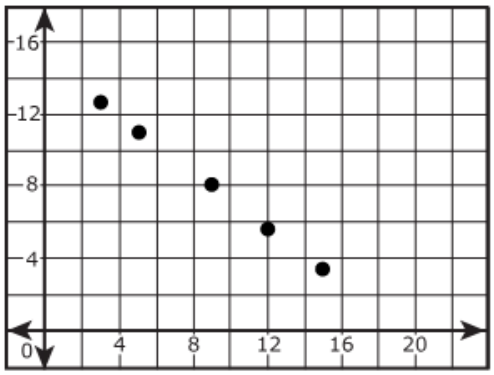
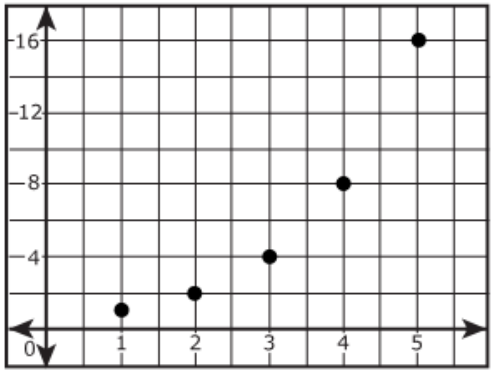
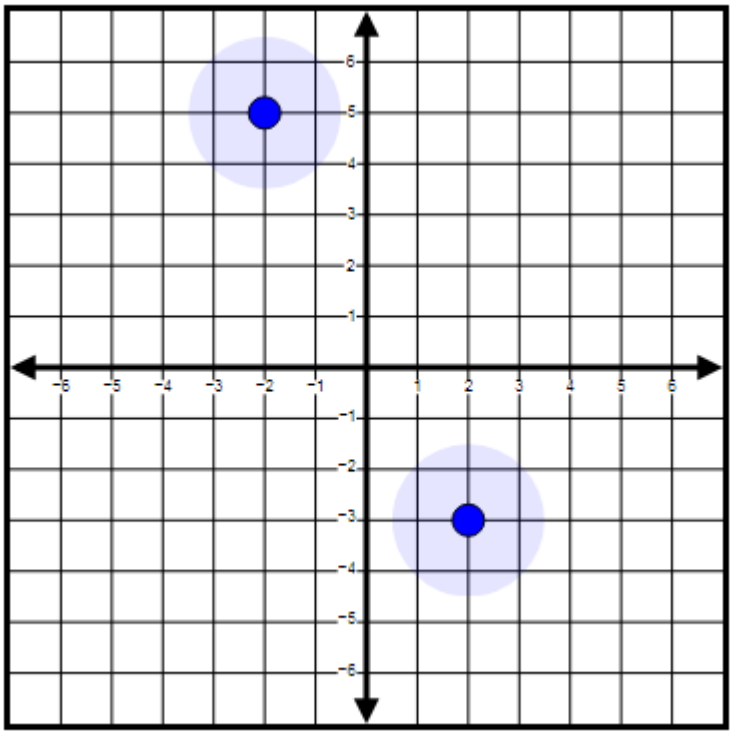
Released Test Answer and Alignment Document

Mathematics – Algebra 1

Spring 2018

Item Number	Answer Key	Evidence Statement Key
1.	B	A-APR.3-1
2.	D	A-APR.1-1
3.	D	F-BF.3-1
4.	Part A: B, C, F Part B: A	F-BF.3-4
5.	A  B  C Begin with 5. Add −5 to each term in the sequence to get the next term. D Begin with −2. Multiply each term in the sequence by −5 to get the next term. $f(n) = (0.5)2^n$ B $g(n) = -\frac{3}{4}n + \frac{59}{4}$ A $h(n) = (-2)(-5)^{n-1}$ D $k(n) = 5 - 5(n - 1)$ C	F-LE.2-1

6.	D	F-IF.9-1
7.	Part A: A Part B: D Part C: D Part D: B, C, E	A-CED.3-1
8.	Part A: See Rubric Part B: See Rubric	HS-D.3-1a
9.	27	S-ID.5
10.		A-REI.11-1a
11.	Part A: See Rubric Part B: See Rubric	HS-C.10.1
12.	Real Solutions: $3x^2 + 6x = -3$ No Real Solutions: $2x^2 - 5x + 7 = 0$; $4x^2 - 2x = -1$	A-REI.4b-2
13.	$100x - 14$ 46 or equivalent expression and number	F-Int.1-1
14.	Part A: D Part B: 7.5	HS-Int.1

