Changes to the Course/Credit Descriptions
Algebra 1

The table below shows the HSCE currently assigned to Algebra I in the left-hand column with the new course description in the right hand column. In summary the following changes were made:

- Moving 4 expectations to Algebra II. These are expectations that deal with more complex calculations that detract from the conceptual focus we want in Algebra I. They connect better with some of the expectations already in Algebra II.
- Deleting one expectation based on the advice of the original writers. It was hard to clarify because it was too ambiguous and the writers agreed that the underlying concept is already addressed with several other expectations.
- Addition of 1 expectation that currently is in Algebra II but should appear in both courses
- Minor changes in wording to either make the expectation more appropriate for Algebra I or correct errors. Also examples are removed from the expectation and embedded into the clarification document.
- Coding changes were made to the HSCE to better balance some of the standards for MME purposes.

All changes are indicated in red, along with explanatory footnotes.

Content Expectations for Algebra 1

Original Course Description	Proposed Course Description
L1.1 Number Systems and Number Sense	**L1.1 Number Systems and Number Sense**
L1.1.1 Know the different properties that hold in different number systems, and recognize that the applicable properties change in the transition from the positive integers, to all integers, to the rational numbers, and to the real numbers.	L1.1.1 Know the different properties that hold in different number systems, and recognize that the applicable properties change in the transition from the positive integers, to all integers, to the rational numbers, and to the real numbers.
L1.1.2 Explain why the multiplicative inverse of a number has the same sign as the number, while the additive inverse of a number has the opposite sign.	L1.1.2 Explain why the multiplicative inverse of a number has the same sign as the number, while the additive inverse of a number has the opposite sign.
L1.1.3 Explain how the properties of associativity, commutativity, and distributivity, as well as identity and inverse elements, are used in arithmetic and algebraic calculations.	L1.1.3 Explain how the properties of associativity, commutativity, and distributivity, as well as identity and inverse elements, are used in arithmetic and algebraic calculations.
L1.1.4 Describe the reasons for the different effects of multiplication by, or exponentiation of, a positive number by a number less than 0, a number between 0 and 1, and a number greater than 1.	L1.1.4 Describe the reasons for the different effects of multiplication by, or exponentiation of, a positive number by a number less than 0, a number between 0 and 1, and a number greater than 1.
L1.1.5 Justify numerical relationships (e.g., show that the sum of even integers is even; that every integer can be written as $3m+k$, where k is 0, 1, or 2, and m is an integer; or that the sum of the first n positive integers is $n(n+1)/2$).	L1.1.5 Justify numerical relationships.
L1.2 Representations and Relationships	**L1.2 Representations and Relationships**
L1.2.2 Interpret representations that reflect absolute value relationships (e.g. $\lvert x - a \rvert \leq b$, *or* $a \pm b$) in such contexts as error tolerance.	L1.2.2 Interpret representations that reflect absolute value relationships in such contexts as error tolerance.
L1.2.4 Organize and summarize a data set in a table, plot, chart, or spreadsheet; find patterns in a display of data; understand and critique data displays in the media.	L1.2.4 Organize and summarize a data set in a table, plot, chart, or spreadsheet; find patterns in a display of data; understand and critique data displays in the media.
L2.1 Calculation Using Real and Complex Numbers	**L2.1 Calculation Using Real and Complex Numbers**
L2.1.1 Explain the meaning and uses of weighted averages (e.g., GNP, consumer price index, grade point average).	L2.1.1 Explain the meaning and uses of weighted averages.
L2.1.2 Calculate fluently with numerical expressions involving exponents; use the rules of exponents; evaluate numerical expressions involving rational and negative exponents; transition easily between roots and exponents.	L2.1.2 Calculate fluently with numerical expressions involving exponents; use the rules of exponents; evaluate numerical expressions involving rational and negative exponents; transition easily between roots and exponents.

