Algebra I

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KCS at Home Learning Packet
April 2020
Algebra I

This packet is aligned to the following Tennessee Mathematics Standards and KCS Curriculum modules.
Module One
A1.F.BF.A.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. **A1.F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input- output pairs. **A1.S.ID.B.4a** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.
Module Two
A1.F.LE.A.1a Recognize that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. **A1.F.LE.A.1b** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. **A1.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems. **A1.A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales. **A1.A.CED.A.3** 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. **A1.A.REI.B.2** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A1.A.REI.C.4** Write and solve a system of linear equations in context. **A1.A.REI.D.7** 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. **A1.F.BF.B.2** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs.
Module Three
A1.F.LE.A.1a Recognize that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. **A1.F.LE.A.1b** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. **A1.F.LE.A.1c** Recognize situations in which a quantity grows or decays by a constant factor per unit interval relative to another. **A1.F.BF.B.2** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative0; find the value of k given the graphs.

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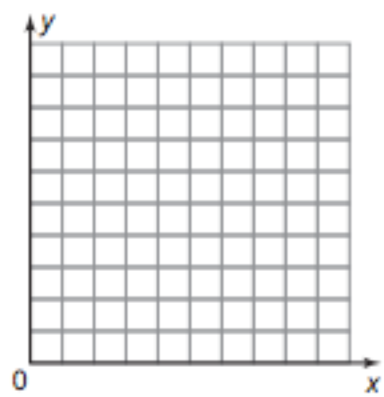
Module 1: Searching for Patterns

[1] Use the explicit formula to determine the following sequence (geometric or arithmetic) and find the 10^{th} term; 3, 6, 12,…

[2] Kyle is collecting canned goods for a food drive. On the first day, he collects 1 can. One the second day, he collects 2 cans. On the third day, he collects 4 cans. On each successive day, he collects twice as many cans as he collected the previous day. Represent the total number of cans Kyle has collected by the end of each of the first 7 days of the food drive with a numeric sequence.

[3] Graph the ordered pairs for the sequence given by the formula $g_n = 2 * 3^{n-1}$



[4] The linear regression equation for a data set is y = -1.2x + 23.5, where y represents the number of balloons sold by a party store each week and x represents the week number. Use the equation to predict the number of balloons the store will sell during week 8. Round to the nearest whole number.

a. 14 b. 33 c. 73 d. 96

[5] The table shows Savannah's salary for different years.

Year	2000	2001	2002	2003
Salary ($)	40,000	42,000	46,000	44,500

Which linear regression equation best represents the line of best for the data if x represents the number of years since 2000?

a. Y = 39,625x + 4375
b. Y = 4375x + 39,625
c. Y = 1750x + 40,500
d. Y = 40,500x + 1750

Module 2: Exploring Constant Change

[6] A faucet leaks water at a constant rate. Andrea places a measuring cup under the leak to catch the water. The table shows the number of milliliters of water in the cup at different times.

Time (hours)	Amount of Water (milliliters)
1.5	7.5
2	10
2.5	12.5
3	15

a. Determine the average rate of change for the problem situation. Be sure to include units.

b. Write a function to model the table of values.

c. Determine the amount of water in the cup after the faucet leaks at a constant rate for 11 hours.

[7] Solve the following.

a. Write the y intercept for the equation: $8x + 3y = -24$

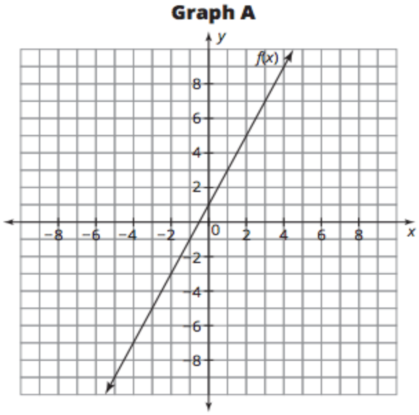
b. Write the equation in standard form: $y = \frac{2}{3}x - 4$

c. Solve for x
$\frac{1}{2}(16x + 5) - 3 = 19 - 5x$

[8] For each of the following, a function has been given along with its graph. Perform the specified transformation on the function and graph.

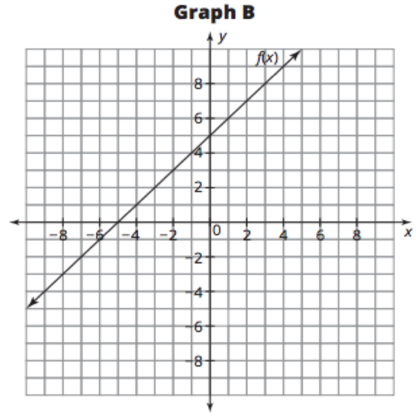
a. $f(x) = 2x + 1$
Graph: $f(x) - 3$

Graph A



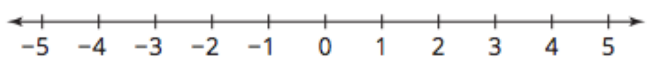
b. $f(x) = x + 5$
Graph: $-2f(x)$

Graph B



[9] Solve the compound inequality and represent the solution on the number line shown.

