8 Algebra CC
Unit 7 Review (Applications with Linear Functions) **ANSWER KEY**

Important Terminology

slope rate of change *constant* rate of change *average* rate of change interval
y-intercept x-intercept

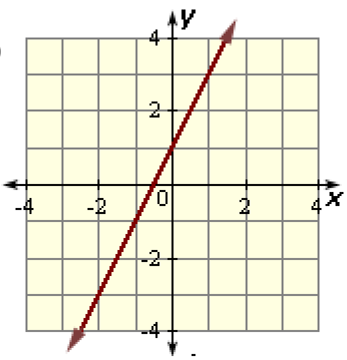
What should I be able to do?

1. Calculate rate of change (slope) and explain its meaning in the context of a situation.
2. Calculate the average rate of change over a specified interval.
3. Identify x and y-intercepts and explain their meaning in the context of a situation.
4. Write the equation of a line from a graph.
5. Write the equation of a line given a set of points or a table of values.
6. Write the equation of a line from a descriptive situation.
7. Identify the rate of change and y-intercept in an equation and explain their meaning in the context of a situation.

Practice Problem Set

1. Write the equation of the line pictured in each graph below.

a)



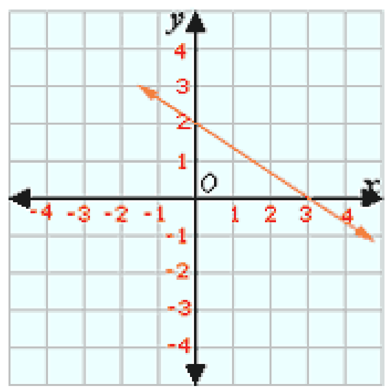
$$\frac{rise}{run} = \frac{2}{1}$$

$$m = 2$$

$$b = 1$$

$$\boxed{y = 2x + 1}$$

b)



$$\frac{rise}{run} = \frac{-2}{3}$$

$$m = -\frac{2}{3}$$

$$b = 2$$

$$\boxed{y = -\frac{2}{3}x + 2}$$

2. Write the equation of a line that passes through the points (-4, -20) and (12, 36).

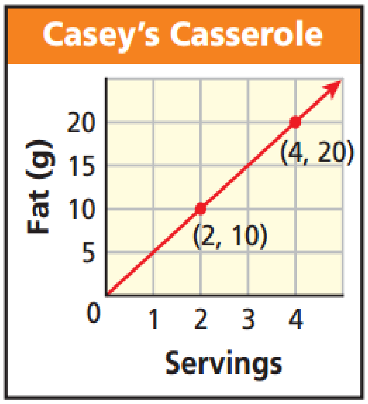
Slope	Y-intercept	Equation
$m = \frac{\Delta y}{\Delta x} = \frac{-20-36}{-4-12}$ $m = \frac{-56}{-16}$ $m = \frac{7}{2}$	(12, 36) y = mx + b $36 = \frac{7}{2}(12) + b$ $36 = 42 + b$ $-6 = b$	$y = \frac{7}{2}x - 6$

3. Write the equation of a line with an x-intercept of 3 and a y-intercept of 2.

Slope	Y-intercept	Equation
x-int: (3, 0) y-int: (0, 2) $m=\frac{\Delta y}{\Delta x}=\frac{2-0}{0-3}$ $m=\frac{2}{-3}$	b = 2	$y=-\frac{2}{3}x+2$

4. Consider the graphs pictured below. Calculate the rate of change. Explain its meaning in the context of the situation.

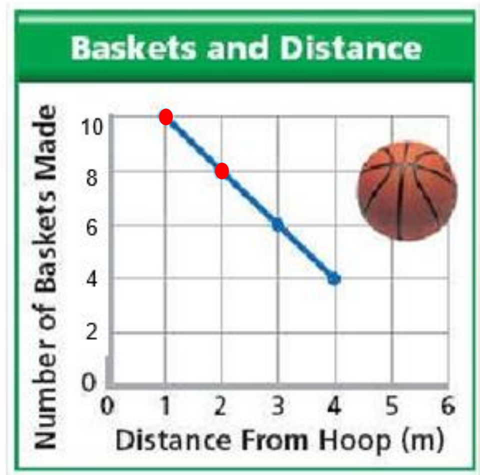
a)



$$\frac{rise}{run}=\frac{20-10}{4-2}$$
$$=\frac{10}{2}$$
$$=\frac{5g}{1\ \ serving}$$

Each serving of casserole contains 5 g of fat.

b)



(1, 10) (2, 8)

$$\frac{rise}{run}=\frac{8-10}{2-1}$$
$$=\frac{-2\ \ baskets}{1\ \ meter}$$

Two less baskets are made as you move 1 meter away from the basket.

5. Michael is walking from home to a subway stop that is 10 blocks away. Calculate Michael's average rate of change, in blocks per minute, for each of the following intervals.