15.	C	A-SSE.3a
16.	D	A-CED.4-2
17.	C	A-SSE.1-1
18.	Part A: 320 Part B: 1600	F-IF.4-1
19.	A, C, E, F	F-IF.1
20.	B, F	A-SSE.1-1
21.	Part A: A Part B: A	A-SSE.2-4
22.	Part A: See Rubric Part B: See Rubric	HS-C.5.6
23.	2.5	F-IF.6-6a
24.	The average rate of change between 0 and 25 is [greater than] the average rate of change between 25 and 50. The average rate of change is [positive on both intervals]. The function is [increasing faster between 0 and 25 than between 25 and 50].	F-IF.6-1b
25.	Part A: $\frac{1}{2}x + \frac{7}{2}$ $\frac{4}{3}x$ or equivalent expressions Part B: See Rubric Part C: See Rubric	HS-D.2-9
26.	Part A: See Rubric Part B: See Rubric	HS-C.6.1
27.	Part A: C Part B: B Part C: D Part D: C	S-ID.Int.1
28.	x | $P(x)$ 60 | 250 95 | 512.50 120 | 700	F-IF.A.Int.1

#8 Rubric Part A VF741634	
Score	**Description**
1	Student response includes the following element. • **Modeling component** = 1 point ○ Correct justification of Bella's prediction Sample Student Response: Bella has determined that she will harvest 3,240 tomatoes during the third year. This number is consistent with a model of the form: $N = 27p$, where N = the number of tomatoes harvested and p = the number of seeds planted, which satisfies the numbers in the first two columns. In other words, 75 x 27 = 2025 and 20 x 27 = 540. Note: The student may also choose to use proportionality to verify the model. The number of plants in year 3 is six times the number of plants in year 2. Therefore, the number of tomatoes harvested should be 540 x 6 = 3240 tomatoes.
0	Student response is incorrect or irrelevant.

#8 Rubric Part B VF741634	
Score	**Description**

2	Student response includes the following 2 elements.
	
	• **Computation component** = 1 point
	  ○ Correct number of tomatoes harvested in July, August, and September
	
	• **Modeling component** = 1 point
	  ○ Correct justification of the numbers
	
	Sample Student Response:
	
	It appears as if the number of tomatoes harvested each month increases. In year 1, the number harvested in September is just over 50% of the total (54%), and in year 2, the number harvested in September is just under 50% of the total (46%). Lacking any more information, it is not unreasonable to estimate about 50% of the 3240 tomatoes will be harvested in September, or 1620. Using similar reasoning for August, an estimate of 35% of the 3240 tomatoes will be harvested in August, or 1134. This leaves about 486 tomatoes to be harvested in July. Student may provide an alternate method and calculation of numbers for each month. If this is the case:

	• Their numbers should sum to 3240. • The rationale for the development of their model should be reasonable and consistent. Acceptable ranges for monthly tomato harvest: July: 380 – 600 August: 950 – 1200 September: 1500 - 1800
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

#11 Rubric Part A VH223149	
Score	**Description**
2	Student response includes the following 2 elements. • **Reasoning component** = 2 points ○ Correct answer that the function is linear ○ Correctly justifies the answer Sample Student Response: The data describes a linear function. The difference from one load to the next is a constant of 1.5. A constant rate of change is a characteristic of a linear function. Notes: • The student does not have to specify the rate of change is 1.5, but if a rate of change is given and it is not correct, the second component is not satisfied. • If the student responds that the function is exponential and then describes a linear function (constant rate of change), the second, but not the first, component is satisfied. • The second component is satisfied if the response talks about the points being in a line when graphed or that the slope of the line is 1.5. • If the student fits the data to a linear function such as $y = 1.5x$, both components are satisfied. However, if a correct linear equation is used, the variables used must be defined or a precision point error applies.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
#11 Rubric Part B VH223149	
Score	**Description**

1	Student response includes the following element. • **Computation component** = 1 point ○ Correct answer that a family with 12 people would generate 18 loads of laundry Sample Student Response: Because of the constant rate of change of 1.5, each increment of 6 in family size produces an additional increment of 9 loads per week. So 18 loads per week must be from a family size of 6 + 6 or 12 people. OR Another approach to solve this problem is to model the situation with a linear function: $y = 1.5x$ where x is the number of people in the family and y is the number of loads. Solving for $y = 18$, $y = 1.5x$ $18 = 1.5x$ $x = 18/1.5$ $x = 12$ Note: If the response in Part A is that the function is exponential and an exponential function is created, no points are earned in Part A. However, the point in Part B can still be earned if it follows from an incorrect function in Part A AND makes sense in context (such as being a number greater than 6).
0	Student response is incorrect or irrelevant.

