Algebra I HSCEs – Alignment Worksheet

Text: Heath Algebra I (McDougal Littell) Edition: 1998

Expectation	Location in Resources by Chapter and Lesson	Depth of Instruction 1 – Mentioned 2 – Partially Developed 3 - Complete
STANDARD L1: REASONING ABOUT NUMBERS,SYSTEMS, AND QUANTITATIVE LITERACY **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.	2.1, 2.2, 2.3, 2.5, 2.7, 2.8, 11.6	3
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.	2.2, 13.6	3
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.	1.1, 2.2, 2.5, 2.6, 3.2, 3.3, 13.6, 13.1	3
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.	1.3, 2.5, 3.3, 3.6, 8.1, 8.2, 8.3	3
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 $n(n+1)/2$).	2.2	1
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.	6.4	2
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Algebra I HSCEs – Alignment Worksheet

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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.	1.8, 2.4, 2.8, 3.7, 5.4, 6.6, 8.7, 9.7, 11.4, 12.6, 12.7	3
STANDARD L2: CALCULATION, ALGORITHMS, AND ESTIMATION **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).	7.4	1
L2.1.2 Calculate fluently with numerical expressions involving exponents. Use the rules of exponents, and evaluate numerical expressions involving rational and negative exponents, and transition easily between roots and exponents.	1.3, 1.4, 8.1, 8.2, 8.3	2
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.		GAP
L2.1.4 Know that the complex number i is one of two solutions to $x^2 = -1$.		GAP
L2.1.5 Add, subtract, and multiply complex numbers. Use conjugates to simplify quotients of complex numbers.		GAP
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).	9.1	1
STANDARD L3: MEASUREMENT AND PRECISION **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		GAP

Algebra I HSCEs – Alignment Worksheet

represent a large change in intensity). Solve applied problems.		
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STANDARD A1: EXPRESSIONS, EQUATIONS, AND INEQUALITIES **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.	1.1, 1.2, 1.3, 1.4, 1.6, 1.7, 2.7	3
A1.1.2 Know the definitions and properties of exponents and roots and apply them in algebraic expressions.	8.1, 8.2, 8.3	2
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).	10.4, 10.5, 10.6	2
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.		GAP
A1.2 Solutions of Equations and Inequalities (linear, exponential, logarithmic, quadratic, power, polynomial, and rational)		
A1.2.1 Write and solve equations and inequalities with one or two variables to represent mathematical or applied situations.	3.1-3.6, 6.1-6.5	3
A1.2.2 Associate a given equation with a function whose zeros are the solutions of the equation.		GAP
A1.2.3 Solve linear and quadratic equations and inequalities, including systems of up to three linear equations with three unknowns. Justify steps in the solutions, and apply the quadratic formula appropriately.	3.1–3.6, 6.1–6.4, 7.1-7.5, 9.1–9.6	2
A1.2.4 Solve absolute value equations and inequalities	4.8, 6.2, 6.3, 6.4	3

(e.g., solve $\|x - 3\| \leq 6$) and justify.		

Algebra I HSCEs – Alignment Worksheet

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A1.2.6 Solve power equations (e.g., $(x + 1)^3 = 8$) and equations including radical expressions (e.g., $\sqrt{3x - 7} = 7$), justify steps in the solution, and explain how extraneous solutions may arise.	13.4	2
A1.2.8 Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution.	3.6	3
STANDARD A2: FUNCTIONS **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.	12.1	3
A2.1.2 Read, interpret, and use function notation and evaluate a function at a value in its domain.	12.1, 12.2, 12.4	3
A2.1.3 Represent functions in symbols, graphs, tables, diagrams, or words and translate among representations.	Chapter 12	2
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).	Chapter 12	2
A2.1.5 Recognize that functions may be defined recursively. Compute values of and graph simple recursively defined functions (e.g., $f(0) = 5$, and $f(n) = f(n\text{-}1) + 2$).	Chapter 12	2
A2.1.6 Identify the zeros of a function and the intervals where the values of a function are positive or negative. Describe the behavior of a function as x approaches positive or negative infinity, given the symbolic and graphical representations.	Chapter 12	2

