ways and how to investigate the effect when the exponent is 0 or negative. • Rewrite expression in different forms using mathematical properties. • The most useful form to write an expression given the context of an expression. • The relationship between the factorization of a quadratic expression and the solutions of a quadratic equation.	• Solve complicated equations and simple exponential equations by rewriting and solving an equivalent equation. • Factor expressions completely using various factoring skills. • Apply the zero-property to factored expressions and explain meaning of the zeros. • Use algebra to simplify long computations, such as computing large sums of consecutive numbers. • Use factoring strategies, including difference of squares, to solve equations. • Explain and justify the relationship between the factorization of a quadratic expression and the solutions of a quadratic equation.

ALGEBRA I

Algebra

Arithmetic with Polynomials and Rational Expressions (A-APR)

Perform arithmetic operations on polynomials — **Major**

A-APR.1
Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Identify polynomials and their characteristics. • Identify like terms. • How to use the distributive property. • Find the degree of a polynomial. • Rules for adding, subtracting and multiplying integers. • Define terms related to the characteristics of polynomials. (e.g. terms, degree, coefficient, leading coefficient, monomial, binomial, and trinomials). • The concept of a zero pair. • The concept of closure.	• Add and subtract polynomials. • Simplify the product of a polynomial by a monomial. • Polynomials, like integers, are “closed” under addition, subtraction, and multiplication. • Combine linear and quadratic polynomials with addition and subtraction. • Multiply a constant by a linear or quadratic polynomial.	• Write polynomials in standard form. • Multiply polynomials using multiple methods. • Find squares of binomials involving sums and differences. • Look closely to discern a pattern or structure when finding the square of a sum and difference.

ALGEBRA I

Algebra

Arithmetic with Polynomials and Rational Expressions (A-APR)

Understand the relationship between zeros and factors of polynomials — **Supporting**

A-APR.3
Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Recognize equivalent expressions. • Solve two-step equations with one variable. • Factor polynomial completely. • Recognize perfect-square polynomials. • Graph quadratic functions by hand, showing intercepts, and maxima or minima. • The relationship of the degree of a polynomial to the graph of the polynomial function.	• Factor expressions by identifying a common factor. • Apply the Zero-Product Property to factored expressions. • How factors, zeros and x-intercepts of a polynomial function are related. • How factors and roots of a polynomial function are related. • Key features of a parabola by looking at how the coefficients affect the graph. • If the product of two quantities equals to zero, at least one of the quantities equals zero. • Why each factor is set to equal zero.	• Find zeros by factoring 2-degree polynomials and using the zero product property. • Determine the maximum number of zeros of a polynomial. • Recognize that repeated factors indicate multiplicity of roots and graph polynomials with repeated factors. • Identify the zeros of a polynomial. • Find the zeros of a cubic polynomial. • Use the zeros to construct a rough graph of the function defined by the polynomial.

ALGEBRA I

Algebra

Creating Equations (A-CED)*

Create equations that describe numbers or relationships — **Major**

A-CED.1

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Define variables. • Translate algebraic and verbal expressions. • Solve multi-step equations and inequalities in one variable. • Solve equations and inequalities with variables on both sides. • Rewrite equations and formulas.	• The relationships between quantities (e.g. how the quantities are changing or growing with respect to each other); express these relationships using mathematical operations to create an appropriate equation or inequality to solve. • Build an equation or inequality from a mathematical situation. • Determine when equations are true sometimes, always, or never. • Discern when to represent an equation using one variable vs. two variables.	• Construct and solve linear and exponential equations in one variable given real-world situations. • Construct and solve simple exponential functions by examining exponential growth and decay problems. • Construct equations that models geometric change by visualizing and extending a pattern. • Extend their understanding of exponential functions by examining the multiplier and starting point in different representations.

ALGEBRA I

Algebra

Creating Equations (A-CED)*

Create equations that describe numbers or relationships — **Major**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Translate algebraic and verbal expressions. • Solve one-variable equations. • Solve one-variable equations with variables on both sides. • Solve equations for specific variable. • Graph linear equations on a coordinate axes with labels and scales. • Apply contextual meaning to slope and *y*-intercept. • Interpret graphs and write equations for linear relations. • Justify relationship between graph, table, equation, and situation.	• Build equations from mathematical situations. • Solve a two-variable equation. • When equations are true sometimes, always, or never. • The slope and *y*-intercept can be used to write and graph an equation of the line. • Explain and illustrate how a change in one variable results in a change in another variable and apply to the relationships between independent and dependent variables. • Graph and analyze linear and exponential functions. • Use algebraic and graphical methods to solve systems of linear equations in mathematical and real-world situations.	• Identify the quantities in a mathematical problem or real-world situation that should be represented by distinct variables and describe what quantities the variable represents. • Write and graph an equation of a direct variation. • Determine appropriate units for the labels and scale of a graph depicting the relationship between equations created in two or more variables. • Graph one or more created equations on a coordinate axes with appropriate labels and scales. • Write equations from given graph, table, or situation.

ALGEBRA I

Algebra

Creating Equations (A-CED)*

Create equations that describe numbers or relationships	Major

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.** ***For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.****	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Build equations from a mathematical or real-world situation. • Solve multiple step equations and inequalities with one-variable. • Solve and graph equations and inequalities of two variables. • Solve and graph systems of equations and inequalities. • Determine when equations are true sometimes, always, or never.	• Define constraints and determine their necessity in modeling real-world situations. • Constraints are necessary to balance a mathematical model with real-world context. • When a modeling context involves constraints. • Interpret solutions as viable or nonviable options in a modeling context. • When a problem should be represented by an equation, inequality, systems of equations and/or inequalities. • Represent constraints by equations or inequalities, and by systems of equations and/or inequalities.	• Use the graphing method to solve or estimate the solutions of complex equations and inequalities. • Explain the meaning of solutions to equations and inequalities using the context of the problem. • Eliminate algebraic solutions that do not make sense in the context of the problem. • Recognize how certain input and output values may or may not be reasonable. • Select an appropriate domain for a single-variable in a modeling context. • Develop necessary constraint using linear equations and linear inequalities.