L2.1.3 Explain the exponential relationship between a number and its base 10 logarithm and use it to relate rules of logarithms to those of exponents in expressions involving numbers[1]. L2.1.4 Know that the complex number *i* is one of two solutions to $x^2 = -1$. L2.1.5 Add, subtract, and multiply complex numbers. Use conjugates to simplify quotients of complex numbers[1]. L2.1.6 Recognize when exact answers aren't always possible or practical; use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots)[2].	L2.1.4 Know that the imaginary number *i* is one of two solutions to $x^2 = -1$.
L3.1 Measurement Units, Calculations, and Scales L3.1.2 Describe and interpret logarithmic relationships in such contexts as the Richter scale, the pH scale, or decibel measurements (e.g., explain why a small change in the scale can represent a large change in intensity); solve applied problems[1].	
A1.1 Construction, Interpretation, and Manipulation of Expressions (linear, quadratic, polynomial, rational, power, exponential, and logarithmic) A1.1.1 Give a verbal description of an expression that is presented in symbolic form, write an algebraic expression from a verbal description, and evaluate expressions given values of the variables. A1.1.2 Know the definitions and properties of exponents and roots, and apply them in algebraic expressions. A1.1.3 Factor algebraic expressions using, for example, greatest common factor, grouping, and the special product identities (e.g., differences of squares and cubes). A1.1.6 Use the properties of exponents and logarithms, including the inverse relationship between exponents and logarithms, to transform exponential and logarithmic expressions into equivalent forms[1].	**A1.1 Construction, Interpretation, and Manipulation of Expressions (linear, quadratic, polynomial, power, and exponential)** A1.1.1 Give a verbal description of an expression that is presented in symbolic form, write an algebraic expression from a verbal description, and evaluate expressions given values of the variables. A1.1.2 Know the properties of exponents and roots, and apply them in algebraic expressions. A1.1.3 Factor algebraic expressions using, for example, greatest common factor, grouping, and the special product identities

[1] Move to Algebra II
[2] Delete

A1.2 Solutions of Equations and Inequalities A1.2.1 Write equations and inequalities with one or two variables to represent mathematical or applied situations, and solve. A1.2.2 Associate a given equation with a function whose zeros are the solutions of the equation. A1.2.3 Solve (and justify steps in the solutions) linear and quadratic equations and inequalities, including systems of up to three linear equations with three unknowns; apply the quadratic formula appropriately. A1.2.4 Solve absolute value equations and inequalities, $\lvert X-3 \rvert < 6$, and justify steps in the solution. A1.2.6 Solve power equations (e.g., solve $(x + 1)^3 = 8$) and equations including radical expressions (e.g., solve $\sqrt{(3x - 7)} = 7$), justify steps in the solution, and explain how extraneous solutions may arise. A1.2.8 Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable, and justify steps in the solution. A1.2.9 Know common formulas (e.g., slope, distance between two points, quadratic formula, compound interest, distance = rate · time), and apply appropriately in contextual situations[1].	**A1.2 Solutions of Equations and Inequalities** A1.2.1 Write equations and inequalities with one or two variables to represent mathematical or applied situations, and solve. A1.2.2 Associate a given equation with a function whose zeros are the solutions of the equation. A1.2.3 Solve (and justify steps in the solutions) linear and quadratic equations and inequalities, including systems of up to three linear equations with three unknowns; apply the quadratic formula appropriately. A1.2.4 Solve absolute value equations and inequalities, and justify steps in the solution. A1.2.6 Solve power equations and equations including radical expressions, justify steps in the solution, and explain how extraneous solutions may arise. A1.2.8 Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable, and justify steps in the solution.
A2.1 Definitions, Representations, and Attributes of Functions A2.1.1 Recognize whether a relationship (given in contextual, symbolic, tabular, or graphical form) is a function; and identify its domain and range. A2.1.2 Read, interpret, and use function notation, and evaluate a function at a value in its domain. A2.1.3 Represent functions in symbols, graphs, tables, diagrams, or words, and translate among representations. A2.1.4 Recognize that functions may be defined by different expressions over different intervals of their domains; such functions are piecewise-defined (e.g., absolute value and greatest integer functions).	**A2.1 Definitions, Representations, and Attributes of Functions** A2.1.1 Determine whether a relationship (given in contextual, symbolic, tabular, or graphical form) is a function; and identify its domain and range. A2.1.2 Read, interpret, and use function notation, and evaluate a function at a value in its domain. A2.1.3 Represent functions in symbols, graphs, tables, diagrams, or words, and translate among representations. A2.1.4 Recognize that functions may be defined by different expressions over different intervals of their domains; such functions are piecewise-defined.

