Summer Enrichment Packet for Rising Algebra 1 Students

ANSWER KEY

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Division of Academics
Department of Curriculum and Instruction

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Note to Student: You've learned so much in Math 8, Foundations for Algebra, or Accelerated 2! It is important that you keep practicing your mathematical knowledge over the summer to be ready for Algebra I. In this packet, you will find weekly activities for the summer break.

Directions:

- Create a personal and fun math journal by stapling several pieces of paper together or use a notebook or binder with paper. Be creative and decorate the cover to show math in your world.

- Each journal entry should:
  - Have the week number and the problem number.
  - Have a clear and complete answer that explains your thinking.
  - Be neat and organized.

Playing board and card games are a good way to reinforce basic computation skills and mathematical reasoning. Try to play board and card games at least once a week. Some suggested games to play are: Monopoly, Chess, War, Battleship, Mancala, Dominoes, Phase 10, Yahtzee, 24 Challenge, Sudoku, Connect Four, and Risk.

Where to Go to Get Help and Opportunities for Practice!

During the course of your math work this summer, you may need some assistance with deepening your understanding the skills and concepts. You also might want to get some more practice. Here are some sites you can visit online:

To get the exact definition of each standard, go to www.corestandards.org and search for the content standard (for example, *HSF.BF.1.3*).

Khan Academy has helpful videos and self-guided practice problems for every grade level. Go to www.khanacademy.org to get started.

Week 1

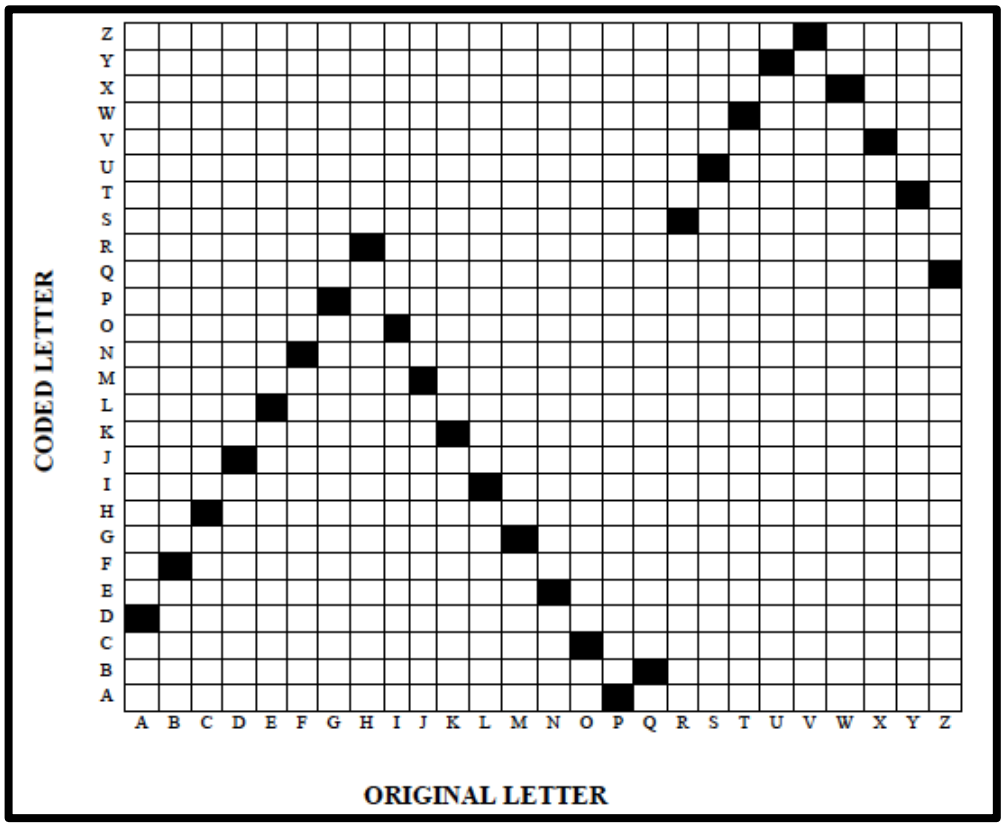
Domain: *Functions*

Standard: 8.F.1 – 8.F.2: Define, evaluate, and compare functions.

Directions:

Encryptions are used by spies, secret societies, and other organizations to transfer information without other people reading their messages. Secret codes can be created by a simple scheme of replacing letters with numbers. More complex codes replace letters with other letters. The code scheme is called a ***cipher*** and can be written as a list or table.

1. A letter-to-letter code can be represented in a graph. Create a key to determine the cipher represented in the graph below.