ALGEBRA I

Algebra

Creating Equations (A-CED)*

Create equations that describe numbers or relationships — **Major**

A-CED.4

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law $V = IR$ to highlight resistance R.**

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simply expressions by combining like terms. • Solve multiple step equations including rational coefficients and involving distributive property. • Solve equations with variables on both sides.	• Formulas are equations with specific meaning that show the relationship between two or more quantities. • Why rewriting formulas can be useful. • Manipulate an equation algebraically without changing its value. • Two equations that appear to be very different, can describe the same equation. • Solve an equation for a specific variable.	• Solve literal equations using the same processes used in solving numerical equations. • Solve formulas that arise from real-world situations and are limited to linear and quadratic variables. • Translate a linear equation in standard form to slope intercept form. • Translate a linear equation in slope intercept form to standard form.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Understand solving equations as a process of reasoning and explain the reasoning — **Major**

A-REI.1
Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• The order of operation and how to apply it. • Zero pairs can be used to simply addition and subtraction equations. • Simplify expressions using properties of algebra. • Add, subtract, multiply and divide rational numbers.	• Construct a mathematically viable argument justifying a given, or self-generated, solution method. • Equations can have multiple solutions or no solutions. • Work backwards to justify solutions to equations.	• Apply and explain the results of using inverse operations. • Justify the steps in solving equations by applying and explaining the properties of equality, inverse and identity. • Use the names of the properties to aid in justifying the steps performed when solving an equation. • Find and analyze mistakes in work samples. • Choose an appropriate method for solving an equation. • Show steps to justify mathematical methods. • Share different ways of solving equations that lead to the same solution.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Solve equations and inequalities in one variable — **Major**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• How to simplify expressions involving rational numbers and coefficients. • The order of operations and how to apply it.	• How to solve equations and inequalities with variables on both sides. • How to solve equations and inequalities using inverse operations. • How to solve equations and inequalities involving many variations of the distributive property. • How to solve equations and inequalities involving rational coefficients. • Equations can have multiple solutions or no solutions. • How solving literal equations relate to solving numeric equations.	• Interpret a situation and represent it mathematically. • Deepen understanding of equations as statements about numbers that can be true always, sometimes, or never. • Extend earlier work with solving linear equations/inequalities in one variable to solving literal equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents. • Build an equation from a mathematical situation. • Rewrite mathematical formulas in equivalent forms. • Solve literal equations for specified variable.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Solve equations and inequalities in one variable — **Major**

A-REI.4.a

Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Factor quadratic polynomials. • Use factoring to solve equations. • Apply the Difference of Squares Theorem to polynomial expressions and numerical examples. • Use difference of squares factoring to solve equations.	• Equations can be written in more than one form. • Write quadratic equations in both standard form and vertex form. • What different forms for writing quadratics reveal about the function. • Solve quadratic equations by completing the square. • The connection between the quadratic formula and the process of completing the square. • The connection between the roots of a quadratic equation and the coefficients of a quadratic equation.	• Convert the equation of a parabola into graphing form by completing the square. • Derive the quadratic formula by completing the square of a general quadratic equation. • Construct a quadratic equation given the equation's two roots. • Factor non-monic quadratics. • Identify which process is best to solve a quadratic equation. • Identify the *y*-intercept, zeros and vertex of a quadratic function and use that to create a rough sketch of the function.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Solve equations and inequalities in one variable — **Major**

A-REI.4.b

Solve quadratic equations in one variable.

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Extend property of exponents to rational exponents. • Factor general quadratic polynomials. • Use factoring to solve quadratic equations.	• Factor a quadratic expression to reveal the zeros of the function. • When solving by inspection students should be able to identify the number of real roots, their value and if there is no real root. • The similarities and differences between quadratic functions and linear functions. • Determine the best method to solve a quadratic equation.	• Solve quadratic equations by taking the square root. • Solve quadratic equations by factoring. • Solve quadratic equations by inspection. • Recognize non-real solutions. • Create a quadratic equation that describes a given situation. • Solve quadratic equations by inspection, factoring, completing the square and the quadratic formula. • Complete the square in a quadratic expression to reveal the minimum or maximum value of the function.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Solve systems of equations | **Additional**

A-REI.5
Prove that, given a system of two equations in two variables, replacing one equation by the sum of the equation and a multiple of the other produces a system with the same solutions.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Solve multiple step equations involving rational numbers and coefficients. • Solve literal equation for specific variables. • Rewrite equations in equivalent forms. • Evaluate numerical expressions involving parentheses, powers, and rational numbers. • Express word problems using variables and mathematical notation. • Write formulas using two or more variables. • Write linear equations in standard form.	• Systems of equations can be solved both graphically and algebraically. • An equivalent system is formed whenever one of the equations is multiplied by a nonzero number and/or when one of the equations is replaced by the sum of a constant multiple of another equation and that equation. • Equations do not have to be written in standard form to use elimination. • A system of intersecting lines has exactly one solution and is consistent and independent. • A system whose graphs coincide has infinitely many solutions and is consistent and dependent. • A system of parallel lines has no solution and is consistent.	• Solve systems of linear equations with two variables by using substitution and elimination. • Write and solve real-world and mathematical situation problems for systems of equations. • Determine the best method for solving systems of equations. • Apply systems of linear equations. • Determine the number of solutions for a system of equation. • Recognize constraints of systems of equations when modeling real-world situations.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Solve systems of equations — **Additional**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Solve multiple step equations involving rational numbers and coefficients. • Solve literal equation for specific variables. • Rewrite equations in equivalent forms. • Evaluate numerical expressions involving parentheses, powers, and rational numbers. • Express word problems using variables and mathematical notation. • Write formulas using two or more variables. • Write linear equations in standard form. • Graph linear equations in two variables. • Find and interpret slope and *y*-intercept.	• Systems of equations can be solved both graphically and algebraically. • A system of intersecting lines has exactly one solution and is consistent and independent. • A system whose graphs coincide has infinitely many solutions and is consistent and dependent. • A system of parallel lines has no solution and is consistent. • How recognizing and comparing the slopes of a lines can help solve many problems and reveal many characteristics of lines.	• Solve systems of linear equations by graphing or symbolically. • Write and solve real-world and mathematical situation problems for systems of equations. • Determine the best method for solving systems of equations. • Apply systems of linear equations. • Determine whether a system of linear equations has no, one, or infinitely many solutions. • Recognize constraints of systems of equations when modeling real-world situation. • Estimate the intersection of points of graphs.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Represent and solve equations and inequalities graphically — **Major**

A-REI.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).

