Summer Enrichment Packet

Rising Foundations for Algebra Students

PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS
Division of Academics
Department of Curriculum and Instruction

PGCPS

Summer Enrichment Packet

Rising Foundations for Algebra Students

Note to the Student

You learned so much in Grade 7! It is important that you keep practicing your math skills over the summer to be ready for the Accelerated 2 course. 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.

- *Pay attention to the gray boxes that you see at the beginning of each week's activities. Those boxes indicate the Common Core domain and standard that the subsequent activities address. If you see a NON-CALCULATOR SYMBOL*  *next to a gray box, then do not use a calculator for the activities in that section!*

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, KenKen, Connect Four, and Risk.

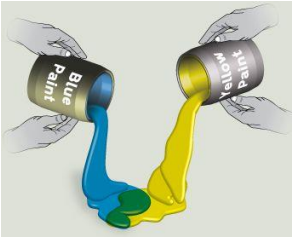
Where to Go to Get Help and Opportunities for Practice!

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:

COMMON CORE STATE STANDARDS INITIATIVE PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER	To get the exact definition of each standard, go to www.corestandards.org and search for the content standard (for example, *7.NS.1a*).
KHAN ACADEMY	***Khan Academy*** has helpful videos and self-guided practice problems for every grade level. Go to www.khanacademy.org to get started.

WEEK 1 || Ratios and Proportional Relationships Standards 7.RP.1-7.RP.3: Analyze proportional relationships and use them to solve real world and mathematical problems.

The students in Ms. Brown's art class were mixing yellow and blue paint. She told them that two mixtures will be the same shade of green if the blue and yellow paint are in the same ratio.



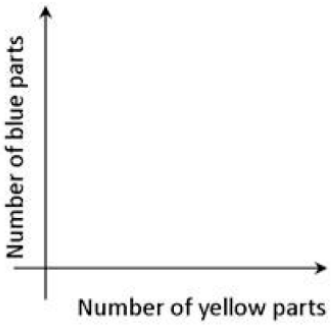
The table below shows the different mixtures of paint that the students made.

	A	B	C	D	E
Yellow	1 part	2 parts	3 parts	4 parts	6 parts
Blue	2 parts	3 parts	6 parts	6 parts	9 parts

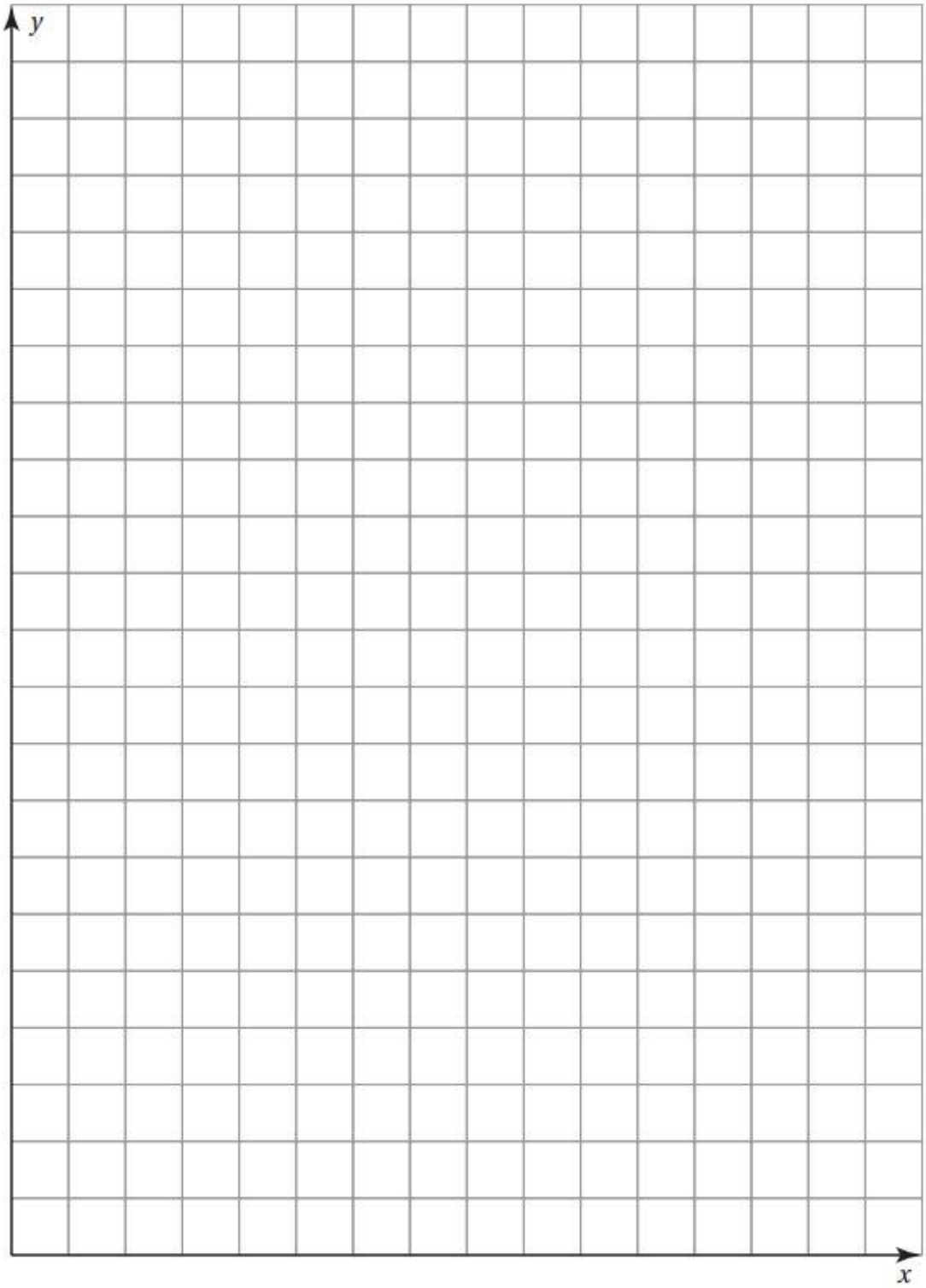
a. How many different shades of paint did the students make?