A2.1.5 Recognize that functions may be defined recursively, and compute values of and graph simple recursively defined functions (e.g., f(0) = 5, and f(n) = f(n-1) + 2).	A2.1.5 Recognize that functions may be defined recursively, and compute values of and graph simple recursively defined functions
A2.1.6 Identify the zeros of a function and the intervals where the values of a function are positive or negative, and describe the behavior of a function, as x approaches postive or negative infinity, given the symbolic and graphical representations.	A2.1.6 Identify the zeros of a function, the intervals where the values of a function are positive or negative, and describe the behavior of a function as x approaches positive or negative infinity, given the symbolic and graphical representations.
A2.1.7 Identify and interpret the key features of a function from its graph or its formula(e), (e.g. slope, intercept(s), asymptote(s), maximum and minimum value(s), symmetry, average rate of change over an interval, and periodicity).	A2.1.7 Identify and interpret the key features of a function from its graph or its formula(s).
A2.2 Operations and Transformations	**A2.2 Operations and Transformations with Functions**
A2.2.1 Combine functions by addition, subtraction, multiplication, and division.	A2.2.1 Combine functions by addition, subtraction, multiplication, and division.
A2.2.2 Apply given transformations (e.g., vertical or horizontal shifts, stretching or shrinking, or reflections about the x- and y-axes) to basic functions, and represent symbolically.	A2.2.2 Apply given transformations to parent functions, and represent symbolically.
A2.2.3 Recognize whether a function (given in tabular or graphical form) has an inverse and recognize simple inverse pairs (e.g., f(x) = x3 and g(x) = $x^{1/3}$).	A2.2.3 Determine whether a function (given in tabular or graphical form) has an inverse and recognize simple inverse pairs.
A2.3 Families of Functions[2]	**A2.3 Representations of Functions**
A2.3.1 Identify a function as a member of a family of functions based on its symbolic or graphical representation; recognize that different families of functions have different asymptotic behavior at infinity and describe these behaviors.	A2.3.1 Identify a function as a member of a family of functions based on its symbolic or graphical representation; recognize that different families of functions have different asymptotic behavior.
A2.3.2 Describe the tabular pattern associated with functions having constant rate of change (linear); or variable rates of change.	A2.3.2 Describe the tabular pattern associated with functions having constant rate of change (linear); or variable rates of change.
	A2.3.3 Write the general symbolic forms that characterize each family of functions.
A3.1 Models of Real-world Situations Using Families of Functions	**A2.4 Models of Real-world Situations Using Families of Functions**
Example: An initial population of 300 people grows at 2% per year. What will the population be in 10 years? [3]	
A3.1.1 Identify the family of function best suited for modeling a given real-world situation (e.g., quadratic functions for motion of an object under the force of gravity; exponential functions for compound interest; trigonometric	A2.4.1 Identify the family of function best suited for modeling a given real-world situation.

functions for periodic phenomena. *In the example above, recognize that the appropriate general function is exponential ($P = P_0a^t$)* A3.1.2 Adapt the general symbolic form of a function to one that fits the specifications of a given situation by using the information to replace arbitrary constants with numbers. *In the example above, substitute the given values $P_0 = 300$ and $a = 1.02$ to obtain $P = 300(1.02)^t$.* A3.1.3 Using the adapted general symbolic form, draw reasonable conclusions about the situation being modeled. *In the example above, the exact solution is 365.698, but for this problem an appropriate approximation is 365.*	A2.4.2 Adapt the general symbolic form of a function to one that fits the specifications of a given situation by using the information to replace arbitrary constants with numbers. A2.4.3 Using the adapted general symbolic form, draw reasonable conclusions about the situation being modeled.

A2.4 Lines and Linear Functions A2.4.1 Write the symbolic forms of linear functions (standard [i.e., Ax + By = C, where B ≠ 0], point-slope, and slope-intercept) given appropriate information, and convert between forms. A2.4.2 Graph lines (including those of the form x = h and y = k) given appropriate information. A2.4.3 Relate the coefficients in a linear function to the slope and x- and y-intercepts of its graph. A2.4.4 Find an equation of the line parallel or perpendicular to given line, through a given point; understand and use the facts that non-vertical parallel lines have equal slopes, and that non-vertical perpendicular lines have slopes that multiply to give -1.	**A3.1 Lines and Linear Functions** A3.1.1 Write the symbolic forms of linear functions (standard, point-slope, and slope-intercept) given appropriate information, and convert between forms. A3.1.2 Graph lines (including those of the form x = h and y = k) given appropriate information. A3.1.3 Relate the coefficients in a linear function to the slope and x- and y-intercepts of its graph. A3.1.4 Find an equation of the line parallel or perpendicular to given line, through a given point; understand and use the facts that non-vertical parallel lines have equal slopes, and that non-vertical perpendicular lines have slopes that multiply to give -1.
A2.5 Exponential and Logarithmic Functions A2.5.1 Write the symbolic form and sketch the graph of an exponential function given appropriate information. (e.g., given an initial value of 4 and a rate of growth of 1.5, write $f(x) = 4\ (1.5)^x$). A2.5.4 Understand and use the fact that the base of an exponential function determines whether the function increases or decreases and how base affects the rate of growth or decay. A2.5.5 Relate exponential and logarithmic functions to real phenomena, including half-life and doubling time. **A2.6 Quadratic Functions** A2.6.1 Write the symbolic form and sketch the graph of a quadratic function given appropriate information (e.g., vertex, intercepts, etc.). A2.6.2 Identify the elements of a parabola (vertex, axis of symmetry, direction of opening) given its symbolic form or its graph, and relate these elements to the coefficient(s) of the symbolic form of the function. A2.6.3 Convert quadratic functions from standard to vertex form by completing the square. A2.6.4 Relate the number of real solutions of a quadratic equation to the graph of the associated quadratic function.	**A3.2 Exponential and Logarithmic Functions** A3.2.1 Write the symbolic form and sketch the graph of an exponential function given appropriate information. A3.2.4 Understand and use the fact that the base of an exponential function determines whether the function increases or decreases and how the base affects the rate of growth or decay. A3.2.5 Relate exponential functions to real phenomena, including half-life and doubling time. **A3.3 Quadratic Functions** A3.3.1 Write the symbolic form and sketch the graph of a quadratic function given appropriate information. A3.3.2 Identify the elements of a parabola (vertex, axis of symmetry, direction of opening) given its symbolic form or its graph, and relate these elements to the coefficient(s) of the symbolic form of the function. A3.3.3 Convert quadratic functions from standard to vertex form by completing the square. A3.3.4 Relate the number of real solutions of a quadratic equation to the graph of the associated quadratic function.