Algebra I HSCEs – Alignment Worksheet

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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, and average rate of change over an interval).	Chapter 12	3
A2.2 Operations and Transformations		
A2.2.1 Combine functions by addition, subtraction, multiplication, and division.	10.1, 10.2, 10.3, 11.7	3
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.	12.3	3
A2.2.3 Recognize whether a function (given in tabular or graphical form) has an inverse and recognize simple inverse pairs (e.g., $f(x) = x^3$ and $(x) = x^{1/3}$).		GAP
A2.3 Families of Functions (linear, quadratic, polynomial, power, exponential, and logarithmic)		
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.	12.5	1
A2.3.2 Describe the tabular pattern associated with functions having constant rate of change (linear) or variable rates of change.	4.2, 4.4	2
A2.4 Lines and Linear Functions		
A2.4.1 Write the symbolic forms of linear functions (standard [i.e., $Ax + By = C$, where $B \neq 0$], point-slope, and slope-intercept) given appropriate information and convert between forms.	5.1, 5.2, 5.3, 5.5, 5.6	3

A2.4.2 Graph lines (including those of the form $x = h$ and $y = k$) given appropriate information.	4.1-4.5	3
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A2.4.3 Relate the coefficients in a linear function to the slope and x- and y-intercepts of its graph.	4.4, 4.5	3
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 nonvertical parallel lines have equal slopes and that nonvertical perpendicular lines have slopes that multiply to give –1.	5.3	2
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 $f(x) = 4\ (1.5)^x$).	12.3	1
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.	12.3	1
A2.5.5 Relate exponential and logarithmic functions to real phenomena, including half-life and doubling time.	8.7, 12.3	1
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.).	9.3, 9.4	3
A2.6.2 Identify the elements of a parabola (vertex, axis of symmetry, and 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.	9.3	3
A2.6.3 Convert quadratic functions from standard to vertex form by completing the square.	10.7	3
A2.6.4 Relate the number of real solutions of a quadratic equation to	9.2, 9.5	3

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.	9.3, 12.4	2

Algebra I HSCEs – Alignment Worksheet

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A2.7 Power Functions (including roots, cubics, quartics, etc.)		
A2.7.1 Write the symbolic form and sketch the graph of power functions.		GAP
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).	11.3	2
A2.7.3 Analyze the graphs of power functions, noting reflectional or rotational symmetry.	12.3	1
A2.8 Polynomial Functions		
A2.8.1 Write the symbolic form and sketch the graph of simple polynomial functions.	4.1, 4.2, 4.3, 4.5	3
A2.8.2 Understand the effects of degree, leading coefficient, and number of real zeros on the graphs of polynomial functions of degree greater than 2.		GAP
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.		GAP
STANDARD A3: MATHEMATICAL MODELING **A3.1 Models of Real-world Situations Using Families of Functions (linear, quadratic, exponential and power)** *Example: An initial population of 300 people grows at 2% per year. What will the population be in 10 years?*		
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 or exponential functions for compound interest. *In the example above, recognize that the appropriate*		GAP

general function is exponential ($P = P_0a^t$)].		

Algebra I HSCEs – Alignment Worksheet

Expectation	Location in Resources by Chapter and Lesson	Depth of Instruction 1 – Mentioned 2 – Partially Developed 3 - Complete
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* $P = 300(1.02)^t$.		GAP
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.*		GAP
RECOMMENDED: ***A3.1.4** Use methods of linear programming to represent and solve simple real-life problems.	7.7	2
STANDARD S2: BIVARIATE DATA-EXAMINING RELATIONSHIPS		
S2.1 Scatterplots and Correlation		
S2.1.1 Construct a scatterplot for a bivariate data set with appropriate labels and scales.	3.7, 5.4, 9.7	3
S2.1.2 Given a scatterplot, identify patterns, clusters, and outliers. Recognize no correlation, weak correlation, and strong correlation.	3.7, 5.4	3
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.		GAP
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.	3.7, 5.4	1

Algebra I HSCEs – Alignment Worksheet

Expectation	Location in Resources by Chapter and Lesson	Depth of Instruction 1 – Mentioned 2 – Partially Developed 3 – Complete
S2.2 Linear Regression		
S2.2.1 For bivariate data that 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.	5.4	2
S2.2.2 Use the equation of the least squares regression line to make appropriate predictions.	5.4	2