$-2 \le 3x + 4 \le 16$



[10] A phone company has two long distance calling plans. The first plan is $25 per month for unlimited long-distance calling. The second plan is $10 per month plus $0.05 per minute of long distance calling. After how many minutes of long distance calls will be cheaper for a customer to purchase the first plan?

[11] Samuel pays $59.99 plus $0.25 for each minute over 450 minutes for his cell phone plan. Monica pays $64.99 plus $0.10 for each minute over 450 minutes for her cell phone plan. Which system of equations represents this situation? Let x represent the number of minutes over 450.

a. $\begin{cases} y = 59.99x + 0.10 \\ y = 64.99x + 0.25 \end{cases}$

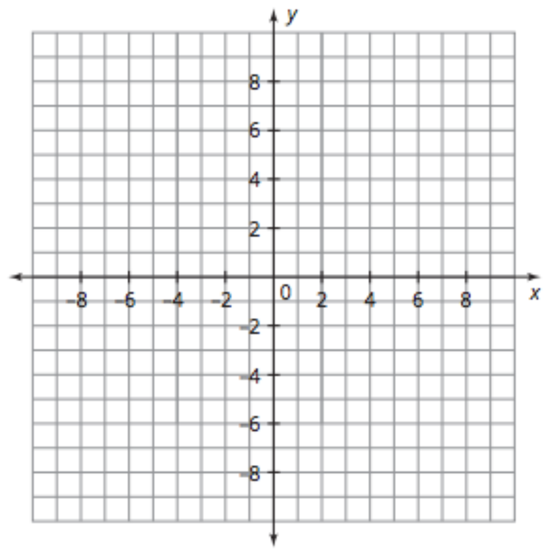
b. $\begin{cases} y = 59.99x + 0.25 \\ y = 64.99x + 0.10 \end{cases}$

c. $\begin{cases} y = 59.99 + 0.10x \\ y = 64.99 + 0.25x \end{cases}$

d. $\begin{cases} y = 59.99 + 0.25x \\ y = 64.99 + 0.10x \end{cases}$

[12] Graph the system of equations. Determine the solution.

$$\begin{cases} 2x = 10 - 3y \\ 3x + 2y = 5 \end{cases}$$



[13] How many solutions does each system of equations have?

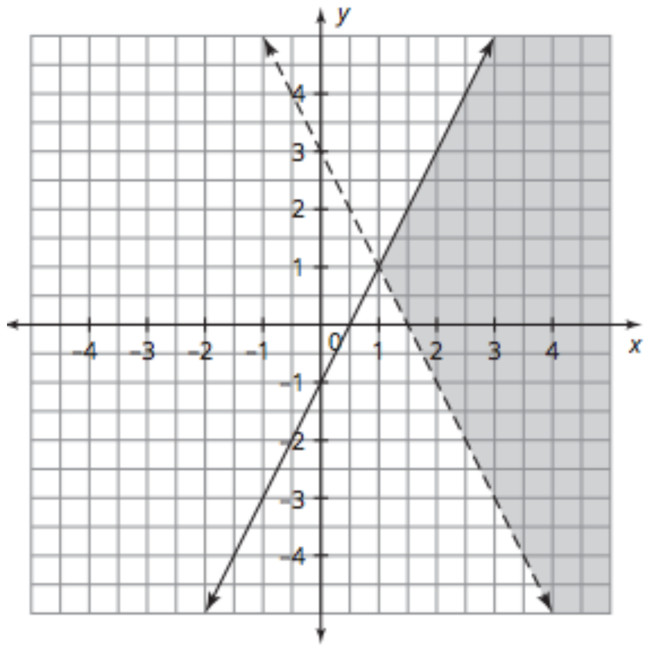
a. $\begin{cases} 3x - y = 1 \\ 3y + 3 = 9x \end{cases}$

b. $\begin{cases} y + 4x = 7 \\ -2y - 4 = 8x \end{cases}$

[14] Alfonso wants to purchase a pool membership for the summer. He has no more than y dollars to spend. The Aquatics Club charges an initial fee of $75 plus $20 per month. The Swimming Hole charges an initial fee of $15 plus $65 per month. Write a system of inequalities that can be used to determine which company offers the better deal. Let x represent the number of months.

[15] Alex saved $65. He has already spent $25. He plans to spend $8 on a movie ticket each month. Write an inequality to represents the number of movie tickets he can buy. Then determine the maximum amount of months Alex can go to the movies.

