Algebra 1 – Summary of Revisions and Planning Guidance - *Arizona Mathematics Standards - Adopted in 2016*

Additions
• **A1.S-CP.A.1** Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.
• **A1.S-CP.A.2** Use the Multiplication Rule for independent events to understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

Parameter Changes/Clarifications

Standard	Notes
A1.N-Q.A.1	Added "utilizing real-world context". This is a mathematical modeling standard.
A1.N-Q.A.2	Added "utilizing real-world context". This is a mathematical modeling standard.
A1.N-Q.A.3	Added "utilizing real-world context". This is a mathematical modeling standard.
A1.A-SSE.A.2	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.A-APR.B.3	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.A-CED.A.1	Added "utilizing real-world context". This is a mathematical modeling standard. This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.A-REI.A.1	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. Algebra 1 focuses on solving linear and quadratic equations. See standard for clarification on limits.
A1.A-REI.B.4b	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.A.REI.C.6	Added "utilizing real-world context". This is a mathematical modeling standard.
A1.A-REI.D.11	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.F-IF.B.4	Added "utilizing real-world context". This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.F-IF.B.6	Added "utilizing real-world context". This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.F-IF.C.7	Sub-standards were combined into a single standard. This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.F-IF.C.9	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.F-BF.A.1	Added "utilizing real-world context". This is a mathematical modeling standard. This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.

Vertical Fluency Articulation

8th Grade	**8. EE.C.7** Fluently solve linear equations and inequalities in one variable.
Algebra 1	**A1.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph. **A1.A-SSE.A.2** Use structure to identify ways to rewrite numerical and polynomial expressions.
Algebra 2	**A2.A-SSE.A.2** Use the structure of an expression to identify ways to rewrite it. **A2.A-REI.B.4** Fluently solve quadratic equations in one variable **A2.F-BF.B.3** Identify the effect on a graph when changing *f*(*x*).

Fluency Definition

Wherever the word *fluently* appears in a content standard, the word includes ***efficiently, accurately, flexibly,*** *and **appropriately***. Being fluent means that students are able to choose flexibly among methods and strategies to solve contextual and mathematical problems, they understand and are able to explain their approaches, and they are able to produce accurate answers efficiently.

- **Efficiency**—carries out easily, keeps track of sub-problems, and makes use of intermediate results to solve the problem.
- **Accuracy**—reliably produces the correct answer.
- **Flexibility**—knows more than one approach, chooses a viable strategy, and uses one method to solve and another method to double-check.
- **Appropriately**—knows when to apply a particular procedure.

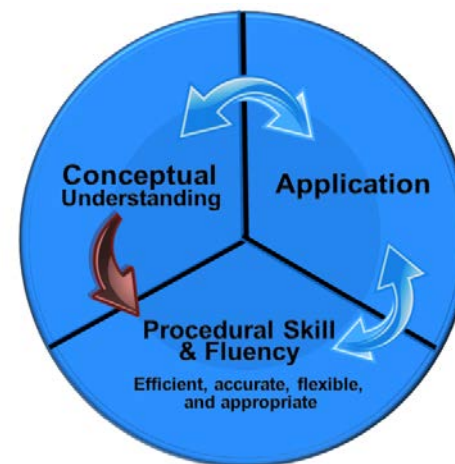|	
A1.F-BF.B.3	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits.
A1.F-LE.B.5	Added "utilizing real-world context". This is a mathematical modeling standard. This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification.
A1.S-ID.A.1	See standard for clarification; includes comparing two or more data sets.
A1.S-ID.B.6	This standard now includes a defined limit between Algebra 1 and Algebra 2 content. See standard for clarification on limits. Limit includes linear models. Sub-standards *a* and *c* were combined into a single sub-standard.
A1.S-ID.C.7	See standard for clarification.
A1.S-ID.C.8	See standard for clarification; "fit" changed to "relationship".

Content Emphasis

● Major Content ▲ Supporting Content

Major Content (●) from the content emphasis section should account for approximately 70% of instructional time.

