Algebra I with Probability Alignment Checklist

Lesson	Task	Met (Y/N)	ACOS #	Standard
Number and Quantity				
Together, irrational numbers and rational numbers complete the real number system, representing all points on the number line, while there exist numbers beyond the real numbers called complex numbers.				
6.03,			1	1. Explain how the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for an additional notation for radicals using rational exponents.
			Notes	
6.01, 6.02, 6.03,			2	2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
			Notes	
6.03			3	3. Define the imaginary number i such that $i^2 = -1$.
			Notes	
Algebra and Functions				
Focus 1: Algebra				
Expressions can be rewritten in equivalent forms by using algebraic properties, including properties of addition, multiplication, and exponentiation, to make different characteristics or features visible.				
1.03, 1.04, 1.05,			4	4. Interpret linear, quadratic, and exponential expressions in terms of a context by viewing one or more of their parts as a single entity. Example: Interpret the accrued amount of investment P(1 + r)t , where P is the principal and r is the interest rate, as the product of P and a factor depending on time t.
			Notes	

Lesson	Task	Met (Y/N)	ACOS #	Standard
1.03, 1.04, 1.05, 7.08, 7.09,			5	5. Use the structure of an expression to identify ways to rewrite it. 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 $(x^2 - y)(x^2 + y^2)$.
			Notes	
1.03, 1.04, 1.05, 7.05, 7.06, 7.07, 7.08, 7.09			6	6. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
			Notes	
7.05, 7.06, 7.07, 7.08, 7.09,			6a	6a. Factor quadratic expressions with leading coefficients of one and use the factored form to reveal the zeros of the function it defines.
			Notes	
8.03, 8.07,			6b	6b. Use the vertex form of a quadratic expression to reveal the maximum or minimum value and the axis of symmetry of the function it defines; complete the square to find the vertex form of quadratics with a leading coefficient of one.
			Notes	
6.05,			6c	6c. Use the properties of exponents to transform expressions for exponential functions. Example: Identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.
			Notes	
7.01, 7.02, 7.03, 7.04			7	7. Add, subtract, and multiply polynomials, showing that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.
			Notes	
Finding solutions to an equation, inequality, or system of equations or inequalities requires the checking of candidate solutions, whether generated analytically or graphically, to ensure that solutions are found and that those found are not extraneous.				

Lesson	Task	Met (Y/N)	ACOS #	Standard
2.07			8	8. Explain why extraneous solutions to an equation involving absolute values may arise and how to check to be sure that a candidate solution satisfies an equation.
			Notes	
The structure of an equation or inequality (including, but not limited to, one-variable linear and quadratic equations, inequalities, and systems of linear equations in two variables) can be purposefully analyzed (with and without technology) to determine an efficient strategy to find a solution, if one exists, and then to justify the solution.				
8.04,			9	9. Select an appropriate method to solve a quadratic equation in one variable.
			Notes	
8.03,			9a	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. Explain how the quadratic formula is derived from this form.
			Notes	
8.01, 8.02, 8.03, 8.04,			9b	b. Solve quadratic equations by inspection (such as $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation, and recognize that some solutions may not be real.
			Notes	
5.01, 5.02, 5.03, 5.04,			10	10. Select an appropriate method to solve a system of two linear equations in two variables.
			Notes	
5.02, 5.03, 5.04,			10a	10a. Solve a system of two equations in two variables by using linear combinations; contrast situations in which use of linear combinations is more efficient with those in which substitution is more efficient.
			Notes	
5.01, 5.02, 5.03, 5.04,			10b	10b. Contrast solutions to a system of two linear equations in two variables produced by algebraic methods with graphical and tabular methods.
			Notes	