b. Some of the shades of paint were bluer than others. Which mixture(s) were the bluest? Show work or explain how you know.

c. Using the coordinate grid on the next page, carefully plot a point for each mixture on a coordinate plane like the one that is shown in the figure to the right.



d. Draw a line connecting each point to (0,0). What do the mixtures that are the same shade of green have in common?


y
x

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Directions: Complete the following three problems to apply your understanding of percentages and ratios.

Problem #1:
Jesse's Awesome Autos advertised a special sale on cars – Dealer cost plus 5%! Quinten and Shapera bought a luxury sedan for $23,727.90. What was the dealer's cost?

Problem #2:
You and some friends went out to T.G.I. Fridays for dinner. You ordered a root beer, sweet potato fries and cheese quesadillas. The total bill came to $21.86. Your dad has told you many times that it is important to leave a good tip; about 20%. You have $26.00 in your wallet. How much would the total be if you left a 20% tip? Can you cover the cost?

Problem #3:
Builders have observed that windows in a home are most attractive if they have the width to length ratio 3:5. If a window is to be 48 inches wide, what should its length be for the most attractive appearance?

2. Create your own problems.

- Create one original problem involving a percentage (discount or tax).
- Create one original problem involving a ratio or part/whole relationship.
- Solve both and keep the answer key.
- Challenge a friend or family member to solve your problems.

WEEK 2 || Ratios and Proportional Relationships Standards 7.RP.1-7.RP.3: Analyze proportional relationships and use them to solve real world and mathematical problems.

Mariah's family is driving to her grandmother's house. Her family travels 370.5 miles between 10:15 a.m. and 4:45 p.m.

Part A

What is an equation that Mariah can use to determine their average rate of travel for the day, *R*, in miles per hour?

Choose the correct numbers and operations from the boxes below. Explain your answer in the space below.

370.5	**6.5**	**10.25**	**4.75**
+	**–**	**●**	**÷**

_____ _____ _____ = ***R***

Part B

Calculate the family's average rate of travel for the day. Show your process for determining your answer.

Part C

Mariah tells her family, "It's a good thing we traveled as fast as we did. If our rate had been 50 miles per hour, we wouldn't have gotten to his house until about…"

Then, show the process you used for determining your answer. Then, fill in the blank to complete the statement at the bottom.

If their average rate had been 50 miles per hour, Mariah's family would have arrived at her grandmother's house at _____ p.m.

Spicy Vegetables!