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Plot points on a coordinate plane. • Substitute values for variables. • Find the slope of a line given two points. • Recognize the slope of a line given an equation in both standard form and *y*-intercept form. • Graph points given a table of values.	• Find the solutions to an equation and how they relate to the graph of the equation. • A graph/curve is a visual representation of an equation or data. • An ordered pair is a solution to the equation if it represents a point on the graph. • Graph an equation given in both standard form and slope intercept form. • Identify characteristics of a graph given its equation. • How equations, graphs, and tables are related. • Create a table of values that satisfy an equation. • A continuous curve or a line contains an infinite number of solutions.	• Test a point to determine whether it is on the graph of an equation. • Graph an equation by plotting points. • Write the equation of a vertical or horizontal line given its graph or a point on its graph. • Write equations of line given slope and *y*-intercept, two points, or slope and a point. • Read a graph to identify points that are solutions to an equation. • Find the intersection points of two graphs and understand its meaning. • Identify different graphs as belonging to the same family of graphs. • Identify solutions and non-solutions of linear and exponential equations.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Represent and solve equations and inequalities graphically — **Major**

A-REI.11
Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Evaluate expressions. • Construct a table of values for a given function. • Graph functions using graphing technology. • Recognize proportionality in direct and inverse variation. • Graph equations given in both standard form and slope intercept form.	• How technology can be used to find the domain, range, points of intersection, and other attributes use to characterize families of graphs. • Recognize the distinguish features of the basic graphs, such as their general shape, and the points and quadrants that they pass through. • Describe the rules for translating graphs of equations vertically or horizontal. • Decide whether a situation represents direct or inverse variation. • Find similarities and differences between scatter plots and continuous graphs.	• Approximate solutions to systems of two equations using graphing technology. • Approximate solutions to systems of two equations using tables of values. • 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 $f(x) = g(x)$. • Be able to express that when f(x) = g(x), the two equations have the same solution(s). • Adjust the window setting on specific graphing technology devices to approximate solutions to systems of equations. • Use the graphing method to solve or estimate the solutions of

CONTINUED A-REI.11 **Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.***			complex equations. • Solve system of equations when one or both equations is/are not linear. • Use intersections of functions to find solutions to the related single-variable equations. • Discuss misconceptions and assumptions associated with the standard screen view when using graphing technology to graph systems of equations and approximating intersection points.

ALGEBRA I

Algebra

Reasoning with Equations and Inequalities (A-REI)

Represent and solve equations and inequalities graphically — **Major**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Write and graph linear equations with two variables. • Simplify inequalities to represent them in a format that is easy to graph. • Find and interpret the slope of a line and recognize its relationship in graphs.	• All points on a half-plane are solutions to a linear inequality. • The solutions to a system of inequalities in two-variables are the points that lie in the intersection of the corresponding half-planes. • Graph the solution set of linear and non-linear inequalities with two variables. • Graph a system of linear equation and inequality on a coordinate plane. • Explain that the solution set for a system of linear inequalities is the intersection of the shaded regions (half-planes) of both inequalities • Check points in the intersection of the half-planes to verify that they represent a solution the system of inequality.	• Determine whether the boundary line should be included as part of the solution set. • Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary for non-inclusive inequalities. • Graph solution set to a system of linear inequalities in two variables as the intersection of their corresponding half-planes. • Graph constraints using systems of inequalities. • Use the graph of a two-variable, linear inequality to solve real-world mathematical situations. • Use a system of inequalities to create a graph of a feasible region and then analyze different scenarios based on the feasible region.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Understand the concept of a function and use function notation — **Major**

F-IF.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then $f(x)$ denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation $y = f(x)$.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions. • Generalize patterns using words and algebraic methods.	• A function is a rule that assigns each element from a set of inputs to exactly one element from a set of outputs. • The difference between a relation and a function. • Domain can also be referred to as "input" and "*x*-values". • Range can also be referred to as "output" and *y*-values". • The graph of the function, f, is the graph of the equation $y = f(x)$. • The relationship between a function, a table, and/or graph. • Look for and analyze patterns in input-output tables. • Recognize different ways to express a function.	• Use the definition of a function to determine whether a relationship is a function given a table, graph, mapping, or words. • Given the function, $f(x)$, identify x as an element of the domain, the input, and $f(x)$ is an element in the range, the output. • Find a rule to describe a set of input and output values. • Build a function from a real-world mathematical situation or word problem. • Determine whether a relationship is a function based on its description or graph. • Provide applications of mathematical functions and non-functions. • Make input-output tables.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Understand the concept of a function and use function notation — **Major**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions. • Generalize patterns using words and algebraic methods.	• A function is a rule that assigns each element from a set of inputs to exactly one element from a set of outputs. • The graph of the function, f, is the graph of the equation $y = f(x)$. • Recognize different ways to define and express a function. • Work with functions expressed in various form (e.g., $x \rightarrow$notation, *f(x)* notation, tables, and graphs. • Use function notation to evaluate functions for given inputs in the domain, including combinations and compositions of functions. • The relationship between a function, a table, mapping and/or graph.	• Use function notation to express relationships between contextual variables. • Input a value from the domain of a function and evaluate. • Create contextual examples that can be modeled by linear or exponential functions. • Use the definition of a function to determine whether a relationship is a function given a table, graph, mapping, or words. • Given the function, $f(x)$, identify x as an element of the domain, the input, and $f(x)$ is an element in the range, the output. • Write a relation in function notation. • Find a rule to describe a set of input and output values.