0 to 5 minutes:

0.6 of a block per minute

(0, 0) (5, 3)

$$\frac{\Delta y}{\Delta x}=\frac{3-0}{5-0}$$
$$=\frac{3}{5}=\frac{0.6\ block}{1\ \ min}$$

5 to 7 minutes:

1.5 blocks per minute

(5, 3) (7, 6)

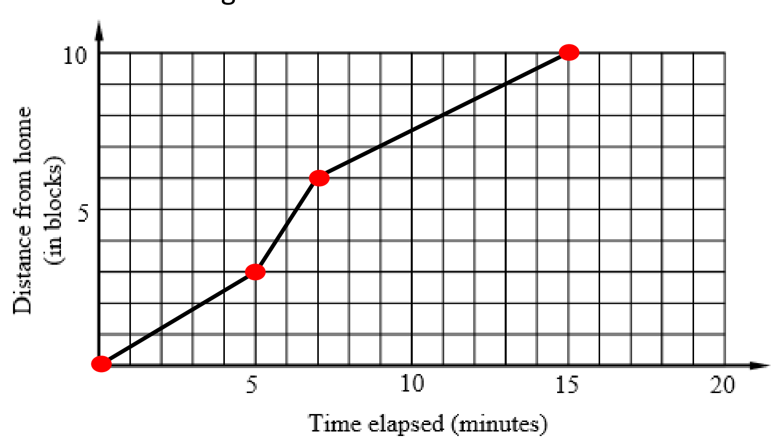
$$\frac{\Delta y}{\Delta x}=\frac{6-3}{7-5}$$
$$=\frac{3}{2}=\frac{1.5\ blocks}{1\ \ min}$$

7 to 15 minutes:

0.5 of a block per minute

(7, 6) (15, 10)

$$\frac{\Delta y}{\Delta x}=\frac{10-6}{15-7}$$
$$=\frac{4}{8}\rightarrow\frac{1}{2}=\frac{0.5\ block}{1\ \ min}$$



During which interval is Michael moving the slowest?

Michael is moving the **slowest** between the 7th and 15th minute. He covers **½ a block per minute**.

During which interval is Michael moving the fastest?

Michael is moving the **fastest** between the 5th and 7th minute. He covers **1.5 blocks per minute**.

6. Before leaving math class, students were instructed to pick a card out of a bag that described a linear relationship. Each student was then asked to write an equation that represented the relationship. Two student's answers are shown below. Which student wrote an incorrect equation? Explain your reasoning.

STUDENT 1

John went trick or treating and received 50 pieces of candy. He decided to eat 3 pieces per day. Represent the relationship between the number of pieces John has remaining (**y**) after **x** days.

y = 3x + 50

STUDENT 2

Mary received 60 dollars from her grandmother for her birthday. She decided to start a savings account with the money and deposit $10 each week for the next year. Represent the relationship between the amount of money in the savings account (**y**) after **x** weeks.

y = 60 + 10x

The equation student 1 wrote is incorrect. The equation should be y = -3x + 50 or y = 50 – 3x because the number of pieces of candy is decreasing by 3 each day since they are being eaten.

The equation student 2 wrote is correct because Mary begins with $60 and is increasing the amount in her savings account by $10 each week.

7. Betty is making a blanket. She goes to the store to buy a sewing kit and some fabric. Let ***f*** stand for the number of yards of fabric and ***c*** for the total cost in dollars that Betty spends at the store. The table below represents the relationship between the number of yards of fabric and total cost.

f	c
0	8
1	10.50
2	13
3	15.50
4	18

a) Calculate the rate of change. What does it represent in the context of the situation?

(0, 8) (2, 13)

$$\frac{\Delta y}{\Delta x} = \frac{13-8}{2-0}$$

$$= \frac{5}{2} \rightarrow \frac{\$2.50}{1yd}$$

The fabric costs $2.50 per yard.

b) Identify the y-intercept. What does it represent in the context of the situation?

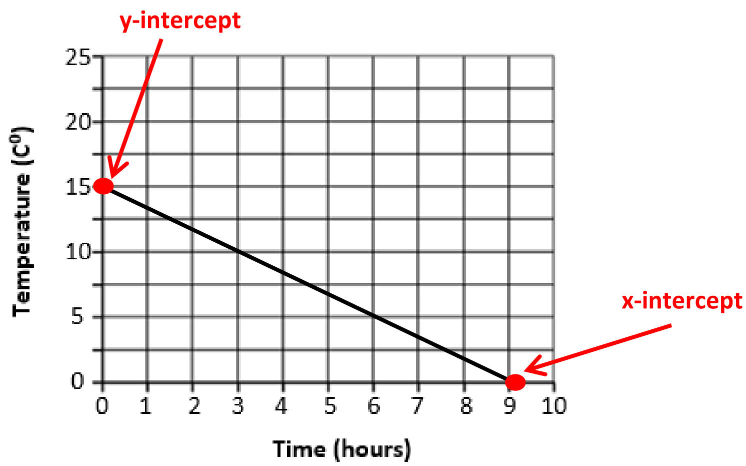
y-intercept: 8

The sewing kit costs $8.

c) Write an equation that represents the relationship.