A restaurant makes a special seasoning for all its grilled vegetables.
Here is how the ingredients are mixed:

$\frac{1}{2}$ of the mixture is salt	$\frac{1}{4}$ of the mixture is pepper
$\frac{1}{8}$ of the mixture is garlic powder	$\frac{1}{8}$ of the mixture is onion powder

When the ingredients are mixed in the same ratio as shown above, every batch of seasoning tastes the same.

Part A

Study the measurements for each batch in the table. Fill in the blanks so that every batch will taste the same.

	Batch 1	Batch 2	Batch 3
Salt (cups)	**1**		
Pepper (cups)		**1**	
Garlic Powder (cups)	$\frac{1}{4}$		**1**
Onion Powder (cups)			**1**

Part B

The restaurant mixes a 12-cup batch of the mixture every week. How many cups of each ingredient do they use in the mixture each week? Show your work in the space below.

<u>WEEKS 3 and 4</u> || Expression and Equations Standards 7.EE.3-7.EE.4: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Choosing a School Fundraiser

A school is going to have a fundraiser to buy new books for the library. The goal is to raise at least $1,000. Three different fundraising plans are being discussed.

Plan 1 Selling Candy Bars	**Plan 2** Selling Carnations	**Plan 3** Holding a Walkathon
		

In order to evaluate the three plans, you will need to answer the following questions about each plan.

Plan 1: Selling Candy Bars

Explain or show your reasoning as you answer the questions below. You may use a combination of diagrams, drawings, expressions/equations, and words.

The school is able to buy 6 boxes of candy bars for $36.80. Each box contains 24 candy bars. What is the cost per candy bar?	Each candy bar will be sold for $2.00. What is the minimum number of candy bars that must be sold to meet the goal of raising at least $1,000? (Amount raised = Earnings *minus* costs)
The goal is to have 150 students in the school sell candy bars for the fundraiser. On average, how many candy bars must be sold per student to meet the goal?	

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Plan 2: Selling Flowers

In answering each question, explain or show your reasoning. You may use a combination of diagrams, drawings, expressions/equations, and words.

The school is able to buy a dozen carnations for $8.68. For the fundraiser, the carnations will be sold with a 90% markup. For what price will the school sell one dozen carnations?

The school will be charged a one-time shipping fee of $89.50 for the flowers. For each flower sold, the school will earn $1.05 for the fundraiser.
Explain why both of these inequalities could be used to determine the number of carnations the students need to sell to meet the goal of $1,000:

- $1.05n - 89.5 \geq 1{,}000$, where n represents the number of carnations sold
- $1.05(12d) - 89.5 \geq 1{,}000$, where d represents the number of dozens of carnations sold.

Use the following inequality to determine n, the minimum number of carnations the students need to sell to meet the goal.

$$\mathbf{1.05n - 89.5 \geq 1000}$$

The goal is to have 150 students sell carnations for the fundraiser. If each student sells the same number of carnations, approximately how many carnations will each student sell?

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Plan 3: Walkathon

The third possible fundraiser is a walkathon. Each lap around a track is $\frac{1}{4}$ of a mile. Students will receive a donation for each lap they walk around the track. The principal expects each student to walk $1\frac{1}{2}$ laps in $\frac{1}{4}$ of an hour.

In answering each question, explain or show your reasoning. You may use a combination of diagrams, drawings, expressions/equations, and words.

To meet the principal's expectation, at what rate of miles per hour must the students walk?
The fundraiser will require the students to walk 9 complete laps. If a student meets the principal's expectation, how many hours will it take to walk 9 complete laps? 
Each student will receive $1.50 per lap. If each student completes exactly 9 laps, what is the minimum number of students that will be needed to meet the goal of raising at least $1,000?

Conclusion: Based on your analysis, which fundraising plan would you recommend the school use? Include any relevant information and mathematical reasoning to support your answer.

WEEK 5 || Expression and Equations Standards 7.EE.3-7.EE.4: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Reviewing Steps for Solving Equations and Properties of Equality

Addition Property of Equality

Words Adding the same number to each side of an equation produces an equivalent equation.

Algebra If $a = b$, then $a + c = b + c$.

Subtraction Property of Equality

Words Subtracting the same number from each side of an equation produces an equivalent equation.

Algebra If $a = b$, then $a - c = b - c$.