F-IF.2 (CONTINUED) **Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context**		• Look for and analyze patterns in input-output tables.	• Build a function from a real-world mathematical situation or word problem. • Determine whether a relationship is a function based on its description or graph. • Provide applications of mathematical functions and non-functions. • Make input-output tables. • Identify functions, including functions represented in equations, tables, graphs, or context.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Understand the concept of a function and use function notation — **Major**

F-IF.3
Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. ***For example, the Fibonacci sequence is defined recursively by*** $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ ***for*** $n \geq 1$.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions. • Generalize patterns using words and algebraic methods. • Recognize linear functions.	• Recursive functions repeat different operations, not just addition. • The connection between tables with constant differences and linear functions. • How to look for and analyze patterns in input-output tables. • A function is a rule that assigns each element from a set of inputs to exactly one element from a set of outputs. • A sequence is a function with a restricted domain.	• Find a recursive function/rule that models a real-world mathematical situation. • Use tables to answer questions about recursive functions. • Write a rule for a recursively-defined function. • Determine whether a table represents a linear function. • Justify and explain why a rule for a recursive functions works for the sequence.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Interpret functions that arise in applications in terms of the context	Major

F-IF.4 **For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.** ***Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.****	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Find and interpret slope as it relates to a graph. • Graph the linear equations and inequalities in two variables given in both standard form and slope intercept form. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions.	• The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can reveal important characteristics of the function's properties. • Determine what a graph looks like. • Describe what happens when *x* increases/decreases. • Identify the *x*- and *y*-intercepts of a graph • Determine any limitations on the inputs/outputs of the equation. • Identify a maximum or minimum *y*-value (if it exists)? • Determine whether the graph	• Describe a parabola, using its intercepts, minima, maxima, vertex, symmetry, and whether it is positively or negatively oriented. • Distinguish linear, quadratic and exponential equations based on equations, tables, graphs and verbal descriptions. • Given a function, identify key features such as intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior. • Use key features of a function to sketch a graph. • Interpret key features in terms of context.

F-IF.4 (CONTINUED) **For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.** ***Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.****		has symmetry and describe the symmetry. • Determine the direction of the graph. • Compare the relative steepness of lines and to build intuition about positive, negative, and zero slopes.	

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Interpret functions that arise in applications in terms of the context	Major

	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
F-IF.5 **Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.** ***For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.****	• Determine whether relations are functions using tables, graphs, mapping, and context. • Graph the linear equations and inequalities in two variables given in both standard form and slope intercept form. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions.	• Interpret key features of functions. • Sketch the graph of functions showing key features, with and without technology. • Apply strategies for finding exponential equations given the *y*-intercept and another point. • Relate the domain of a function to its graph within context of a given relationship. • Determine whether the domain of a function is reasonable given the context. • Sketch the graph of a function that models a relationship between two quantities.	• Identify appropriate values for the domain of a function based on context. • Identify the domain of a function from the graph. • Use set and interval notation to represent domain. • Describe the domain of a relation by examining an equation or graph. • Solidify connections between tables, equations, graphs and mathematical situations representations of functions. • Find equations of linear, quadratic and exponential functions by using known quantities to solve for a missing parameter. • Interpret fractional exponents.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Interpret functions that arise in applications in terms of the context — **Major**

F-IF.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.*

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Find and interpret slope as it relates to a graph. • Graph the linear equations and inequalities in two variables given in both standard form and slope intercept form. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions. • Generate data by evaluating expressions for different values of a variable and organize the data.	• How the slope of a graph relates to a rate of change. • Interpret the rate of change and initial value of linear function in terms of the situation it models and in terms of its graph or a table of values. • The rate of change between any two points, for non-linear functions, might not be the same as the rate of change of the overall function. • Compare the relative steepness of lines and to build intuition about positive, negative, and zero slopes.	• Calculate the slope between two points. • Calculate the rate of change over a given interval for rational, square root, cube root, and polynomial functions with a context. • Calculate the rate of change when presented as an equation or table. • Estimate the rate of change from a graph.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Analyze functions using different representations	Supporting

F-IF.7.a **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.**	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Find and interpret slope as it relates to a graph. • Graph the linear equations and inequalities in two variables given in both standard form and slope intercept form. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions.	• The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can reveal important characteristics of the function's properties. • Interpret key features of functions. • Sketch the graph of functions showing key features, with and without technology. • Relate the domain of a function to its graph within context of a given relationship. • Sketch the graph of a function that models a relationship between two quantities.	• Describe a parabola, using its intercepts, minima, and maxima. • Graph and identify key features in linear and quadratic functions by hand and with technology. • Distinguish between linear and quadratic equations based on equations, tables, graphs and verbal descriptions. • Given a linear or quadratic function, identify key features such as intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior. • Use key features of a function to sketch a graph.

F-IF.7.a (CONTINUED) **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.**		• Describe what the graph of a given function looks like. • Describe what happens when *x* increases/decreases. • Identify *x*- and *y*-intercepts. • Determine any limitations on the inputs/outputs of the equation. • Determine if there is a maximum or minimum *y*-value. • Determine whether the graph has symmetry. • Identify the direction of the graph.	• Interpret key features in terms of context. • Use the graphing method to solve or estimate the solutions of complex equations and inequalities. • Graph quadratic equations using vertex form.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Analyze functions using different representations	Supporting

	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
F-IF.7.b **Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*** **b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.**	• Find and interpret slope as it relates to a graph. • Graph the linear equations and inequalities in two variables given in both standard form and slope intercept form. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions.	• The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can reveal important characteristics of the function's properties. • Interpret key features of functions. • Sketch the graph of functions showing key features, with and without technology. • Relate the domain of a function to its graph within context of a given relationship. • Sketch the graph of a function that models a relationship between two quantities.	• Describe a parabola, using its intercepts, minima, and maxima. • Graph and identify key features in linear, exponential, quadratic, absolute value, and piecewise functions by hand and with technology. • Distinguish between linear, exponential, quadratic, square root, and cube root functions in context and represent each in different ways. (e.g. equations, tables, graphs and verbal descriptions.)

