I Can… Algebra I

EOY—End of Year Assessment **PBA**—Performance-Based Assessment

Major Content **Supporting Content** **Additional Content**

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	I Can…	*Example*	I don't yet know it.	I need help from my teacher.	I sometimes need help.	I can do this all by myself.	I can teach this.
Seeing Structure in Equations	**1a** I can interpret exponential expressions, including related numerical expressions that represent a quantity in terms of its context.	Given the expression for the value, in dollars, of a savings account after t years, 500(1.005)t, \$500 was the initial deposit.					
	1b Interpret quadratic expressions that represent a quantity in terms of its context.	Given the height of a basketball free throw, in meters, is modeled by the expression $-4.9(t - 1.2)^2 + 4$, where t is the time since the ball was thrown, the maximum height is 4 meters.					
	1c I can interpret parts of an expression, such as terms, factors, and coefficients.	In the expression $4x^3 + x - 5$, there are three terms, 4 is the leading coefficient, and –5 is the constant.					
	1d I can interpret complex expressions by viewing one or more of their parts as a single entity.	I can interpret complex expressions by viewing one or more of their parts as a single entity.					
	2a I can use the structure of a numerical expressions and polynomial expressions in one variable to identify ways to rewrite it.	Recognize $53^2 - 47^2$ as a difference of squares and see an opportunity to rewrite it in the easier-to-evaluate form (53+47)(53-47).					

Algebra I

Unit	I Can…	*Example*					
	2b I can use the structure of a numerical expression and polynomial expression in one variable to rewrite it, in a case where two or more rewriting steps are required.	Factor completely: $x^2 - 1 + (x - 1)^2$, which could be rewritten as $(x - 1)(x + 1 + x - 1)$ on the way to factorizing completely as $2x(x - 1)$.					
	3 I can choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	Which of the following is an equivalent expression for $(3a^2b)^3$? a. $9a^5b^3$ b. $27a^5b^3$ c. $9a^6b^3$ d. $27a^6b^3$					
	3a I can factor a quadratic expression to reveal the zeros of the function it defines.	Given the expression $x^2 - 4x - 12$, this can be factored as $(x - 6)(x + 2)$. This means that the function $f(x) = x^2 - 4x - 12$ has zeroes at $(6, 0)$ and $(-2, 0)$.					
	3b I can complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	Given the expression $m^2 + 2m - 3$, completing the square yields an equivalent expression of $(m + 1)^2 - 4$. This means that the function $f(m) = m^2 + 2m - 3$ has a minimum at $(-1, -4)$.					
	3c I can use the properties of exponents to transform expressions for exponential functions.	The expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.					

Algebra I

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Arithmetic With Polynomials and Rational Expressions	**1** I can understand that polynomials form a system resembling the operations of integers, namely, they are closed under addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	Given the polynomials 5x + 3z and 2x – 4z, the sum is 7x – z, the difference is 3x+7z, and the product is $10x^2 - 14xz - 12z^2$.					
	3 I can identify zeros of polynomials when factors are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	Given the polynomial $2x^2 + 18x + 36$, this factors to 2(x + 6)(x + 3). This means the graph has x-intercepts at (–6, 0) and (–3, 0) and a vertical stretch of 2.					
Creating Equations	**1** I can create equations and inequalities in one variable and use them to solve problems. *Including equations from linear, quadratic, and exponential functions.*	A new tractor costs $30,000. For insurance purposes, the tractor's value depreciates by 15% per year. After t years, the tractor will have a replacement value of $30{,}000(0.85)^t$ dollars.					
	2 I can create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Bill & Rooster's Fun Time Arcade offers racing games, r, for $0.50 each and Skee-Ball games, b, for $0.25. The model for the number of games of each one can play for exactly $10 is 0.50r + 0.25b = 10.					
	3 I can represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.	Represent inequalities describing nutritional and cost constraints on combinations of different foods.					
	4 I can rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	Rearrange Ohm's law V = IR to highlight resistance R as R = V / I.					

Algebra I

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Reasoning with Equations and Inequalities	**1** I can 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.	The equation 3x + 6 = 8 is equivalent to 3x = 2 by the Subtraction Property of Equality (balance the equation by subtracting 6 from each side of the equal sign)					
	3 I can solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Solve ax – 5 > bx for x. x > 5 / (a – b)					
	4 I can solve quadratic equations in one variable.	Solve $x^2 + 2x = 15$. x = {–5, 3}					
	4a I can solve quadratic equations using 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.	Solve $m^2 + 2m – 3 = 0$. Completing the square yields an equivalent equation of $(m + 1)^2 = 4$. m = {–3, 1}					
	4b I can 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.	Solve $2x^2 + 3x + 1 = 0$. $x = \frac{-3 \pm \sqrt{3^2 - 4(2)(1)}}{2(2)} = \frac{-3 \pm 1}{4} = \left\{-1, -\frac{1}{2}\right\}$					
	5 I can 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.	Solve the system of equations $2x + y = 19 \rightarrow (2x + y = 19) + -2(x - y = 11) \rightarrow 3y = -3 \rightarrow y = -1 \quad x - y = 11 \rightarrow x - (-1) = 11 \rightarrow x = 10$ The solution to the system is (10, –1).					