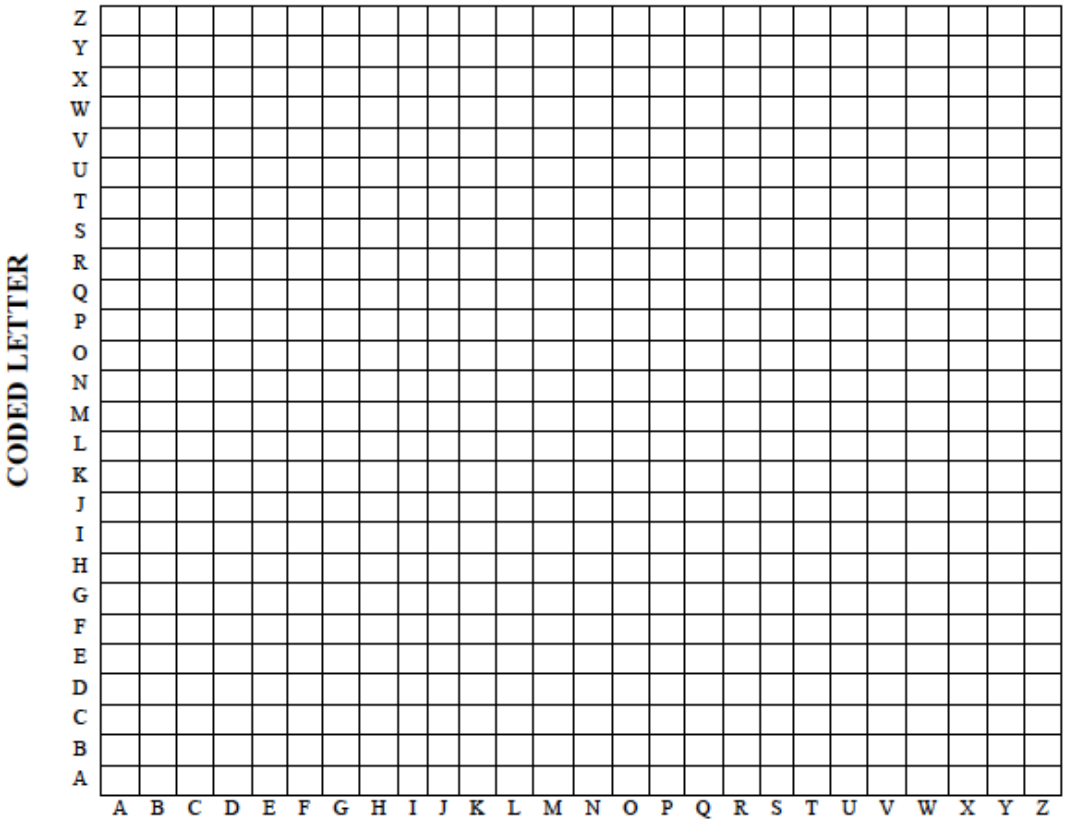
Original Letter	Coded Letter
A	D
B	F
C	H
D	J
E	L
F	N
G	P
H	R
I	O
J	M
K	K
L	I
M	G
N	E
O	C
P	A
Q	B
R	S
S	U
T	W
U	Y
V	Z
W	X
X	V
Y	T
Z	Q

2. Use the code cipher from the to code the message "*The homework is on page fifty".*
WRL RCGLXCSK OU CE ADPL NONWT

3. Use the cipher to decode the message *"SLJ JCP FDSKU DW GOJEOPRW".*
RED DOG BARKS AT MIDNIGHT

4. *Create your own cipher code so that another letter replaces each letter.*

GRAPHS WILL VARY.



5. Use your cipher to code the following message*: "Summer Breaks are relaxing."*

ANSWERS WILL VARY

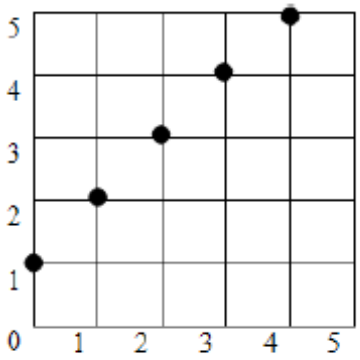
Week 2

Domain: *Functions*

Standard: 8.F.1 – 8.F.2: Define, evaluate, and compare functions.

Directions:

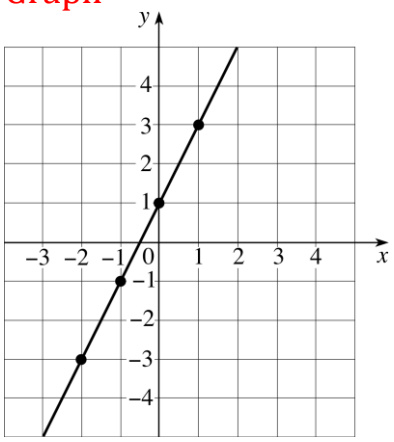
As rules can be created to code a message in letters, you can write a rule that changes numbers into other numbers. Words, tables and graphs can represent these rules. The rule "add one to each number" can be represented in other forms.