F-IF.7.b (CONTINUED) **Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*** **b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.**		• Describe what the graph of a given function looks like. • Describe what happens when *x* increases/decreases. • Identify *x*- and *y*-intercepts. • Determine any limitations on the inputs/outputs of the equation. • Determine if there is a maximum or minimum *y*-value. • Determine whether the graph has symmetry. • Identify the direction of the graph.	• Given a linear or quadratic function, identify key features such as intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior. • Use key features of a function to sketch a graph. • Interpret key features in terms of context. • Use the graphing method to solve or estimate the solutions of complex equations and inequalities.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Analyze functions using different representations	Supporting

F-IF.8.a **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.**	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Recognize equivalent expressions. • Solve two-step equations with one variable. • Factor a polynomial completely. • Recognize perfect-square polynomials. • Graph quadratic and linear functions by hand and using technology. • How the degree of a polynomial relates to its polynomial function.	• Where on a graph you can find the solutions, zeros, roots, or *x*-intercepts of a quadratic function. • 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 them. • Which representation is best when comparing the properties of quadratic functions. • How factors and roots of a polynomial function are related. • Identify key features of a parabola by looking at how the coefficients affect the graph. • If the product of two quantities equals to zero, at least one of the quantities equals zero.	• Use factoring and completing the square to find key features of quadratics. • Write an equivalent form of a function defined by an expression for functions given. • Apply the zero property to factored expressions. • Identify zeros, transformations, points of discontinuity, and asymptotes when suitable factorizations are available. • Compare properties of quadratic functions from multiple representations. • Determine the maximum number of zeros of a polynomial. • Model real world problems using quadratic functions.

ALGEBRA I

Functions

Interpreting Functions (F-IF)

Analyze functions using different representations — **Supporting**

F-IF.9
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). ***For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.***

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Recognize equivalent expressions. • Solve multiple step equations involving one variable and rational numbers. • Factor a polynomial completely. • Graph quadratic and linear functions by hand and using technology. • How the degree of a polynomial relates to its polynomial function.	• Which representation is best when comparing the properties of quadratic functions. • How factors and roots of a polynomial function are related. • Identify key features of a parabola by looking at how the coefficients affect the graph. • Use transformations to simplify calculations and show that two expressions are equivalent. • When it useful to write an expression as a product of expressions vs. the standard form. • Represent functions algebraically, graphically, numerically in tables, and/or by verbal description.	• Express functions using multiple representations and compare the properties for quadratic functions. (e.g. equation, table of values, graph, or mathematical situation) • Model quadratic functions in real-world context. • Determine which representation is best when comparing the properties of quadratic functions. • Expand powers and products of expressions. • Factor polynomials completely using various factoring techniques.

ALGEBRA I

Functions

Building Functions (F-BF)

Build a function that models a relationship between two quantities | **Supporting**

F-BF.1
Write a function that describes a relationship between two quantities.*
a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions including rational polynomial terms. • Evaluate expressions with exponents. • Relate representations of square root functions • Use the laws of exponents to find products and quotients of monomials. • Use the properties of exponents to simplify expressions containing negative and zero exponents. • Make input-output tables and look for and analyze patterns. • Graph linear equations and inequalities in two variables.	• Linear functions are the explicit form of recursively-defined arithmetic sequences and that exponential functions are the explicit form of recursively-defined geometric sequences. • Build a function from a real world mathematical situation. • How to evaluate compositions of functions. • The difference between a recursive rule and an explicit expression for a function. • How a recursive rule can be used to generate an explicit expression. • That manipulating parameters of the symbolic rule will result in a predictable transformation of the graph.	• Sketch the graph of a parabola from its rule using its intercepts. • Transfer data from a table, graph, or situation to a quadratic rule. • Determine whether a relationship is a function based on its description, graph, or table of values. • Recognize different ways to define and express a function. • Compare graphs of functions and equations. • Build functions and generate graphs both by hand and using graphing technology. • Given a linear or exponential context, find an expression, recursive process, or steps to model a context with mathematical representations.

ALGEBRA I

Functions

Building Functions (F-BF)

Build a function from existing functions | **Additional**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Solve quadratic equations by inspection, factoring, completing the square and the quadratic formula. • Complete the square in a quadratic expression to reveal the minimum or maximum value of the function. • Solve quadratic equations by inspection, factoring, completing the square and the quadratic formula. • Complete the square in a quadratic expression to reveal the minimum or maximum value of the function.	• Describe the rules for translating graphs of equations. • Recognize the distinguishing features of the basic graphs, such as their general shaped, and the points and quadrants that they pass through. • Use graphing technology to explore transformations of functions. • Explore transformations that preserve characteristics of graphs of functions and which do not. • Identify the effects of vertical translations of graphs of linear and exponential functions on their equations.	• Sketch the graphs of the equations $y = x$, $xy = 1$, $y = x^2$, $y = x^3$, $y = \sqrt{x}$, $y = \lvert x \rvert$, and variations of these equations. • Perform transformation on quadratic and absolute value functions with and without technology. • Describe the effects of each transformation of functions (e.g., if $f(x)$ is replaced with $f(x + k)$). • Given the graph of a function, describe all transformations using specific values of k. • Recognize which transformations take away the even nature of a quadratic or absolute value function.

F-BF.3 (CONTINUED) **Identify the effect on the graph of replacing *f(x)* by *f(x)+k, k f(x), f(kx)*, and *f(x+k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.***		• Graph parent functions for quadratic and absolute value functions. • The meaning and effects that the coefficients, factors, exponents, and/or intercepts in a linear and exponential function have when describing the attributes of graphs.	