[16] Write a system of linear inequalities that represents the graph.

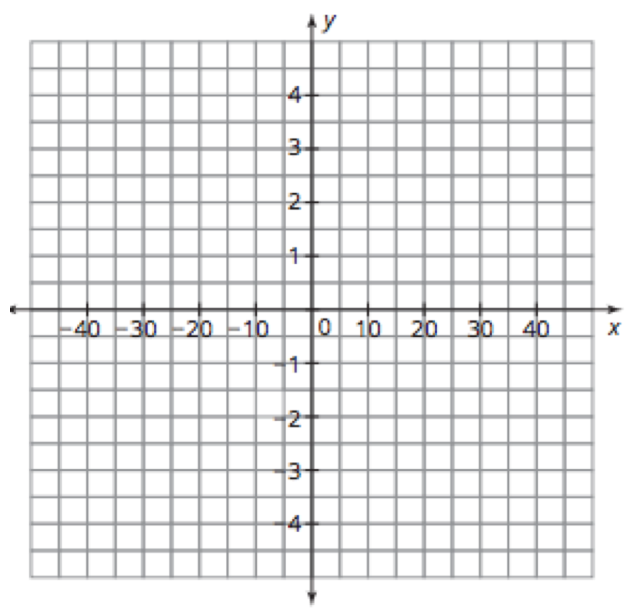


[17] You run by a rest station halfway through a road race. You are running at a rate of 1/10 mile per minute.

a. Complete the table to show your distance from the rest station over time. Consider the time before you pass the rest station to be negative.

Time (minutes)	Number of Miles
−30	
−20	
−10	
0	
10	
20	
30	

b. Plot the points from the table on the coordinate plane.



c. Write a function to represent the graph.

[18] The equation, $A = \pi r^2$ give the area, A, of a circle with radius, r.
Solve the function for π.

[19] Given $f(x) = |x|$ Describe the transformations performed on the graph of $f(x)$ to get $g(x) = 3f(x) + 4$.

a. The graph of $f(x)$ is translated to the left 4 units and dilated by a factor of $\frac{1}{3}$.

b. The graph of $f(x)$ is translated up 4 units and dilated by a factor of 3.

c. The graph of $f(x)$ is translated to the right 4 units and dilated by a factor of 3.

d. The graph of $f(x)$ is translated up 4 units and dilated by a factor of $\frac{1}{3}$.

Module 3: Investigating Growth and Decay

[20] Taylor earned the following amount each day.
- one dollar of the first day
- three dollars on the second day
- nine dollars on the third day
- twenty-seven dollars on the fourth day

Which function represents Taylor's daily earnings as a function of the number of days, t?

a. $f(x) = 3^t$ **b.** $f(x) = 3^{t+1}$ **c.** $f(x) = 3^{t-1}$ **d.** $f(x) = 3t$

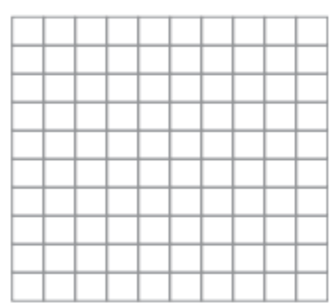
[21] Clayton placed $1500 into a savings account with 2.8% interest, compounded annually. He also has $200 in a safe at home that he does not touch or add to. Write Clayton's total savings S(t) as a function of time in years, t.

[22] Complete the table to determine the corresponding points on $c(x)$, given reference points on $f(x)$. Then graph $c(x)$ on the same coordinate plane as $f(x)$ and state the domain and range.

$f(x) = 4^x$

$c(x) = f(x) - 1$

Reference Points on $f(x)$	Corresponding Points on $c(x)$
$\left(-1, \frac{1}{4}\right)$	
(0, 1)	
(1, 4)	



Module 1: Searching for Patterns Answer Key

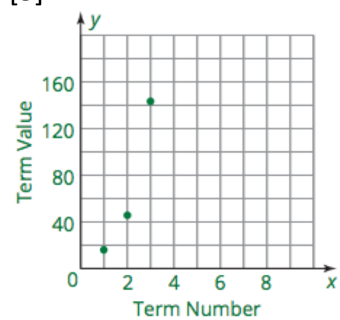
[1] $g_n = * g_1 \cdot r^{n-1}$

$g_{10} = * 3 \cdot 2^{10-1}$

$g_{10} = 1536$

[2] 1, 3, 7, 15, 31, 63, 127

[3]



[4] A. 14

[5] C. Y = 1750x + 40,500

Module 2: Exploring Constant Change Answer Key

[6] A. The average rate of change is 5 milliliters per hour.