$c = 2.5f + 8$

8. The temperature in an experiment is reduced at a constant rate over a period of time until the temperature reaches 0°C.



a) Identify the y-intercept. Explain its meaning in the context of the situation.

y-intercept: 15

At the start of the experiment, the temperature is 15° C.

b) Identify the x-intercept. Explain its meaning in the context of the situation.

x-intercept: 9

It took 9 hours for the temperature to decrease from 15° to 0° C.

c) Calculate the rate of change. Explain its meaning in the context of the situation.

(0, 15) (9, 0)

$$\frac{\Delta y}{\Delta x} = \frac{0-15}{9-0}$$
$$= \frac{-15}{9} \rightarrow \frac{-5}{3} \rightarrow \frac{-1.\overline{6}}{1}$$

The temperature decreases $1\frac{2}{3}$ degrees Celsius per hour.

d) Write an equation that represents the relationship between time and temperature. ***Define*** each variable in your equation.

x = number of hours

y = temperature

$$\boxed{y = -\frac{5}{3}x + 15}$$

e) On the 7th hour of the experiment, what temperature was being used?

$$y = -\frac{5}{3}x + 15$$
$$y = -\frac{5}{3}(7) + 15$$
$$y = -\frac{35}{3} + 15$$
$$y = 3\frac{1}{3}$$

On the 7th hour, the temperature was $3\frac{1}{3}$° C.

9. Nicholas is going to the arcade to play video games. The linear function **y = 50 – 2.25x** models how much money Nicholas has left (**y**) after playing **x** video games.

a) Identify the y-intercept. Explain its meaning in the context of the situation.

y-intercept: 50

Nicholas had $50 before he started playing video games.

b) Identify the rate of change. Explain its meaning in the context of the situation.

slope: -2.25

Each video game costs $2.25.

c) After a couple of hours of playing video games, Nicholas leaves the arcade with $11.75 in his pocket. How many video games did he play?

$$\begin{aligned} y &= 50 - 2.25x \\ 11.75 &= 50 - 2.25x \\ -38.25 &= -2.25x \\ x &= 17 \end{aligned}$$

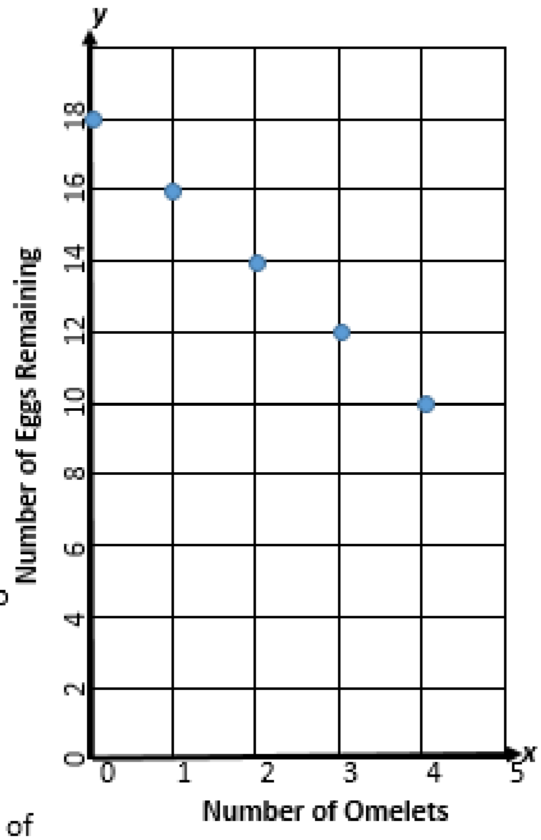
When Nicholas leaves the arcade with $11.75, he had played 17 video games.

See the answer to #10 on the next page.

The function rule $y = 18 - 2x$ represents the number of eggs (y) left in a carton after cooking x omelets.

a. Graph the function using a domain of 0, 1, 2, 3 and 4.

Domain (x) Omelets	0	1	2	3	4
Range (y) Eggs	18	16	14	12	10



b. Does it make sense to connect the points on the graph? Explain.

It doesn't make sense to connect the points because part of an egg cannot remain in the carton and only whole omelets can be cooked.

c. Consider the table and graph you created in part (a) to answer the questions that follow.

- How many eggs were in the carton before any omelets were made?
  18 eggs (see ordered pair (0,18))
- How many omelets can be made with the amount of eggs in the carton?
  9 omelets

If you continue the pattern in the table, you can see that 9 omelets requires all 18 eggs because there are 0 eggs left in the carton.

Omelets	0	1	2	3	4	5	6	7	8	**9**
Eggs Remaining	18	16	14	12	10	8	6	4	2	**0**