ALGEBRA I

Functions

Linear, Quadratic, and Exponential Models (F-LE)*

Construct and compare linear, quadratic, and exponential models and solve problems	Supporting

F-LE.1.a **Distinguish between situations that can be modeled with linear functions and with exponential functions.*** **a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.**	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Find and interpret slope as a rate of change. • Apply properties of exponents to generate equivalent numerical expressions. • Evaluate square roots of perfects squares and cube roots of perfect cubes. • Graph a variety of functions, including exponential using a table of values.	• Two families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. • Distinguish between constant differences (linear functions) and constant ratios (exponential functions) by recognizing constant growth patterns vs. exponential growth patterns. (e.g. compound interest vs. simple interest) • Recognize the relationship between rises and runs on a graph and differences of inputs and outputs in a symbolic form of the proof.	• Make conjectures about the equations, tables, and graphs of linear and exponential functions. • Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. • Create and graph linear, quadratic, and exponential functions. • Write and use arithmetic and geometric sequences recursively and explicitly to model situations. • Distinguish between situations that model linear and exponential functions. • Construct linear and exponential functions give a graph, table, or mathematical situation. • Use exponential functions to

F-LE.1.a (CONTINUED) **Distinguish between situations that can be modeled with linear functions and with exponential functions.*** **a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.**		• The ratio of the rise and run for any two distinct points on a line is the same. • Linear functions with a constant term of zero describe proportional relationships. • Characteristics of graphs, tables, and equations for linear, exponential, and quadratic functions.	calculate compound interest.

ALGEBRA I

Functions

Linear, Quadratic, and Exponential Models (F-LE)*

Construct and compare linear, quadratic, and exponential models and solve problems	Supporting

F-LE.1.b **Distinguish between situations that can be modeled with linear functions and with exponential functions.*** **b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.**	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Find and interpret slope as a rate of change. • Apply properties of exponents to generate equivalent numerical expressions. • Evaluate square roots of perfects squares and cube roots of perfect cubes. • Graph a variety of functions, including exponential using a table of values.	• How real-world and mathematical situations can be modeled by linear functions when the rate of change of a quantity is constant. • When the rate of change is not constant, the function cannot be linear. • Analyze tables and graphs to identify exponential or linear functions. • The ratio of the rise and run for any two distinct points on a line is the same. • Linear functions with a constant term of zero describe proportional relationships.	• Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. • Recognize a linear function when analyzing a table, graph, or equation. • Determine the rate of change of a linear function in context. • Make conjectures about equations, tables, and graphs of linear and exponential functions. • Combine linear and exponential functions using arithmetic operations.

ALGEBRA I

Functions

Linear, Quadratic, and Exponential Models (F-LE)*

Construct and compare linear, quadratic, and exponential models and solve problems	Supporting

F-LE.1.c **Distinguish between situations that can be modeled with linear functions and with exponential functions.*** **c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.**	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Find and interpret slope as a rate of change. • Apply properties of exponents to generate equivalent numerical expressions. • Evaluate square roots of perfects squares and cube roots of perfect cubes. • Graph a variety of functions, including exponential using a table of values. • The relationship between variables in a function.	• Recursive forms of functions will show that linear models grow by a constant rate over equal intervals. • Exponential models grow by equal factors over equal intervals. • If the percent rate of change is not constant for a given function, the function is not exponential. • Constant ratios are like constant differences, except you calculate the ratio between consecutive outputs. • When the rate of change is not constant, the function cannot be linear.	• Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. • Write exponential functions from graphs, tables, and mathematical and real-world situations recursively and with an explicit formula. • Describe how quantities increase or decrease exponentially over intervals. • Match tables with constant ratios to exponential functions and graphs. • Make conjectures about equations, tables, and graphs of linear and exponential functions.

ALGEBRA I

Functions

Linear, Quadratic, and Exponential Models (F-LE)*

Construct and compare linear, quadratic, and exponential models and solve problems | **Supporting**

F-LE.2
Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Write the equation of a line given two points, a graph, or table. • Simplify expressions involving rational numbers and coefficients. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions. • Generalize patterns using words and algebraic methods. • Recognize linear functions.	• Identify sequences generated by adding a constant as *arithmetic*, and those generated by multiplying by a constant as *geometric*. • The vocabulary and notation for arithmetic sequences as they develop formulas for the n^{th} term. • Write sequences from recursive equations and vice versa. • Convert between explicit and recursive equations for arithmetic sequences. • Find equations for geometric sequences and see relationships between geometric sequences and exponential functions. • How to look for and analyze patterns in input-output tables.	• Construct linear and exponential functions given a graph. • Construct linear and exponential function given a description of a relationship. • Construct linear and exponential functions given two input-output pairs. • Construct arithmetic and geometric sequences given a description of a relationship. • Construct arithmetic and geometric sequences given two input-output pairs. • Sort sequences based on their patterns in their representation. • Write rules for arithmetic and geometric sequences that model real world problems and mathematical situations.

ALGEBRA I

Functions

Linear, Quadratic, and Exponential Models (F-LE)*

Construct and compare linear, quadratic, and exponential models and solve problems — **Supporting**

F-LE.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. *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Simplify expressions involving rational numbers and coefficients. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Translate verbal phrases into mathematical expressions. • Generalize patterns using words and algebraic methods. • Recognize patterns of linear functions.	• How and why you can use exponential functions in real world applications. • Use tables to generate graphs of exponential functions. • Recognize and interpret characteristics of graphs of exponential functions. • Analyze and compare patterns of growth in tables, graphs, and mathematical situations to determine whether a linear or exponential function matches it. • If the rate of change is constant or changing as it pertains to a graph, table, or function. • Recognize the family of function model for each sequence.	• Explain and justify why a quantity increasing exponentially will eventually exceed a quantity increasing linearly. • Build an exponential function given a geometric sequence, graph, a description of a relationship, or a table of input-output pairs. • Identify whether a relationship is linear or exponential given a graph or numeric representation. • Graph exponential functions and recognize important properties of exponential graphs. • Describe the differences between the rates of change of a linear function vs. an exponential function.