The Real Number System (N-RN)	Creating Equations (A-CED)	Interpreting Functions (F-IF)
▲ Use properties of rational and irrational numbers.	● Create equations that describe numbers or relationships.	● Understand the concept of a function and use function notation.
Quantities (N-Q)	**Reasoning with Equations and Inequalities (A-REI)**	● Interpret functions that arise in applications in terms of the context.
● Reason quantitatively and use units to solve problems.	● Understand solving equations as a process of reasoning and explain the reasoning.	● Analyze functions using different representations.
Seeing Structure in Expressions (A-SSE)	▲ Solve equations and inequalities in one variable.	**Linear, Quadratic, and Exponential Models (F-LE)**
● Interpret the structure of expressions.	▲ Solve systems of equations.	● Construct and compare linear, quadratic, and exponential models and solve problems.
● Write expressions in equivalent forms to solve problems.	▲ Represent and solve equations and inequalities graphically.	● Interpret expressions for functions in terms of the situation they model.
Arithmetic with Polynomials and Rational Expressions (A-APR)	**Building Functions (F-BF)**	**Interpreting categorical and Quantitative data (S-ID)**
▲ Perform arithmetic operations on polynomials.	● Build a function that models a relationship between two quantities.	▲ Summarize, represent, and interpret data on a single count or measurement variable.
● Understand the relationship between zeros and factors of polynomials.	▲ Build new functions from existing functions.	▲ Summarize, represent, and interpret data on two categorical and quantitative variables.
	Conditional Probability and the Rules of Probability (S-CP)	● Interpret linear models.
	▲ Understand independence and conditional probability and use them to interpret data.	

Balance of Rigor in the Math Classroom

Conceptual Understanding — Application — Procedural Skill & Fluency — Efficient, accurate, flexible, and appropriate

Defining Standards, Curriculum and Instruction

Standards – What a student needs to know, understand, and be able to do by the end of each grade/course. Standards build across grade levels in a progression of increasing understanding and through a range of cognitive demand levels. Standards are adopted at the state level by the State Board of Education.

Curriculum – The resources used for teaching and learning the standards. Curricula are adopted at a local level by districts and schools.

Instruction – The methods used by teachers to teach their students. Instructional techniques are employed by individual teachers in response to the needs of the students in their classes to help them progress through the curriculum in order to master the standards.

The Standards for Mathematical Practice

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years.

The Arizona Mathematics Standards has included narratives for each of the 8 Mathematical Practices.

Comparison of Arizona Mathematics Standards – 2010 to 2016

Algebra 1				
Number and Quantity – N				
The Real Number System (N-RN)				
Adopted 2010		**Adopted 2016**		
HS.N-RN.B Use properties of rational and irrational numbers.	**HS.N-RN.B.3**. Explain why the sum or product of two rational numbers are 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.	**A1.N-RN.B Use properties of rational and irrational numbers.**	**A1.N-RN.B.3**	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
Quantities (N-Q)				
HS.N-Q.A Reason quantitatively and use units to solve problems.	**HS.N-Q.A.1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	**A1.N-Q.A Reason quantitatively and use units to solve problems.**	**A1.N-Q.A.1**	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.
	HS.N-Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.		**A1.N-Q.A.2**	Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.
	HS.N-Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.		**A1.N-Q.A.3**	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.

Algebra – A				
Seeing Structure in Expressions (A-SSE)				
Adopted 2010		**Adopted 2016**		
HS.A-SSE.A Interpret the structure of expressions.	**HS.A-SSE.A.1.** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. 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.	**A1.A-SSE.A Interpret the structure of expressions.**	A1.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret expressions by viewing one or more of their parts as a single entity.
	HS.A-SSE.A.2. Use the structure of an expression to identify ways to 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 $(x^2 - y^2)(x^2 + y^2)$.*		A1.A-SSE.A.2	Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.
HS.A-SSE.B Write expressions in equivalent forms to solve problems.	**HS.A-SSE.B.3.** 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. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	**A1.A-SSE.B Write expressions in equivalent forms to solve problems.**	A1.A-SSE.B.3	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. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Algebra – A				
Arithmetic with Polynomials and Rational Expressions (A-APR)				
Adopted 2010		**Adopted 2016**		
HS.A-APR.A Perform arithmetic operations on polynomials.	**HS.A-APR.A.1.** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	**A1.A-APR.A Perform arithmetic operations on polynomials.**	**A1.A-APR.A.1**	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
HS.A-APR.B Understand the relationship between zeros and factors of polynomials.	**HS.A-APR.B.3.** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	**A1.A-APR.B Understand the relationship between zeros and factors of polynomials.**	**A1.A-APR.B.3**	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available.