If a = b, then

a + c = b + c

If a = b, then

a − c = b − c

Multiplication Property of Equality

Words Multiplying each side of an equation by the same number produces an equivalent equation.

Algebra If $a = b$, then $a \cdot c = b \cdot c$.

Division Property of Equality

Words Dividing each side of an equation by the same number produces an equivalent equation.

Algebra If $a = b$, then $a \div c = b \div c, c \neq 0$.

If a = b, then

a ● c = b ● c

If a = b, then

a ÷ c = b ÷ c

Turning a TV *on* and turning that TV *off* can be considered *inverse operations*. Describe two other real-life situations that can be thought of as inverse operations.

_____

_____

Describe the inverse operation that will undo the given operation:

Multiplying by $\frac{2}{7}$ _____

Subtracting –4 _____

Dividing by –3.5 _____

Adding $\frac{2}{3}$ _____

Match the equation in the top table with the first step to solve it in the bottom table.

$1.2 + 2d = 10$	$1.2d = 10$	$\frac{d}{1.2} = 10$	$\frac{d}{1.2} - 2 = 10$

Add 1.2	Subtract 1.2	Multiply by 1.2	Divide by 1.2

Review the two examples that show the process for solving an equation below. Make sure to attend to any properties of equality shown next to solution steps.

Solve $-3x + 5 = 2$. Check your solution.

	$-3x + 5 = 2$	Write the equation.
Undo the addition. →	$\underline{-5} \quad \underline{-5}$	Subtraction Property of Equality
	$-3x = -3$	Simplify.
Undo the multiplication. →	$\frac{-3x}{-3} = \frac{-3}{-3}$	Division Property of Equality
	$x = 1$	Simplify.

The solution is $x = 1$.

Check

$-3x + 5 = 2$

$-3(1) + 5 \stackrel{?}{=} 2$

$-3 + 5 \stackrel{?}{=} 2$

$2 = 2$ ✓

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Solve $\frac{x}{8} - \frac{1}{2} = -\frac{7}{2}$. Check your solution.

$\frac{x}{8} - \frac{1}{2} = -\frac{7}{2}$	Write the equation.
$+\frac{1}{2} \quad +\frac{1}{2}$	Addition Property of Equality
$\frac{x}{8} = -3$	Simplify.
$8 \cdot \frac{x}{8} = 8 \cdot (-3)$	Multiplication Property of Equality
$x = -24$	Simplify.

Check

$$\frac{x}{8} - \frac{1}{2} = -\frac{7}{2}$$

$$\frac{-24}{8} - \frac{1}{2} \stackrel{?}{=} -\frac{7}{2}$$

$$-3 - \frac{1}{2} \stackrel{?}{=} -\frac{7}{2}$$

$$-\frac{7}{2} = -\frac{7}{2} \checkmark$$

The solution is $x = -24$.

Write the properties that correspond to each solution step for the equation. Choose from the following properties and actions:

Addition Property of Equality	**Simplify**
Subtraction Property of Equality	**Distributive Property**
Multiplication Property of Equality	**Collect Like Terms**
Division Property of Equality	

$$\frac{m}{2} + 6 = 10$$

$$\frac{m}{2} + 6 - 6 = 10 - 6 \quad \_\_\_\_\_$$

$$\frac{m}{2} = 4 \quad \_\_\_\_\_$$

$$2 \bullet \frac{m}{2} = 2 \bullet 4 \quad \_\_\_\_\_$$

$$m = 8 \quad \_\_\_\_\_$$

The solution is $m = 8$.

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$$6(x-2) = -18$$
$$6 \bullet x - 6 \bullet 2 = -18 \quad \_\_\_\_\_$$
$$6x - 12 = -18 \quad \_\_\_\_\_$$
$$6x - 12 + 12 = -18 + 12 \quad \_\_\_\_\_$$
$$6x = -6 \quad \_\_\_\_\_$$
$$\frac{6x}{6} = \frac{-6}{6} \quad \_\_\_\_\_$$
$$x = -1$$

The solution is $x = -1$.

$$4 - 2y + 3 = -9$$
$$7 - 2y = -9 \quad \_\_\_\_\_$$
$$7 - 7 - 2y = -9 - 7 \quad \_\_\_\_\_$$
$$-2y = -16 \quad \_\_\_\_\_$$
$$\frac{-2y}{-2} = \frac{-16}{-2} \quad \_\_\_\_\_$$
$$y = 8 \quad \_\_\_\_\_$$

The solution is $y = 8$.