Unit	I Can…	*Example*					
	6 I can solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	Solve the system of equations $2x + y = 19$ → $2(y + 11) + y = 19$ → $3y = -3$ → $y = -1$ $x = y + 11$ → $x = (-1) + 11$ → $x = 10$ The solution to the system is (10, –1).					
	10 I can 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).	Which of the points (-4, 2), (1, 3), and (3, 6) are solutions to the equation 7y = 4x + 30?					
	11 I can 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.	Which of the x-values –3, 5, or 9, represents the x-coordinate of the solution to this system of equations? $-4x + 9y = 9$ $x - 3y = -6$ Justify your answer with technology.					
	12 I can 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.	Identity a point that satisfies this system of inequalities. $-4x + 9y > 9$ $x - 3y > -6$ Support your choice with a graph.					

Algebra I

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Interpreting Functions	**1** I can understand that a function from one set to another set assigns to each element of the domain exactly one element of the range.	Determine if the relation $x = y^2$ is a function.					
	2 I can use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context	Given the height of a basketball free throw, in meters, is modeled by $h(t) = –4.9(t – 1.2)^2 + 4$, where t is the time since the ball was thrown, determine the height of the ball after 1.1 seconds.					
	3 I can recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	The Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.					
	4 I can 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.	A strain of bacteria is being tested in an experiment. The initial population is ten bacteria. If the scientists discover that the population doubles every three days, sketch a graph of the situation, identifying all key features.					
	5a Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes limiting to linear functions , square root functions, cube root functions, piecewise-defined functions, and exponential functions.	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.					
	5b I can relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes, limiting to quadratic functions.	Look at the graph of the height of a cannon shot versus time. Identify the domain of the function. Describe the values in the context of the situation.					

Algebra I

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	6 I can calculate and interpret the average rate of change of a function over a specified interval with functions limited to square root, cube root, and piecewise-defined.	Examine the graph of the path of a mountain climber. Determine an interval with the same average rate of change as the interval from t =1 to t = 2.					
	6a I can estimate the rate of change from a graph of linear functions, quadratic functions, square root functions, cube root functions, piecewise-defined functions and/or exponential functions with domains in the integers.	A computer game drops pixels onto the screen every minute. At the first minute, 40 pixels are dropped. At the second minute, 120 pixels are dropped. At the third minute 360 pixels are dropped. Calculate the average rate of change of pixels between the sixth and tenth minutes. How does this compare to the average rate of change from the second and sixth minutes?					
	7a I can graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph linear functions and show intercepts.	Identity all of the key features of the graph of $3x - 4y = 10$.					
	7b I can graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph quadratic functions and show intercepts, maxima and minima.	Identify all of the key features of the graph of $f(x) = 2x^2 + 18x + 36$.					
	7c I can graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	***Identify all of the key features of the graph of*** $\boldsymbol{f(x) = \begin{cases} \lvert x-2 \rvert, & x < 2 \\ 3\sqrt{x-2}, & x \geq 2 \end{cases}}$					

Algebra I

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	8 I can write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context**.**	A jumping frog's height, in inches, can be modeled by the expression $-8t^2 + 4.8t$, where t is the elapsed time of the jump in seconds. Determine at what time the frog lands the jump. What is the maximum height of the frog and at what time did this occur?					
	9 I can Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.					
Building Functions	**1** I can write a function that describes a relationship between two quantities.	In the game Lava Lovers, you must will a volcano with lava. Lava flows into the volcano at a rate of 10 gallons per second. After an explosion, lava also flows out of the volcano at a rate of 2 gallons per second. Write a function to determine the volume of lava, V, at any given time, t.					
	3a I can build new functions from existing functions.	At Bill & Rooster's Fun Time Arcade, traditional pizza has a base price of $7 with $0.50 per additional topping. Sicilian pizza has a base price of $10 with $.75 per additional topping. Write a function that describes the total price of two Sicilian pizzas and one traditional pizza, assuming you get the same quantity of toppings, t, on each pizza.					

Algebra I

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Linear, Quadratic, and Exponents	**1** I can express reasoning about linear and exponential growth.	Look at the graphs comparing distance traveled at a constant 40 miles per hour and distance traveled under constant acceleration. Describe the key characteristics of the graph and identify the function type that will best model each graph.					
	2a I can construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs.	Zeno is walking towards the ice cream shop. In the first minute, he walks 100 feet. In the second minute he walks 50 feet. If this pattern continues, write a function that describes the distance Zeno walks in a given minute.					
	2b I can solve multi step contextual problems with degree of difficulty appropriate to the course by constructing linear and/or exponential function models, where exponentials are limited to integer exponents.	Zeno is walking towards the ice cream shop. In the first minute, he walks 100 feet. In the second minute he walks 50 feet. If this pattern continues, determine how many feet Zeno walks in the 60^{th} minute.					
Real Number System	**3** I can use properties of rational and irrational numbers.	An equilateral triangle has a base of length $2\sqrt{3}$ and a height of 2. Determine the perimeter and area of the triangle.					
	5 I can summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data.	After conducting a survey of the favorite music genre of students in her school, Sheena recorded her results in a table. Which genre was most popular among female students? Which gender most preferred Country music? Overall, what is the most popular music genre of students at Sheena's school?					