Lesson	Task	Met (Y/N)	ACOS #	Standard
Expressions, equations, and inequalities can be used to analyze and make predictions, both within mathematics and as mathematics is applied in different contexts – in particular, contexts that arise in relation to linear, quadratic, and exponential situations.				
2.01, 2.02, 2.03, 2.04, 2.05, 2.06, 2.07, 5.04, 5.05, 5.06,			11	11. Create equations and inequalities in one variable and use them to solve problems in context, either exactly or approximately. Extend from contexts arising from linear functions to those involving quadratic, exponential, and absolute value functions.
			Notes	
2.08, 2.09, 4.03, 4.04, 4.05, 4.06, 4.07, 5.04,			12	12. Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, quadratic, exponential, absolute value, and linear piecewise functions.
			Notes	
2.04, 2.05, 2.06, 5.01, 5.02, 5.03, 5.04, 5.05, 5.06,			13	13. Represent constraints by equations and/or inequalities, and solve systems of equations and/or inequalities, interpreting solutions as viable or nonviable options in a modeling context. Limit to contexts arising from linear, quadratic, exponential, absolute value, and linear piecewise functions.
			Notes	
Focus 2: Connecting Algebra to Functions				
Functions shift the emphasis from a point-by-point relationship between two variables (input/output) to considering an entire set of ordered pairs (where each first element is paired with exactly one second element) as an entity with its own features and characteristics.				
4.01, 4.03, 4.04, 4.05, 4.06, 4.07,			14	14. Given a relation defined by an equation in two variables, identify the graph of the relation as the set of all its solutions plotted in the coordinate plane. Note: The graph of a relation often forms a curve (which could be a line).

Lesson	Task	Met (Y/N)	ACOS #	Standard
			Notes	
3.01, 3.02, 3.07,			15	15. Define a function as a mapping from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range.
			Notes	
3.02, 3.07			15a	15a. Use function notation evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context. Note: 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.
			Notes	
3.01, 6.04, 6.05, 8.05, 8.06, 8.07,			15b	15b. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Limit to linear, quadratic, exponential, and absolute value functions.
			Notes	
4.02, 3.01, 6.04, 8.09,			16	16. Compare and contrast relations and functions represented by equations, graphs, or tables that show related values; determine whether a relation is a function. Explain that a function f is a special kind of relation defined by the equation y = f(x).
			Notes	
3.02			17	17. Combine different types of standard functions to write, evaluate, and interpret functions in context. Limit to linear, quadratic, exponential, and absolute value functions.
			Notes	
3.02,			17a	17a. Use arithmetic operations to combine different types of standard functions to write and evaluate functions. Example: Given two functions, one representing flow rate of water and the other representing evaporation of that water, combine the two functions to determine the amount of water in a container at a given time.
			Notes	

<table>
<tr><th>Lesson</th><th>Task</th><th>Met (Y/N)</th><th>ACOS #</th><th>Standard</th></tr>
<tr><td>3.02,</td><td></td><td></td><td>17b</td><td>17b. Use function composition to combine different types of standard functions to write and evaluate functions.
Example: Given the following relationships, determine what the expression S(T(t)) represents.
<table>
<tr><td>Function</td><td>Input</td><td>Output</td></tr>
<tr><td>G</td><td>Amount of studying: s</td><td>Grade in course: G(s)</td></tr>
<tr><td>S</td><td>Grade in course: g</td><td>Amount of screen time: S(g)</td></tr>
<tr><td>T</td><td>Amount of screen time: t</td><td>Number of followers: T(t)</td></tr>
</table></td></tr>
<tr><td colspan="4">Notes</td><td></td></tr>
<tr><td colspan="5">Graphs can be used to obtain exact or approximate solutions of equations, inequalities, and systems of equations and inequalities – including systems of linear equations in two variables and systems of linear and quadratic equations (given or obtained by using technology).</td></tr>
<tr><td>5.01, 5.04, 8.08,</td><td></td><td></td><td>18</td><td>18. Solve systems consisting of linear and/or quadratic equations in two variables graphically, using technology where appropriate.</td></tr>
<tr><td colspan="4">Notes</td><td></td></tr>
<tr><td>5.01,</td><td></td><td></td><td>19</td><td>19. 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).</td></tr>
<tr><td colspan="4">Notes</td><td></td></tr>
<tr><td colspan="4"></td><td></td></tr>
<tr><td>5.01,</td><td></td><td></td><td>19a</td><td>19a. Find the approximate solutions of an equation graphically, using tables of values, or finding successive approximations, using technology where appropriate. Note: Include cases where f(x) is a linear, quadratic, exponential, or absolute value function and g(x) is constant or linear.</td></tr>
<tr><td colspan="4">Notes</td><td></td></tr>
<tr><td>5.05, 5.06,</td><td></td><td></td><td>20</td><td>20. 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, using technology where appropriate.</td></tr>
<tr><td colspan="4">Notes</td><td></td></tr>
<tr><td colspan="5">Focus 3: Functions</td></tr>
</table>