For each of the equations above, use the given solution to check the equation. Show your work in the space below.

<u>WEEK 6</u> || Expression and Equations Standards 7.EE.3-7.EE.4: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

<u>Identifying and Correcting Errors in Solutions</u>

Nancy thought she correctly solved the equations below, but she made some mistakes. Examine her work below. What should Nancy do to correct the errors that she made? Use the second column in the table to *Identify and Explain Her Errors* and use the third column to indicate the *Correct Steps and Correct Solution.*

Nancy's Work	Identify and Explain Her Error(s)	Correct Steps and Correct Solution
8 – 5c = –37 $8 - 5c = -37$ $-8 \quad -8$ $5c = -45$ $\frac{5c}{5} = \frac{-45}{5}$ $c = -9$		
3(2x – 4) = 8 $3(2x - 4) = 8$ $6x - 4 = 8$ $+4 \quad +4$ $6x = 12$ $\frac{6x}{6} = \frac{12}{6}$ $x = 2$		
3x + 2x – 6 = 24 $3x + 2x - 6 = 24$ $-2x \quad -2x$ $x - 6 = 24$ $+6 \quad +6$ $x = 30$		

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Nancy's Work	Identify and Explain Her Error(s)	Correct Steps and Correct Solution
−2(x − 2) = 14 $-2(x-2)=14$ $-2x-4=14$ $+4 \quad +4$ $\frac{-2x}{-2}=\frac{18}{-2}$ $x=-9$		
3(2x + 1) + 4 = 10 $3(2x+1)+4=10$ $6x+3+4=10$ $9x+4=10$ $-4 \quad -4$ $\frac{9x}{9}=\frac{6}{9}$ $x=\frac{6}{9}=\frac{2}{3}$		

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Which is the Odd One Out?

Use your knowledge of properties and equations to determine which equation is *not* equivalent to the other three equations in the row.

$2.5x = 12.5$	$22.5 = 10 + 2.5x$	$5(0.5x + 2) = 22.5$	$0.5x + 5 = 12.5$

$\frac{1}{2}(a + 24) = 7$	$-5 = \frac{1}{2}a$	$7 = 12 + \frac{1}{2}a$	$\frac{1}{2}a + 12 = -5$

$-9 = 5 - 3c + 4$	$3c - 9 = -9$	$-4c + c + 9 = -9$	$-3(c - 3) = -9$

<u>WEEK 7</u> || Ratios and Proportional Relationships Standards 7.RP.2: Recognize and represent proportional relationships between quantities.

Proportional Relationships and Constant of Proportionality

Proportional relationships are two-variable relationships that have a consistent rate of change and include the value (0, 0). Proportional relationships can be shown in a variety of ways – in words, a table, a graph, and an equation.

In a proportional relationship, the rate of change, expressed as a ratio of the ***dependent*** variable to the ***independent*** variable, yields the ***constant of proportionality***. The constant of proportionality can be written as a constant in an equation in the form of $y = cx$, where c is the constant of proportionality.

Review the four representations of a proportional relationship shown in the table below.

<table>
<tr>
<td>

Words

A company is tracking its electricity use and charges on a given day. After 4 hours, it has accumulated $40 in charges. After 8 hours, it has accumulated $80 in charges.

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Graph on Coordinate Grid

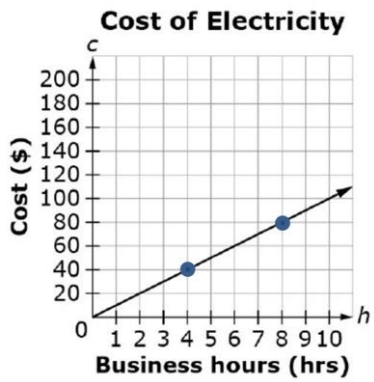

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Table

Hours (h)	Cost (c)
2	20
4	40
8	80

</td>
<td>

Equation

The rate of change is $10 for every hour. So the equation is:

$c = 10h$

</td>
</tr>
</table>

Proportional Relationships/Constant of Proportionality Sort

Identify which graphs and tables do or do not show a *proportional relationship* by placing the letter of each graph or table in the corresponding column. For the tables or graphs that show proportional relationships, determine the *constant of proportionality*.