<table>
<tr><th>Form</th><th>Representation</th></tr>
<tr><td>Words – verbal expression</td><td>"add one to each number"</td></tr>
<tr><td>Equation</td><td>$y = x + 1$</td></tr>
<tr><td>Table</td><td>
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>y</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
</table>
</td></tr>
<tr><td>Graph</td><td> 
</td></tr>
</table>

1. Represent the function in the other 3 forms.

x	-4	3	5	16	25	31
y	-7	7	11	33	51	63

VERBAL EXPRESSION – 2 times a number plus 1
Equation – y = 2x + 1
Graph –

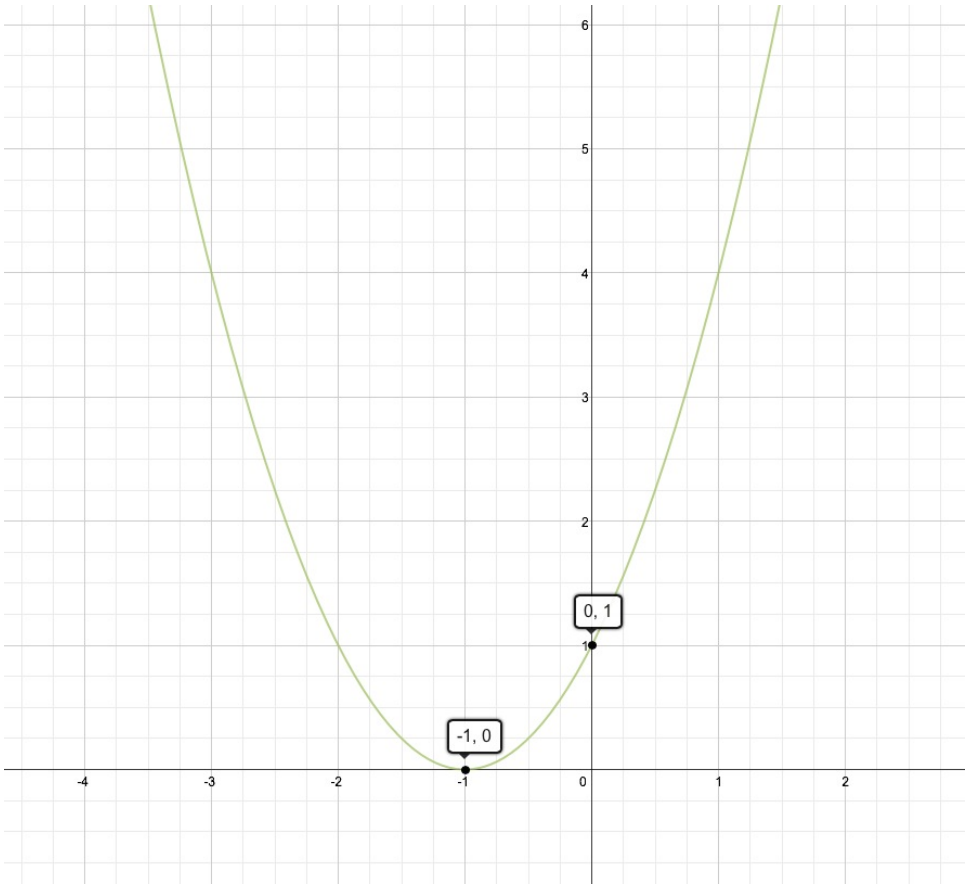


2. Complete the table and graph $y = x^2 + 2x + 1$.

a.

Input	-3	-2	-1	0	1	2	3
Output	4	1	0	1	4	9	16

b.



c. Is it possible for two different inputs to give you the same output? Justify your answer.

Yes, according to the table and graph an input of -2 and 0 both give an output of 1 and input values for -3 and 1 both give an output of 4.

3. Use the vocabulary words below to explain how the following real-life experience is like a function.

When you pick up a phone and dial (301) 555-2612 you will get the Prince George's County Zoo. When you dial (301) 222-3645 you will get the Prince George's County Museum. When you pick up the phone and dial a specific number, you will get only one business/resident.

domain range input output relation function

Sample Response

You can think of phone numbers for various businesses and residents as a relation. The phone number represents the input and the business/resident associated with the phone represents the output. The set of phone numbers for all businesses/residents represents the domain and the set of business/residents in Prince George's County represents the range. This is a functional relationship since one phone number corresponds to only one business. One phone cannot be associated to more than one business.