B. f(t)=5t

C. f(11)= 55; The cup will have 55 milliliters of water in it after 11 hours.

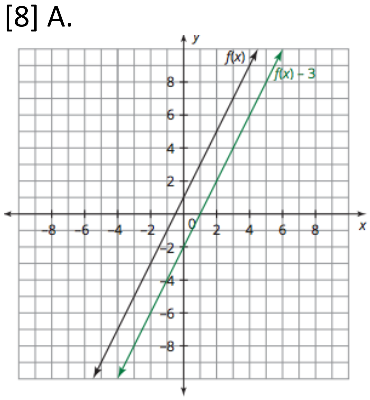
[7] A. (0, -8) (y intercept)

B. 2x – 3y = 12 (standard form)

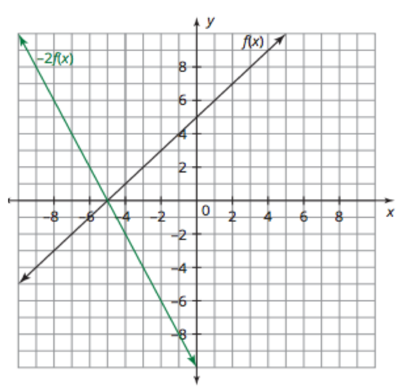
C. x = 3/2

$$\frac{1}{2}(16x + 5) - 3 = 19 - 5x$$
$$8x + \frac{5}{2} - 3 = 19 - 5x$$
$$8x - \frac{1}{2} = 19 - 5x$$
$$13x - \frac{1}{2} = 19$$
$$13x = \frac{39}{2}$$
$$x = \frac{3}{2}$$

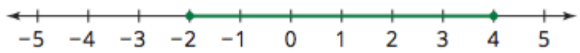
[8] A.



B.



$-2 \le x \le 4$

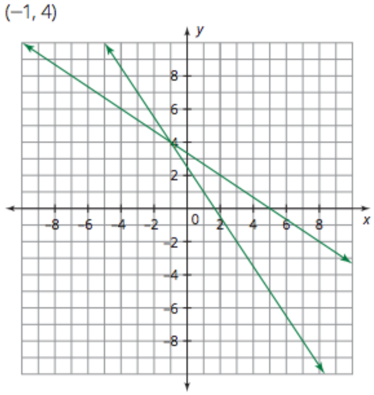
[9] 

[10] 300 minutes

[11] **d.** $\begin{cases} y = 59.99 + 0.25x \\ y = 64.99 + 0.10x \end{cases}$

[12]

(−1, 4)



[13] a. infinite solutions
b. no solutions

[14] $\begin{cases} y \ge 75 + 20x \\ y \ge 15 + 65x \end{cases}$

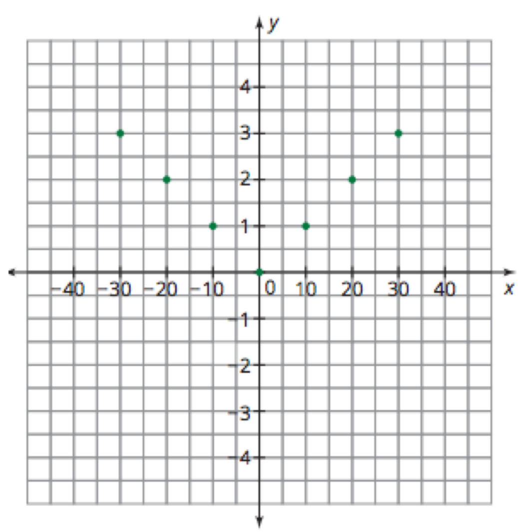
[15] $8t + 25 \le 65$

[16] $\begin{cases} y \le 2x - 1 \\ y > -2x + 3 \end{cases}$

17] a

Time (minutes)	Number of Miles
−30	3
−20	2
−10	1
0	0
10	1
20	2
30	3

b.



c. $f(x) = |0.1x|$

[18] $\pi = \frac{A}{r^2}$

[19] b.

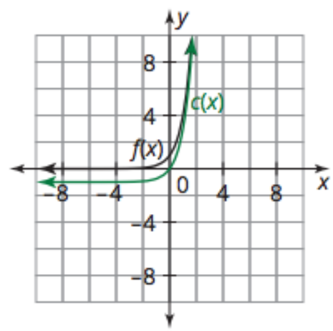
Module 3: Investigating Growth and Decay Answer Key

[20] **c.** $f(x) = 3^{t-1}$

[21] $S(t) = 1500 \cdot (1.028)^t + 200$

[22]

Reference Points on *f*(*x*)	Corresponding Points on *c*(*x*)
$\left(-1, \frac{1}{4}\right)$	$\left(-1, -\frac{3}{4}\right)$
(0, 1)	(0, 0)
(1, 4)	(1, 3)



The domain is all real numbers, the range is all real numbers greater than −1, and the asymptote is $y = -1$.