ALGEBRA I

Functions

Linear, Quadratic, and Exponential Models (F-LE)*

Interpret expressions for functions in terms of the situation they model — **Supporting**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Recognize equivalent expressions. • Solve multiple step equations involving one variable and rational numbers. • Factor a polynomial completely. • Graph quadratic and linear functions by hand and using technology. • Generate data by evaluating expressions for different values of a variable and organize the data. • Justify conjectures and patterns using numerical expressions. • Expand powers and products of expressions.	• Generalize the roles of a and b for the equation $y = a \cdot b^x$. • Apply knowledge of linear and exponential functions to investigate the relationship between simple and compound interest. • Represent exponential decay in multiple representations. • Solidify connections between a table, equation, graph, and situation representations of an exponential function. • Interpret the meaning of slope and y-intercept of a linear equation in terms of context.	• Based on the context of a situation, explain the meaning of the coefficients, factors, exponents, and/or intercepts in a linear or exponential function. • Apply exponential functions to real-life situations involving growth and decay. • Calculate simple interest. • Use exponential functions to calculate compound interest. • Determine which representation is best when comparing the properties of quadratics. • Explain and illustrate how a change in one variable may result in a change in another variable and apply to the relationships between independent and dependent variables.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on a single count or measurement variable | **Additional**

S-ID.1
Represent data with plots on the real number line (dot plots, histograms, and box plots). *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Perform basic operations involving rational numbers. • Identify limitations, or misuses, of visual representations of data.	• A dot plot includes values from the range of the data and plots a point for each occurrence of an observed value on a number line. • A histogram subdivides the data into class intervals and uses a rectangle to show the frequency of observations in those intervals. • A box-and-whisker plot shows the five-number summary of a distribution. (Five-number summary includes the minimum, lower quartile (25 percentile), median (50 percentile), upper quartile (75 percentile), and the maximum. • Quartiles are just medians for the upper and lower halves of the data set.	• Construct dot plots, histograms and box-and-whisker plots for data on real number lines. • Analyze data and compare data in different data sets. (*e.g.*, dot plots, histograms and box-and-whisker plots.)

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on a single count or measurement variable — **Additional**

S-ID.2
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Perform basic operations involving rational numbers. • Identify limitations, or misuses, of visual representations of data.	• A spread describes how the data lies. • The shape of a data distribution might be described as symmetrical, skewed, flat, or bell shaped, and it might be summarized by a statistic-measuring center (such as standard deviation or interquartile range). • Different distributions can be compared numerically using statistics or compared visually using plots. • Which statistics to compare, which plots to use, and what the results of a comparison might mean, depending on the question to be investigated and the real-life actions to be taken.	• Describe a distribution using center and spread. • Use the correct measure of center and spread to describe a distribution that is symmetric or skewed. • Identify outliers and their effects on data sets. • Compare two or more different data set using the center and spread of each. • Analyze data and compare data in different data sets. • Compute the mean, median, interquartile range, and standard deviation by hand in simple cases and using technology with larger data sets.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on a single count or measurement variable — **Additional**

S-ID.3
Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). *

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Perform basic operations involving rational numbers. • Identify limitations, or misuses, of visual representations of data.	• What shapes distributions a data set can have and how statistics can affect the shape and outliers. • How shapes of graphically displayed data can describe data distributions. • The shape and presence of extreme values may affect center and spread. • The shape of a data distribution might be described as symmetrical, skewed, flat, or bell-shaped, and it might be summarized by a statistic-measuring center (such as standard deviation or interquartile range). • Different distributions can be compared numerically using statistics or compared visually using plots.	• Identify a data set by its shape and describe the data set as symmetric, skewed, flat, or bell-shaped. • Use the outlier rule to identify outliers in a data set. • Explain how adding or removing an outlier affects measures of center and spread in real-world and mathematical situations. • Compare two or more data sets using shape, center, and spread. • Determine which statistics to compare, which plots to use, and what the results of a comparison might mean, depending on the question to be investigated and the real-life actions to be taken. • Discuss the effects of outliers

S-ID.3 continued **Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ***		• Explain a decision based on a graphical display of data and the corresponding descriptive statistics. • How changes in data affect visual representation of data.	on the measures of center and what that would look like on a graph of the data. • Discuss the effects of extreme values on the decision-making process in the context of a problem. • Explain how measures of spread might affect their decision-making process within the context of a set of data. • Organize multiple sets of data for comparison and articulates similarities and differences.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on two categorical and quantitative variables	Supporting

S-ID.5 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.*	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Perform basic operations involving rational numbers. • Identify limitations, or misuses, of visual representations of data. • Make and interpret visual and tabular representations of data. • How changes in data affect visual representations of data.	• Entries in the "Total" row and column are called marginal frequencies. • Entries in the body of the table are called joint frequencies. • The relative frequencies in the body of the table are called conditional frequencies. • How to use two-way tables to organize and display categorical data. • The difference between quantitative data vs. categorical data. • What it means for two categorical data sets to be independent.	• Recognize the differences between joint, marginal and conditional relative frequencies. • Calculate relative frequencies including joint, marginal and conditional relative frequencies. • Create and summarize a two-way frequency table for a set of categorical data. • Analyze two-way tables to determine if two categorical variables are associated or independent. • Interpret relative frequencies in the context of a give data set. • Recognize possible associations and trends in data.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on two categorical and quantitative variables	Supporting

S-ID.6.a	Desired Student Performance		
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.* **a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data.** ***Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.***	**A student should know** • Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Identify limitations, or misuses, of visual representations of data. • Make and interpret visual and tabular representations of data. • How changes in data affect visual representations of data.	**A student should understand** • Functions may be used to describe data. • How to identify the difference between association and causation. • Analyze tables and graphs to identify exponential or linear functions. • Make conjectures about equations, tables, and graphs of linear, quadratic, and exponential functions. • Distinguish between constant differences (linear functions) and constant ratios (exponential functions) by recognizing constant growth patterns vs. exponential growth patterns.	**A student should be able to do** • Create a scatter plot from two quantitative variables and analyze possible associations between two variables. • Describe the form, strength, and direction of the relationship. • Categorize data as linear, exponential, or quadratic based on its graphical display, function, or table of data. • Use algebraic methods and technology to fit a function to the data and use the function to predict values in the context of the data. • Explain the meaning of slope, *y*-intercept, the constant and coefficients, in terms of the context of the data. • Formulate a line of best fit given data presented in a table or in a graph.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on two categorical and quantitative variables | **Supporting**