Week 3

Domain: *Expressions and Equations*

Standard: 8.EE.5 - 8.EE.6: Understand the connections between proportional relationships, lines, and linear equations.
Standard: 8.EE.7 –8.EE.8: Analyze and solve linear equations and pairs of simultaneous linear equations.

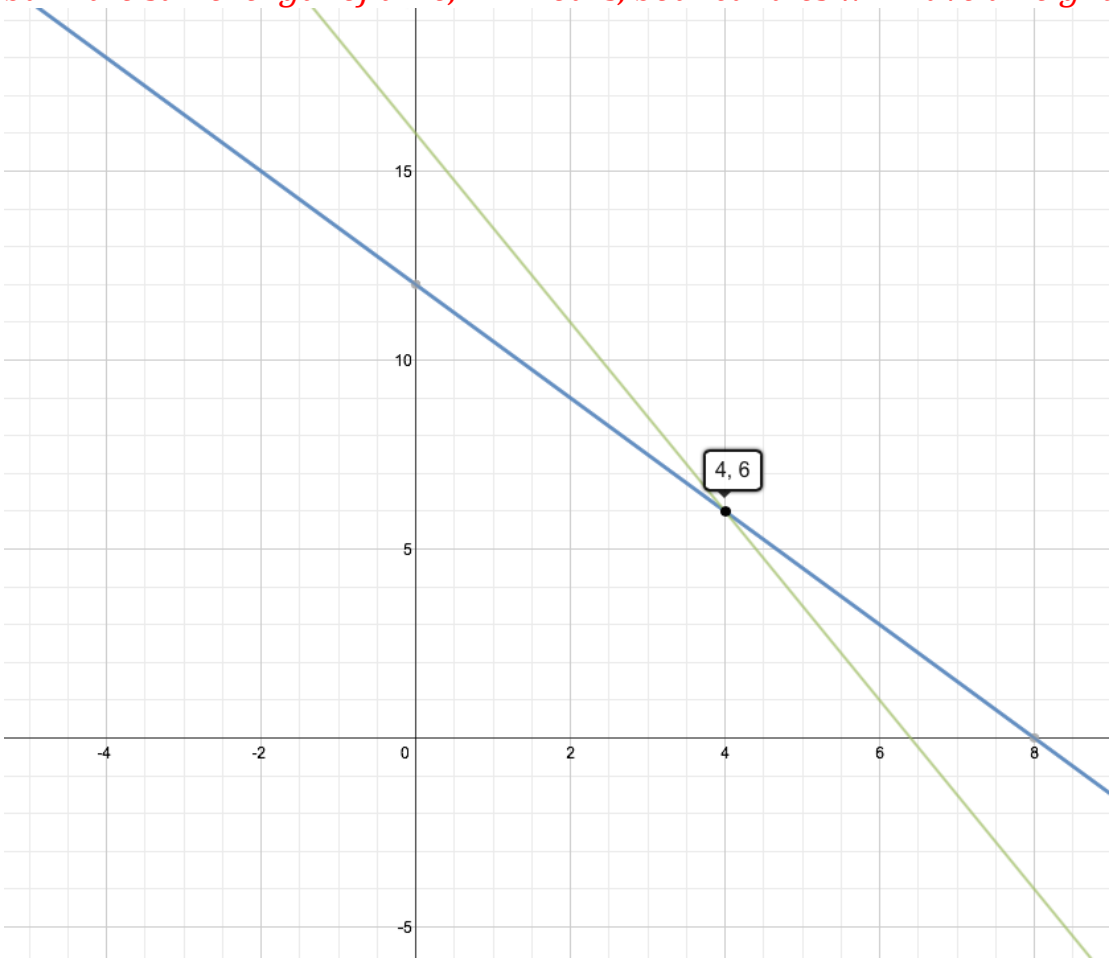
Directions: Jessie likes candles. She also likes mathematics and was thinking about using algebra to answer a question that she had about two of her candles. Her taller candle is 16 centimeters tall. Each hour, which it burns, makes the candle lose 2.5 centimeters in height. Her short candle is 12 centimeters tall and loses 1.5 centimeters in height for each hour that it burns.

Jessie needs your help to determine whether these two candles would ever reach the same height at the same time if allowed to burn the same length of time. She also wants to know what height the two candles would be at that time. If it is not possible, she wants to know why it could not happen and what would need to be true in order for them to be able to reach the same height. To help Jessie understand what you are doing, be sure to use ***multiple representations***, ***justify*** your results and ***explain*** your thinking.