Lesson	Task	Met (Y/N)	ACOS #	Standard
Functions can be described by using a variety of representations: mapping diagrams, function notation (e.g., f(x) = x^2), recursive definitions, tables, and graphs				
8.09,			21	21. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Extend from linear to quadratic, exponential, absolute value, and general piecewise.
			Notes	
3.06, 6.06,			22	22. Define sequences as functions, including recursive definitions, whose domain is a subset of the integers.
			Notes	
6.06,			22a	22a. Write explicit and recursive formulas for arithmetic and geometric sequences and connect them to linear and exponential functions. Example: A sequence with constant growth will be a linear function, while a sequence with proportional growth will be an exponential function.
			Notes	
Functions that are members of the same family have distinguishing attributes (structure) common to all functions within that family.				
4.04, 6.08, 8.05, 8.06, 8.07,			23	23. Identify the effect on the graph of replacing $f(x)$ by $ff(x) + k$, $k \cdot f(x)$, $f(k \cdot x)$, 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 explain the effects on the graph, using technology as appropriate. Limit to linear, quadratic, exponential, absolute value, and linear piecewise functions.
			Notes	
3.03, 6.05, 8.09,			24	24. Distinguish between situations that can be modeled with linear functions and those that can be modeled with exponential functions.
			Notes	
8.09,			24a	24a. Show that linear functions grow by equal differences over equal intervals, while exponential functions grow by equal factors over equal intervals.
			Notes	

Lesson	Task	Met (Y/N)	ACOS #	Standard
4.02, 4.03, 4.04, 3.07, 8.09,			24b	24b. Define linear functions to represent situations in which one quantity changes at a constant rate per unit interval relative to another.
			Notes	
6.05, 8.09,			24c	24c. Define exponential functions to represent situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
			Notes	
4.05, 4.06, 4.07, 3.07, 6.06,			25	25. 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).
			Notes	
8.09,			26	26. Use graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
			Notes	
6.05,			27	27. Interpret the parameters of functions in terms of a context. Extend from linear functions, written in the form mx + b, to exponential functions, written in the form abx. Example: If the function $V(t) = 19885(0.75)^t$ describes the value of a car after it has been owned for t years, 19885 represents the purchase price of the car when t = 0, and 0.75 represents the annual rate at which its value decreases.
			Notes	
Functions can be represented graphically and key features of the graphs, including zeros, intercepts, and, when relevant, rate of change and maximum/minimum values, can be associated with and interpreted in terms of the equivalent symbolic representation.				
4.03, 4.04, 4.05, 4.06, 4.07, 3.03, 3.05, 6.04, 6.07, 6.08,			28	28. 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. Note: Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; symmetries; and end behavior. Extend from relationships that can be represented by linear functions to quadratic, exponential, absolute value, and linear piecewise functions.

Lesson	Task	Met (Y/N)	ACOS #	Standard
8.05, 8.06, 8.07, 8.09,				
			Notes	
4.02, 4.03, 4.04, 4.05, 4.06, 4.07, 3.07, 6.08, 8.09,			29	29. 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. Limit to linear, quadratic, exponential, and absolute value functions.
			Notes	
4.01, 3.04, 3.05, 6.04, 6.07, 6.08, 8.06, 8.07, 8.09,			30	30. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
			Notes	
4.01, 4.03, 4.04, 3.04, 3.05, 8.06, 8.07, 8.09,			30a	30a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
			Notes	
3.04, 6.07, 6.08,			30b	30b. Graph piecewise-defined functions, including step functions and absolute value functions.
			Notes	
3.04, 6.04,			30c	30c. Graph exponential functions, showing intercepts and end behavior.
			Notes	
Functions model a wide variety of real situations and can help students understand the processes of making and changing assumptions, assigning variables, and finding solutions to contextual problems.				