Algebra - A				
Creating Equations (A-CED)				
HS.A-CED.A **Create equations that describe numbers or relationships.**	**HS.A-CED.A.1.** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	**A1.A-CED.A** **Create equations that describe numbers or relationships.**	**A1.A-CED.A.1**	Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
	HS.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		**A1.A-CED.A.2**	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
	HS.A-CED.A.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.*		**A1.A-CED.A.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.
	HS.A-CED.A.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*		**A1.A-CED.A.4**	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Algebra – A				
Reasoning with Equations and Inequalities (A-REI)				
HS.A-REI.A Understand solving equations as a process of reasoning and explain the reasoning.	**HS.A-REI.A.1.** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	**A1.A-REI.A Understand solving equations as a process of reasoning and explain the reasoning.**	**A1.A-REI.A.1**	Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
HS.REI.B Solve equations and inequalities in one variable.	**HS.A-REI.B.3.** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	**A1.REI.B Solve equations and inequalities in one variable.**	**A1.A-REI.B.3**	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
	HS.A-REI.B.4. 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. 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.		**A1.A-REI.B.4**	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 $(x - k)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.
HS.A-REI.C Solve systems of equations.	**HS.A-REI.C.5.** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	**A1.A-REI.C Solve systems of equations.**	**A1.A-REI.C.5**	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

	HS.A-REI.C.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		**A1.A-REI.C.6**	Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. Include problem solving opportunities utilizing real-world context.
HS.A-REI.D Represent and solve equations and inequalities graphically.	**HS.A-REI.D.10.** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**A1.A-REI.D Represent and solve equations and inequalities graphically.**	**A1.A-REI.D.10**	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line.
	HS.A-REI.D.11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, 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.		**A1.A-REI.D.11**	Explain why the x-coordinates of the points where the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equation $f(x) =g(x)$; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Focus on cases where $f(x)$ and/or $g(x)$ are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
	HS.A-REI.D.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.		**A1.A-REI.D.12**	Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions – F

Interpreting Functions (F-IF)

HS.F-IF.A Understand the concept of a function and use function notation.	**HS.F-IF.A.1.** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f(x)* denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f(x)*.	**A1.F-IF.A Understand the concept of a function and use function notation.**	A1.F-IF.A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f(x)* denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f(x)*.
	HS.F-IF.A.2. Use function notations, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.		A1.F-IF.A.2	Evaluate a function for inputs in the domain, and interpret statements that use function notation in terms of a context.
	HS.F-IF.A.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 ≥ 1.*		A1.F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
HS.F-IF.B Interpret functions that arise in applications in terms of the context.	**HS.F-IF.B.4.** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*	**A1.F-IF.B Interpret functions that arise in applications in terms of the context.**	A1.F-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

			A1.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	HS.F-IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*		A1.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	HS.F-IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.		A1.F-IF.B.6	Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
HS.F-IF.C Analyze functions using different representations.	**HS.F-IF.C.7.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	**A1.F-IF.C Analyze functions using different representations.**	A1.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
	HS.F-IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.		A1.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square of a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

	HS.F-IF.C.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.*		A1.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

Functions - F				
Building Functions (F-BF)				
HS.F-BF.A **Build a function that models a relationship between two quantities.**	**HS.F-BF.A.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.	**A1.F-BF.A** **Build a function that models a relationship between two quantities.**	A1.F-BF.A.1	Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
HS.F-BF.B **Build new functions from existing functions.**	**HS.F-BF.B.3.** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	**A1.F-BF.B** **Build new functions from existing functions.**	A1.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, 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. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