Time (hours)	16 cm candle height (cm)	12 cm candle height (cm)
0	**16**	**12**
1	**13.5**	**10.5**
2	**11**	**9**
3	**8.5**	**7.5**
4	**6**	**6**
5	**3.5**	**4.5**
6	**1**	**3**
7	**-1.5**	**1.5**

Sample Response

According to the table and graph I created below, if both candles are allowed to burn the same length of time, in 4 hours, both candles will have a height of 6 cm.



Week 4

Domain: *Expressions and Equations*

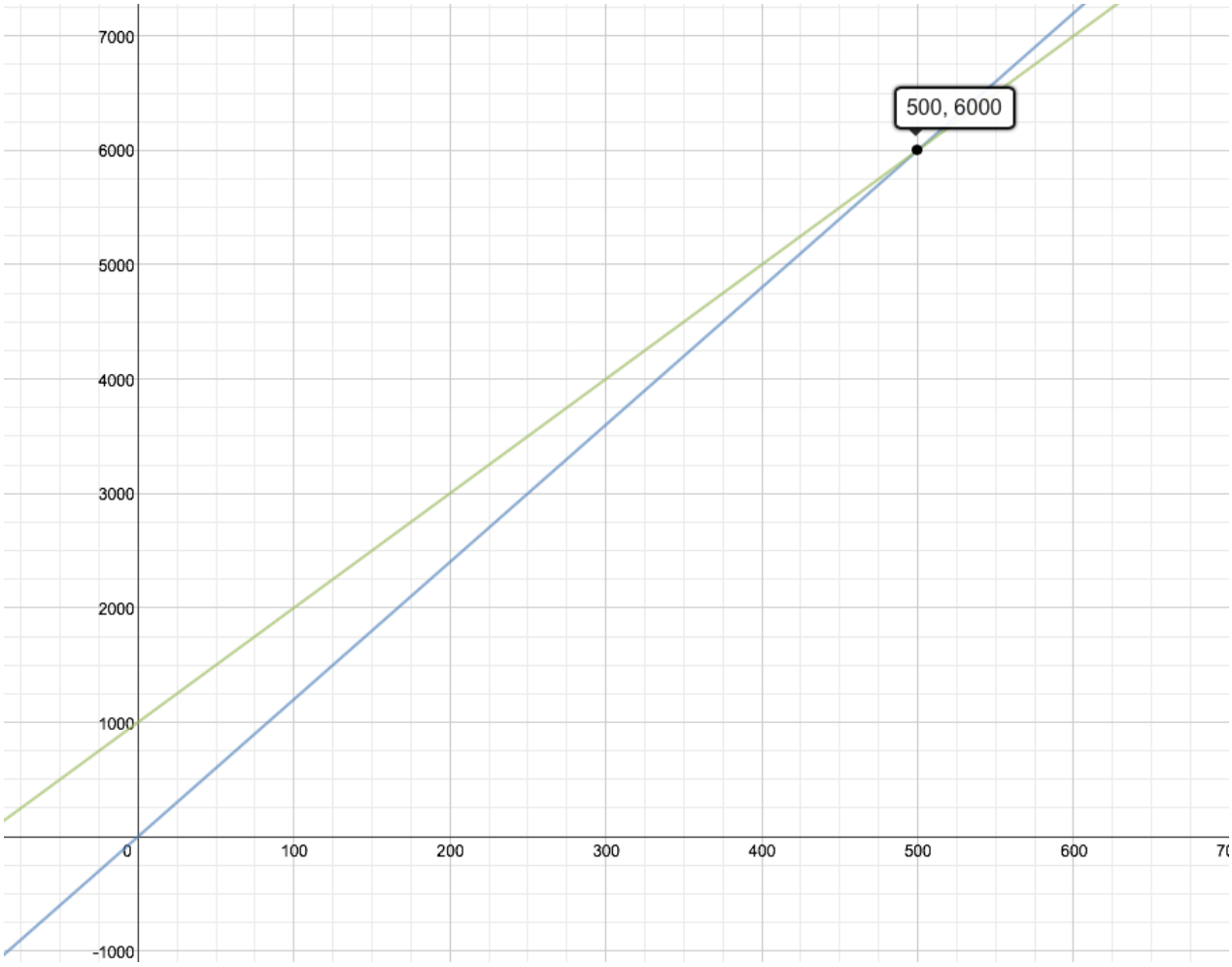
Standard: 8.EE.5 - 8.EE.6: Understand the connections between proportional relationships, lines, and linear equations. **Standard: 8.EE.7 – 8.EE.8:** Analyze and solve linear equations and pairs of simultaneous linear equations.

Directions: You have been selected by members of Team Cheetah to participate in a one-mile race during spirit week. Another student from Team Gazelle will race against you. You are able to run 12 feet per second. Since the student from Team Gazelle runs 10 feet per seconds, you have been asked to let him have a 1000-feet head start. If both of you maintain the estimated rates, would you be able to beat your opponent? Use at least 2 different methods to justify your conclusion.