Lesson	Task	Met (Y/N)	ACOS #	Standard
4.06, 4.07,			31	31. Use the mathematical modeling cycle to solve real-world problems involving linear, quadratic, exponential, absolute value, and linear piecewise functions.
			Notes	
Data Analysis, Statistics, and Probability				
Focus 1: Quantitative Literacy				
Mathematical and statistical reasoning about data can be used to evaluate conclusions and assess risks.				
9.04, 9.05,			32	32. Use mathematical and statistical reasoning with bivariate categorical data in order to draw conclusions and assess risk. Example: In a clinical trial comparing the effectiveness of flu shots A and B, 21 subjects in treatment group A avoided getting the flu while 29 contracted it. In group B, 12 avoided the flu while 13 contracted it. Discuss which flu shot appears to be more effective in reducing the chances of contracting the flu. Possible answer: Even though more people in group A avoided the flu than in group B, the proportion of people avoiding the flu in group B is greater than the proportion in group A, which suggests that treatment B may be more effective in lowering the risk of getting the flu.
			Notes	
Making and defending informed, data-based decisions is a characteristic of a quantitatively literate person.				
9.04, 9.05,			33	33. Design and carry out an investigation to determine whether there appears to be an association between two categorical variables, and write a persuasive argument based on the results of the investigation. Example: Investigate whether there appears to be an association between successfully completing a task in a given length of time and listening to music while attempting the task. Randomly assign some students to listen to music while attempting to complete the task and others to complete the task without listening to music. Discuss whether students should listen to music while studying, based on that analysis.

	Contracted Flu	Did Not Contract Flu
Flu Shot A	29	21
Flu Shot B	13	12
Total	42	33

Lesson	Task	Met (Y/N)	ACOS #	Standard
			Notes	
Focus 2: Visualizing and Summarizing Data				
Data arise from a context and come in two types: quantitative (continuous or discrete) and categorical. Technology can be used to “clean” and organize data, including very large data sets, into a useful and manageable structure – a first step in any analysis of data.				
9.04,			34	34. Distinguish between quantitative and categorical data and between the techniques that may be used for analyzing data of these two types. Example: The color of cars is categorical and so is summarized by frequency and proportion for each color category, while the mileage on each car’s odometer is quantitative and can be summarized by the mean.
			Notes	
The association between two categorical variables is typically represented by using two-way tables and segmented bar graphs.				
9.05,			35	35. Analyze the possible association between two categorical variables.
			Notes	
9.05,			35a	35a. Summarize categorical data for two categories in two-way frequency tables and represent using segmented bar graphs.
			Notes	
9.05,			35b	35b. Interpret relative frequencies in the context of categorical data (including joint, marginal, and conditional relative frequencies).
			Notes	
9.05,			35c	35c. Identify possible associations and trends in categorical data.
			Notes	
Data analysis techniques can be used to develop models of contextual situations and to generate and evaluate possible solutions to real problems involving those contexts.				
9.04, 9.05			36	36. Generate a two-way categorical table in order to find and evaluate solutions to real-world problems.
			Notes	

Lesson	Task	Met (Y/N)	ACOS #	Standard
9.05			36a	36a. Aggregate data from several groups to find an overall association between two categorical variables.
			Notes	
9.05			36b	b. Recognize and explore situations where the association between two categorical variables is reversed when a third variable is considered (Simpson's Paradox). Example: In a certain city, Hospital 1 has a higher fatality rate than Hospital 2. But when considering mildly-injured patients and severely-injured patients as separate groups, Hospital 1 has a lower fatality rate among both groups than Hospital 2, since Hospital 1 is a Level 1 Trauma Center. Thus, Hospital 1 receives most of the severely injured patients who are less likely to survive overall but have a better chance of surviving in Hospital 1 than they would in Hospital 2.
			Notes	
Focus 3: Statistical Inference (Note: There are no Algebra I with Probability standards in Focus 3)				
Two events are independent if the occurrence of one event does not affect the probability of the other event. Determining whether two events are independent can be used for finding and understanding probabilities.				
9.01, 9.02, 9.03, 9.04, 9.05,			37	37. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
			Notes	
9.02, 9.04,			38	38. Explain whether two events, A and B, are independent, using two-way tables or tree diagrams.
			Notes	
Conditional probabilities – that is, those probabilities that are “conditioned” by some known information – can be computed from data organized in contingency tables. Conditions or assumptions may affect the computation of a probability.				
9.02, 9.04, 9.05			39	39. Compute the conditional probability of event A given event B, using two-way tables or tree diagrams.
			Notes	

Lesson	Task	Met (Y/N)	ACOS #	Standard
9.02, 9.04, 9.05,			40	40. Recognize and describe the concepts of conditional probability and independence in everyday situations and explain them using everyday language. Example: Contrast the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.
			Notes	
9.02, 9.04, 9.05			41	41. Explain why the conditional probability of A given B is the fraction of B's outcomes that also belong to A and interpret the answer in context. Example: the probability of drawing a king from a deck of cards, given that it is a face card, is $\frac{4/52}{12/52}$, which is 13.
			Notes	