A2.6.5 Express quadratic functions in vertex form to identify their maxima or minima, and in factored form to identify their zeros.	A3.3.5 Express quadratic functions in vertex form to identify their maxima or minima, and in factored form to identify their zeros.
A2.7 Power Functions (including roots, cubics, quartics, etc.) A2.7.1 Write the symbolic form and sketch the graph of power functions. A2.7.2 Express direct and inverse relationships as functions (e.g., $y = kx^n$ and $y = kx^{-n}$, $n > 0$) and recognize their characteristics (e.g., in $y = x^3$, note that doubling x results in multiplying y by a factor of 8). A2.7.3 Analyze the graphs of power functions, noting reflectional or rotational symmetry. **A2.8 Polynomial Functions** A2.8.1 Write the symbolic form and sketch the graph of simple polynomial functions. A2.8.2 Understand the effects of degree, leading coefficient, and number of real zeros on the graphs of polynomial functions of degree of degree greater than 2**.** A2.8.3 Determine the maximum possible number of zeroes of a polynomial function, and understand the relationship between the x-intercepts of the graph and the factored form of the function.	**A3.4 Power Functions (including roots, cubics, quartics, etc.)** A3.4.1 Write the symbolic form and sketch the graph of power functions. A3.4.2 Express directly and inversely proportional relationships as functions and recognize their characteristics A3.4.3 Analyze the graphs of power functions, noting reflectional or rotational symmetry. **A3.5 Polynomial Functions** A3.5.1 Write the symbolic form and sketch the graph of simple polynomial functions. A3.5.2 Understand the effects of degree, leading coefficient, and number of real zeros on the graphs of polynomial functions of degree greater than 2. A3.5.3 Determine the maximum possible number of zeroes of a polynomial function, and understand the relationship between the x-intercepts of the graph and the factored form of the function.

S2.1 Scatterplots and Correlation	**S2.1 Scatterplots and Correlation**
S2.1.1 Construct a scatterplot for a bivariate data set with appropriate labels and scales.	S2.1.1 Construct a scatterplot for a bivariate data set with appropriate labels and scales.
S2.1.2 Given a scatterplot, identify patterns, clusters, and outliers; recognize no correlation, weak correlation, and strong correlation.	S2.1.2 Given a scatterplot, identify patterns, clusters, and outliers; recognize no correlation, weak correlation, and strong correlation.
S2.1.3 Estimate and interpret Pearson's correlation coefficient for a scatterplot of a bivariate data set; recognize that correlation measures the strength of linear association.	S2.1.3 Estimate and interpret Pearson's correlation coefficient for a scatterplot of a bivariate data set; recognize that correlation measures the strength of linear association.
S2.1.4 Differentiate between correlation and causation; know that a strong correlation does not imply a cause-and-effect relationship; recognize the role of lurking variables in correlation.	S2.1.4 Differentiate between correlation and causation; know that a strong correlation does not imply a cause-and-effect relationship; recognize the role of lurking variables in correlation.
S2.2 Linear Regression	**S2.2 Linear Regression**
S2.2.1 For bivariate data which appear to form a linear pattern, find the least squares regression line by estimating visually and by calculating the equation of the regression line; interpret the slope of the equation for a regression line.	S2.2.1 For bivariate data which appear to form a linear pattern, find the least squares regression line by estimating visually and by calculating the equation of the regression line; interpret the slope of the equation for a regression line.
S2.2.2 Use the equation of the least squares regression line to make appropriate predictions.	S2.2.2 Use the equation of the least squares regression line to make appropriate predictions.