Students may also use an equation.

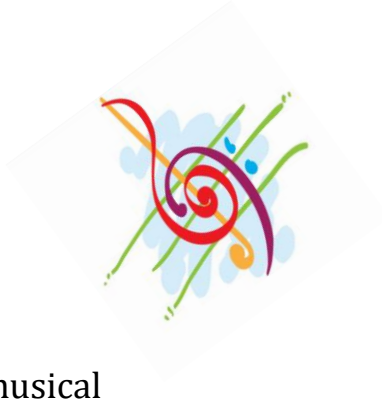
Seconds	Team Cheetah Distance (feet)	Team Gazelle Distance (feet)
0	0	1000
100	1200	2000
200	2400	3000
300	3600	4000
400	4800	5000
500	6000	6000

At 500 seconds, both runners will be at 6000 feet. Since 1 mile equals 5280 feet, Team Cheetah will not be able to beat Team Gazelle.


7000
6000
5000
4000
3000
2000
1000
0
-1000
100
200
300
400
500
600
500, 6000

Week 5

Domain: *Statistics and Probability*



Standard: 8.SP.1 - 8.SP.4: Investigate patterns of association in bivariate data.

Directions:

Is there an association between whether a middle or high school student plays a sport and whether he or she plays a musical instrument? To investigate, survey 30 people and record your results below. Record the answers in the table below. **Answers will vary based on student's results.**

Student	Sport (Yes or No)	Musical Instrument (Yes or No)
1	Yes	No
2	No	No
3	Yes	Yes
4	No	Yes
5	Yes	Yes
6	No	Yes
7	Yes	Yes
8	No	Yes
9	No	No
10	No	No
11	No	No
12	Yes	Yes
13	No	No
14	Yes	Yes
15	Yes	Yes
16	No	Yes
17	Yes	Yes
18	Yes	No
19	Yes	No
20	Yes	No
21	Yes	No
22	Yes	Yes
23	Yes	Yes
24	Yes	Yes
25	Yes	Yes

Summarize the data below.

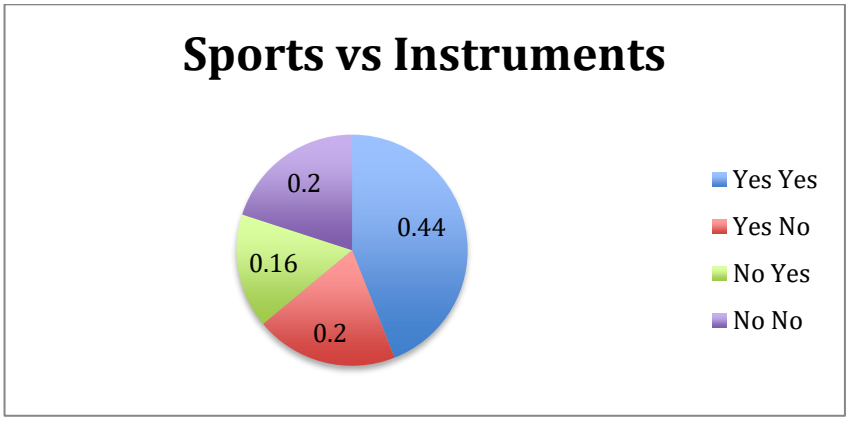
		Instrument		
		Yes	No	Total
Sport	Yes	11	5	16
	No	4	5	9
	Total	15	10	25

a. Of the middle and high school students you surveyed who play a sport, what proportion plays a musical instrument?
   11/16 = 68.75%

b. Of the middle and high school students you surveyed who do not play a sport, what proportion plays a musical instrument?
   4/9 = 44.4%

c. Based on your data, do you think there is an association between playing a sport and playing an instrument? Justify your reasoning.
Yes, according to the study, if you play a sport, they are most likely to play an instrument.

d. Create another visual representation that could help you determine the association, if any, between playing a sport and playing a musical instrument.