S-ID.6.b

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*

b. Informally assess the fit of a function by plotting and analyzing residuals.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Perform basic operations involving rational numbers. • Identify limitations, or misuses, of visual representations of data. • Make and interpret visual and tabular representations of data. • How changes in data affect visual representations of data. • Write linear equations given a point and slope, two points, or graph.	• The residual in a regression model is the difference between the observed *y*-value and its predicted *y*-value. • Residuals measure how much the data deviate from the regression line. • Represent the residuals from a function and the data set it models numerically and graphically. • Use line of fit and scatter plots to evaluate trends and make predictions. • If the data suggest a linear relationship, the relationship can be modeled with a regression line and its strength and direction can be expressed through a correlation coefficient.	• Graph the residuals and evaluate the fit of the linear equations. • Fit functions to data. • Informally assess the fit of a function by analyzing residuals from the residual plot. • Find residuals with and without technology and analyze their meaning. • Write equations of best-fit lines using linear regression. • Find a curve of best-fit in the form of a polynomial function for data. • Calculate and interpret the correlation coefficient for linear regression models.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on two categorical and quantitative variables	Supporting

	Desired Student Performance		
S-ID.6.c **Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*** **c. Fit a linear function for a scatter plot that suggests a linear association.**	**A student should know** • Interpret the slope and *y*-intercept of a linear model in the context of the data. • Write and graph linear equations given a point and slope, two points, or graph. • Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Perform basic operations involving rational numbers. • Make and interpret visual and tabular representations of data. • How changes in data affect visual representations of data.	**A student should understand** • Use lines of fit and scatter plots to evaluate trends and make predictions. • Identify the difference between association and causation. • Determine whether the graph of real-world data shows a positive correlation, negative correlation, or no correlation. • Use the function for the line of fit to predict values inside the range of the data for a real-world situation. • Some models are better than others at making predictions.	**A student should be able to do** • Fit a linear function for a scatter plot that suggests a linear correlation. • Fit a linear function (trend line) to a scatter plot with and without technology. • Create a scatter plot from two quantitative variables and analyze possible associations between two variables. • Describe the form, strength, and direction of the relationship. • Determine whether the graph shows a positive, negative, or no correlation. • Interpret the meaning of positive and negative correlated graphs in context of the data. • Use algebraic methods and technology to fit a function to the data and use the function to predict values.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Interpret linear models	Major

S-ID.7 **Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.***	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Generate data by evaluating expressions for different values of a variable and organize the data. • Find the slope of a line given a graph, table, or two points on a line. • Recognize and justify if a line has a positive, negative, zero, or undefined slope. • Interpret slope by describing how *y* is expected to change when *x* changes by one unit. • Simplify expressions involving rational numbers.	• Explain the meaning of slope (rate of change) and *y*-intercept (constant term) in context. • Explain and illustrate how a change in one variable may result in a change in another variable and apply to the relationships between independent and dependent variables. • How the slope of a graph relates to a rate of change. • Interpret the rate of change and initial value of linear function in terms of the situation it models and in terms of its graph or a table of values.	• Write the equation of a line given a graph, table of values, or mathematical situation. • Determine the rate of change and constant term when given a graph, table, or mathematical situation and interpret its meaning in context. • Identify the quantities in a mathematical problem or real-world situation that should be represented by distinct variables and describe what quantities the variable represents. • Calculate the slope between two points. • Solve problems that involve interpreting slope as a rate of change. • Estimate the rate of change from a graph.

S-ID.7 continued **Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.***		• The rate of change between any two points, for non-linear functions, might not be the same as the rate of change of the overall function. • Compare the relative steepness of lines and to build intuition about positive, negative, and zero slopes.	

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Interpret linear models	Major

S-ID.8 **Compute (using technology) and interpret the correlation coefficient of a linear fit.***	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
	• Interpret the slope and *y*-intercept of a linear model in the context of the data. • Write and graph linear equations given a point and the slope, two points, or graph. • Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Identify limitations, or misuses, of visual representations of data. • How changes in data affect visual representations of data.	• Correlation coefficients measure the strength of association for a data set. • Correlation coefficients are a calculation based on the data that returns a number between -1 and 1. • Correlation does not imply causation. • Correlation coefficient does not detect nonlinear association. • Input data using statistical or graphing technology and calculate its correlation coefficient. • Some models are better than others at making predictions.	• Calculate the correlation coefficient of a linear fit using technology. • Interpret the correlation coefficient of a linear fit as a measure of how well the data fit the relationship. • Investigate relationships between quantities by using points on scatter plots. • Fit a linear function (trend line) to a scatter plot with and without technology. • Create a scatter plot from two quantitative variables and analyze possible associations between two variables. • Describe the form, strength, and direction of the relationship. • Define, explain, and determine positive, negative, or no correlation in context.

ALGEBRA I

Statistics and Probability*

Interpreting Categorical and Quantitative Data (S-ID)

Interpret linear models — **Major**

S-ID.9
Distinguish between correlation and causation.*

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Interpret the slope and *y*-intercept of a linear model in the context of the data. • Write and graph linear equations given a point and the slope, two points, or graph. • Determine the mean, median, mode, and range for a set of data, and decide how meaningful they are in specific situations. • Identify trends in data. • Identify limitations, or misuses, of visual representations of data. • How changes in data affect visual representations of data.	• The difference between correlation (association) and causation (cause-and-effect). • Correlation refers to how closely two sets of information or data are related. • Causal relationship between two things or events exists if one occurs because of the other. • When two variables have a correlation, it does not mean that a change in one causes a change in the others. • Correlation does not imply causation. • Use lines of fit and scatter plots to evaluate trends and make predictions. • No model is perfect. Some models are better than others at making predictions.	• Investigate relationships between quantities by using points on scatter plots. • Fit a linear function (trend line) to a scatter plot with and without technology. • Create a scatter plot from two quantitative variables and analyze possible associations between two variables. • Describe the form, strength, and direction of the relationship. • Define positive, negative, or no correlation and explain why correlation does not imply causation. • Interpret the meaning of positive and negative correlated graphs in context of the data. • Estimate the correlation coefficient between two variables.