Functions – F				
Linear, Quadratic, and Exponential Models (F-LE)				
HS.F-LE.A Construct and compare linear, quadratic, and exponential models and solve problems.	**HS.F-LE.A.1.** 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. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	**A1.F-LE.A Construct and compare linear, quadratic, and exponential models and solve problems.**	**A1.F-LE.A.1**	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. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
	HS.F-LE.A.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).		**A1.F-LE.A.2**	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.
	HS.F-LE.A.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.		**A1.F-LE.A.3**	Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
HS.F-LE.B Interpret expressions for functions in terms of the situation they model.	**HS.F-LE.B.5.** Interpret the parameters in a linear or exponential function in terms of a context.	**A1.F-LE.B Interpret expressions for functions in terms of the situation they model.**	**A1.F-LE.B.5**	Interpret the parameters in a linear or exponential functions utilizing real-world context.

Statistics and Probability – S				
Summarize, represent, and interpret data on a single count or measurement variable. (S-ID)				
HS.S-ID.A **Summarize, represent, and interpret data on a single count or measurement variable.**	**HS.S-ID.A.1.** Represent data with plots on the real number line (dot plots, histograms, and box plots).	**A1.S-ID.A** **Summarize, represent, and interpret data on a single count or measurement variable.**	**A1.S-ID.A.1**	Represent real-value data with plots for the purpose of comparing two or more data sets.
	HS.S-ID.A.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.		**A1.S-ID.A.2**	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
	HS.S-ID.A.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).		**A1.S-ID.A.3**	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers if present.
HS.S-ID.B **Summarize, represent, and interpret data on two categorical and quantitative variables.**	**HS.S-ID.B.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.	**A1.S-ID.B** **Summarize, represent, and interpret data on two categorical and quantitative variables.**	**A1.S-ID.B.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.

	HS.S-ID.B.6. 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 chooses a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.		**A1.S-ID.B.6**	Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Focus on linear models. b. Informally assess the fit of a function by plotting and analyzing residuals.
HS.S-ID.C Interpret linear models.	**HS.S-ID.C.7.** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	**A1.S-ID.C Interpret linear models.**	**A1.S-ID.C.7**	Interpret the slope as a rate of change and the constant term of a linear model in the context of the data.
	HS.S-ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.		**A1.S-ID.C.8**	Compute and interpret the correlation coefficient of a linear relationship.
	HS.S-ID.C.9. Distinguish between correlation and causation.		**A1.S-ID.C.9**	Distinguish between correlation and causation.
Statistics and Probability – S
Conditional Probability and the rules of Probability (S-CP)
		A1.S-CP.A Understand independence and conditional probability and use them to interpret data.	**A1.S-CP.A.1**	Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.
			A1.S-CP.A.2	Use the Multiplication Rule for independent events to understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

Standards for Mathematical Practice

A1.MP.1 Make sense of problems and persevere in solving them.
Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, "Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

A1.MP.2 Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

A1.MP.3 Construct viable arguments and critique the reasoning of others. Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

A1.MP.4 Model with mathematics.
Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

A1.MP.5 Use appropriate tools strategically.
Mathematically proficient students consider available tools when solving a mathematical problem. They choose tools that are relevant and useful to the problem at hand. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful; recognizing both the insight to be gained and their limitations. Students deepen their understanding of mathematical concepts when using tools to visualize, explore, compare, communicate, make and test predictions, and understand the thinking of others.

A1.MP.6 Attend to precision.
Mathematically proficient students clearly communicate to others using appropriate mathematical terminology, and craft explanations that convey their reasoning. When making mathematical arguments about a solution, strategy, or conjecture, they describe mathematical relationships and connect their words clearly to their representations. Mathematically proficient students understand meanings of symbols used in mathematics, calculate accurately and efficiently, label quantities appropriately, and record their work clearly and concisely.

A1.MP.7 Look for and make use of structure.
Mathematically proficient students use structure and patterns to assist in making connections among mathematical ideas or concepts when making sense of mathematics. Students recognize and apply general mathematical rules to complex situations. They are able to compose and decompose mathematical ideas and notations into familiar relationships. Mathematically proficient students manage their own progress, stepping back for an overview and shifting perspective when needed.

A1.MP.8 Look for and express regularity in repeated reasoning.
Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.