Week 6

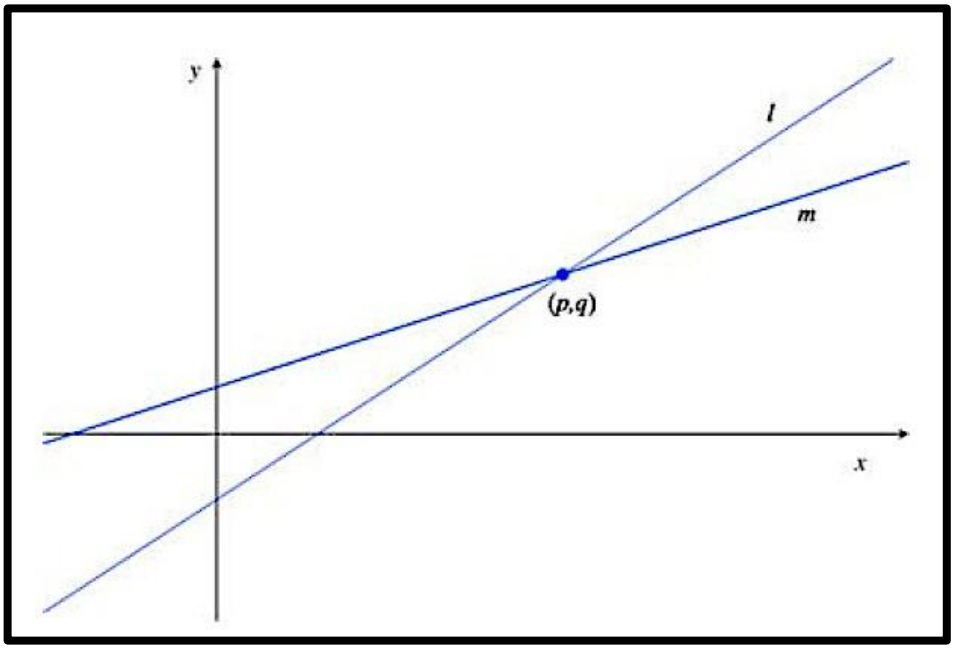
Domain: *Expressions and Equations*

Standard: 8.EE.5 - 8.EE.6: Understand the connections between proportional relationships, lines, and linear equations.
Standard: 8.EE.7 –8.EE.8: Analyze and solve linear equations and pairs of simultaneous linear equations.

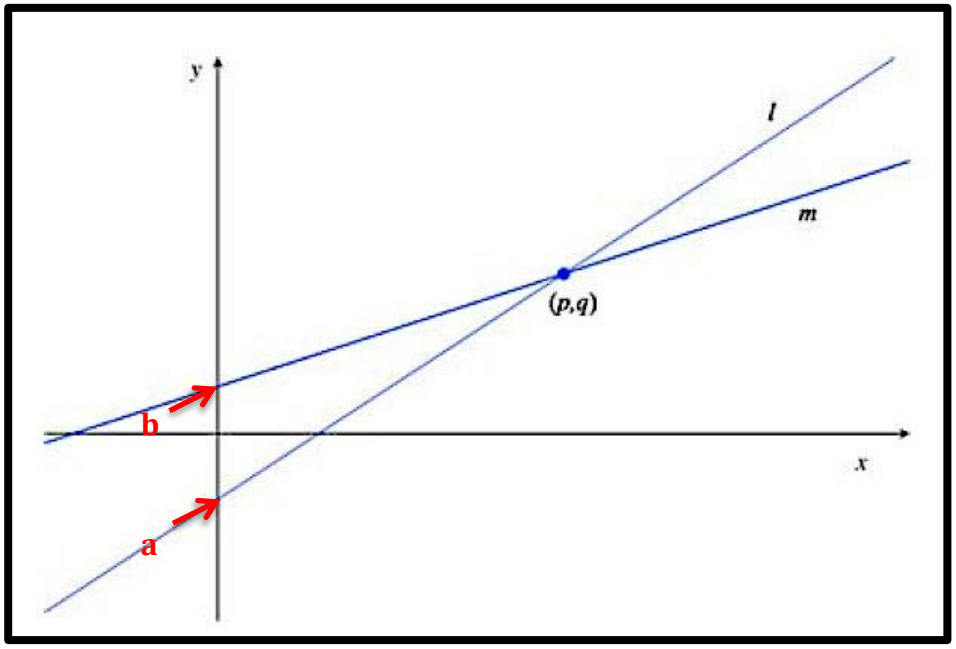
Directions:

Read the problem below.

The figure below shows the lines l and m described by the equations $4x - y = a$ and $y = 2x + b$ respectively for some constants ***a*** and ***b***. The two lines interest at the point (p, q).



1. Interpret *a* and *b* in terms of the graphs of the equations.



a & b represent the y-intercepts of the graph. Line l is steeper and therefore –a is the y coordinate of the point where l intersects he y-axis.

2. Using a pencil, place the tip of your pencil at point (p,q) and trace line *l* to the point whose x-coordinate is $p + 2$. Using a pen, do the same for line *m*. Determine the difference between the y-coordinates for lines *l* and *m*.