#22 Rubric Part A 2362-M41568	
Score	**Description**
2	Student response includes the following 2 elements. • **Computation component** = 1 point ○ Correct value of *c,* -3 • **Reasoning component** = 1 point ○ Valid justification for the value of *c* Sample Student Response:

	The system will have no solutions if the graphs of the equations are parallel lines. On a coordinate plane, parallel lines have equal slopes but different *y*-intercepts. So, write the second equation, $3y = cx - 18$, in slope-intercept form. $$3y = cx - 18$$ $$\frac{3y}{3} = \frac{cx}{3} - \frac{18}{3}$$ $$y = \frac{c}{3}x - 6$$ When a linear equation is written in slope-intercept form, the slope of its graph is the coefficient of x. In the equation $y = -x - 4$, the coefficient of x is -1. So when $\frac{c}{3} = -1$, that is, when $c = -3$, the slopes of the graphs will be equal and the *y*-intercepts will be different. Therefore, the system will have no solution when $c = -3$.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
#22 Rubric Part B 2362-M41568	
Score	**Description**
2	Student response includes the following 2 elements. • **Computation component** = 1 point ○ Correct value for *c*, which is any value of *c* other than *c* = -3 • **Reasoning component** = 1 point ○ Valid work to solve the system using the chosen value of *c* Sample Student Response: Let $c = 3$. Substitute 3 for *c*. $\begin{cases} y = -x - 4 \\ 3y = 3x - 18 \end{cases}$ Divide each side of the second equation by 3. $\begin{cases} y = -x - 4 \\ \frac{3y}{3} = \frac{3x}{3} - \frac{18}{3} \end{cases}$ Simplify the second equation.

	$\begin{cases} y = -x - 4 \\ y = x - 6 \end{cases}$ $2y = -10$ Add the equations. $y = -5$ Solve for y. $-5 = -x - 4$ Substitute -5 for y in the first equation. $x = 1$ Solve for x. $3(-5) = 3(1) - 18$ $-15 = -15$ Check that (1, -5) is a solution of the second equation. Therefore, the system has exactly one solution, namely (1, –5), when $c = 3$.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

#25 Rubric Part A 2280-M41337	
Score	**Description**
2	**This part of the item is machine-scored.** • **Modeling component** = 2 points ○ Valid equation that represents the cost function ○ Valid equation that represents the revenue function Sample Student Response: $y = \frac{1}{2}x + \frac{7}{2}$ or equivalent for the cost function $y = \frac{4}{3}x$ or equivalent for the revenue function
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
#25 Rubric Part B 2280-M41337	
Score	**Description**
2	Student response includes the following 2 elements. • **Modeling component** = 1 point ○ Valid equation that represents the profit function based on

	answers in Part A • **Computation component** = 1 point ○ Correct number of months it took the business to make a profit based on the profit function Sample Student Response: Profit = Revenue − Cost $y = \frac{4}{3}x - \left(\frac{1}{2}x + \frac{7}{2}\right)$ $y = \frac{4}{3}x - \frac{1}{2}x - \frac{7}{2}$ $y = \frac{8}{6}x - \frac{3}{6}x - \frac{7}{2}$ $y = \frac{5}{6}x - \frac{7}{2}$ The profit function was greater than 0 when $\frac{5}{6}x - \frac{7}{2} > 0$. The solution of $\frac{5}{6}x - \frac{7}{2} > 0$ is $x > \frac{21}{5}$, or $x > 4\frac{1}{5}$. In the context of the problem, $x > 4\frac{1}{5}$ means that the business made its first profit after 4 months of operation. Other mathematically valid and appropriate methods of finding the correct number of months are acceptable, including using the graph or setting the cost and revenue equal to each other and solving the equation.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.
#25 Rubric Part C 2280-M41337	
Score	**Description**
2	Student response includes the following 2 elements. • **Computation component** = 1 point ○ Correct prediction for the amount of profit after 10 months of operation based on the profit function in Part B • **Modeling component** = 1 point ○ Valid justification for the answer Sample Student Response: To predict the profit after 10 months, use the profit function and substitute 10 for x, since x represents the number of months the company has been in

	business. $y = \frac{5}{6}x - \frac{7}{2}$ $y = \frac{5}{6}(10) - \frac{7}{2}$ $y = \frac{29}{6} = 4\frac{5}{6}$ After 10 months, we predict that *Muffins A-plenty* will have a profit of $4\frac{5}{6}$ thousand dollars, which rounds to \$4,833. Other correct and mathematically appropriate methods are acceptable.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

#26 Rubric Part A VH174749	
Score	**Description**
2	Student response includes the following 2 elements. • **Reasoning component** = 2 points ○ Correct answer that $f(x) = g(x)$ has two solutions. ○ Valid explanation of the solutions. Sample Student Response: The graph of $g(x)$ turns downward to the right of what is shown. The graph of $f(x)$ turns upward to the left of what is shown. Therefore, the graphs will intersect once in the first quadrant and once in the second quadrant, so there will be two solutions.
1	Student response includes 1 of the 2 elements.
0	Student response is incorrect or irrelevant.

#26 Rubric Part B VH174749	
Score	**Description**
1	Student response includes the following element. • **Reasoning component** = 1 point ○ Valid explanation for why the number of solutions is the same Sample Student Response: The x-intercept of the graph $y = h(x)$ are the same as those of $y = g(x)$, and the y-intercept of $g(x)$ is positive, so the y-intercept of $h(x)$ is positive. The y-intercept of $h(x)$ is greater than the y-intercept of $f(x)$, so again $f(x) =$

	$h(x)$ has two solutions.
0	Student response is incorrect or irrelevant.