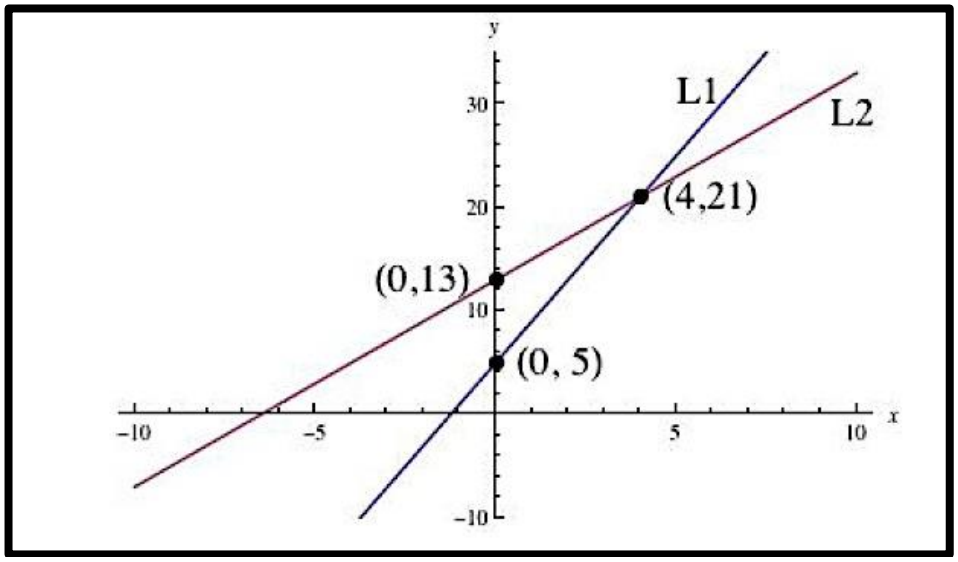
Line l has a slope of 4. So on l, each increase of one unit in the x-value produces an increase of units in the y-value. Thus an increase of 2 units in the x-value produce an increase of 8 units in the y-value. The line m has a slope of 2 So on m each increase of 1 unit in the x-value produces an increase of 2 units in the y-value. Thus an increase of 2 units in the x value produces an increase of 4 units in the y value.

Thus the l y-value would be 8 – 4 = 4 units larger the they m y value.

Week 7

Domain: *Expressions and Equations*

Standard: 8.EE.5 - 8.EE.6: Understand the connections between proportional relationships, lines, and linear equations.
Standard: 8.EE.7 –8.EE.8: Analyze and solve linear equations and pairs of simultaneous linear equations.



1. Find the linear equations for L_1 and L_2.
   L_1 – y = 4x + 5
   L_2 – y = 2x + 13

2. Find two additional points, one that lies on L_1 and one that lies on L_2.

x	L_1 y = 4x + 5	L_2 y = 2x + 13
1	9	15
2	13	17
3	15	19

Algebra I – Unit 1 Preview

Domain: Number System

Standard:
A.CED.1– Create equations that describe numbers or relationships.
A.SSE.1 – Interpret the structure of expressions.

Sean has been assigned the following linear equations and inequality word problems. Help him solve each problem below by using the five-step plan below.

1. Drawing a Sketch (if necessary)
2. Defining a Variable
3. Setting up an equation or inequality
4. Solve the equation or inequality
5. Make sure you answer the question

1. The sum of 38 and twice a number is 124. Find the number.

x - number
$38 + 2x = 124$
$x = 43$

$38 + 2(43) = 124$
$38 + 86 = 124$
$124 = 124$

2. The sum of two consecutive integers is less than 83. Find the pair of integers with the greatest sum.
x – a number

$x + (x+1) < 83$
$2x + 1 < 83$
$2x < 82$
$x < 41$

$40 + 41 < 83$

81 < 83

3. A rectangle is 12m longer than it is wide. Its perimeter is 68m. Find the length and width of the rectangle.

w + 12

w

w + 12 + w + 12 + w + w = 68
4w + 24 = 68
4w = 44
w = 11

width = 11
length = 23

4. Alex has twice as much money as Jennifer. Jennifer has $6 less than Shannon. Together they have $54. How much money does each have?

x – amount of money for Jennifer
y – amount of money for Alex
z – amount of money for Shannon

y = 2x
x = z – 6
x +y + z = 54

x + 2x + z = 54
3x + z = 54
3x + x + 6 = 54
4x + 6 = 54
4x = 48
x = 12

y = 2x = 24

12 + 24 + z = 54
36+z=54
z=18
Jennifer has $12
Alex has $24
Shannon has $18

5. There are three exams in a marking period. A student received grades of 75 and 81 on the first two exams. What grade must the student earn on the last exam to get an average of no less than 80 for the marking period?

$$\frac{x + 75 + 81}{3} > 80$$

x +75 + 81 > 240

x + 156 > 240
-156 -156

x > 84

The student must receive a score greater than 84 to receive a score of no less than 80 for the marking period.