x	y
–2	4
–1	2
0	0
1	2

A

x	y
2	2
3	4
4	6
5	8

B

x	y
1	2
2	3
3	4
4	5

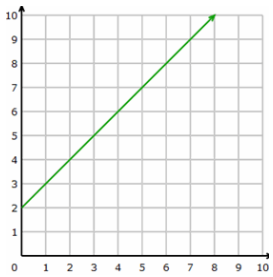
C

x	y
2	3
4	6
6	9
8	12

D

x	y
4	2
8	4
12	6
16	8

E



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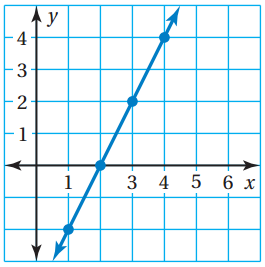

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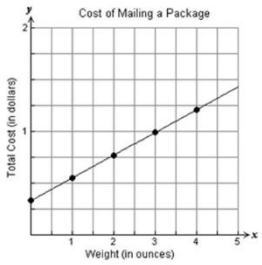
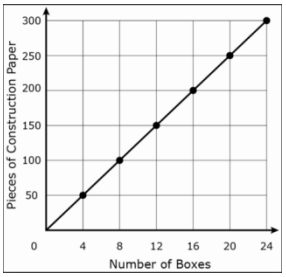
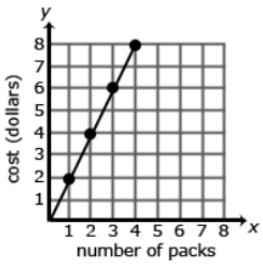


H



I



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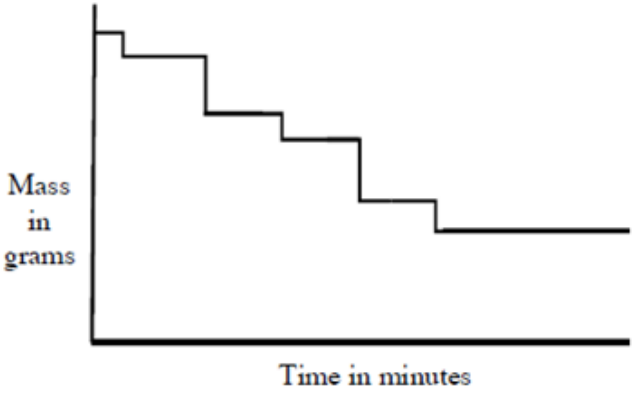
Does Not Show a Proportional Relationship	Shows a Proportional Relationship	What is the Constant of Proportionality?

<u>WEEK 8</u> || Functions Standards 8.F.4-8.F.5: Use functions to model relationships between quantities.

<u>Graph #1: Snacking on M&M's</u>

Kelly is eating a pack of M&M's.

The graph shows the changes in the mass of the M&M's in the pack as time passes.



1. What is Kelly doing when there is a vertical line on the graph?

_____

2. Why are the vertical lines of different lengths?

_____

_____

3. Did Kelly eat all of the M&M's? Explain how you know.

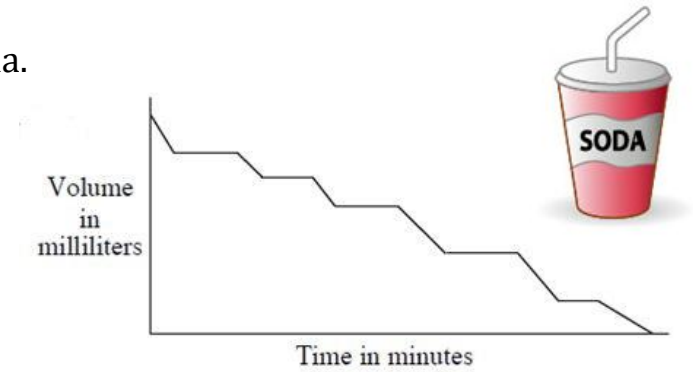
_____

_____

Graph #2: Drinking a Cup of Soda

Ezra is drinking with a straw from a cup of soda.

The graph shows the volume of soda in the cup as time passes.



1. What is happening when the line on the graph is horizontal?

_____

_____

2. Why do the lines going downwards on this graph go at an angle?

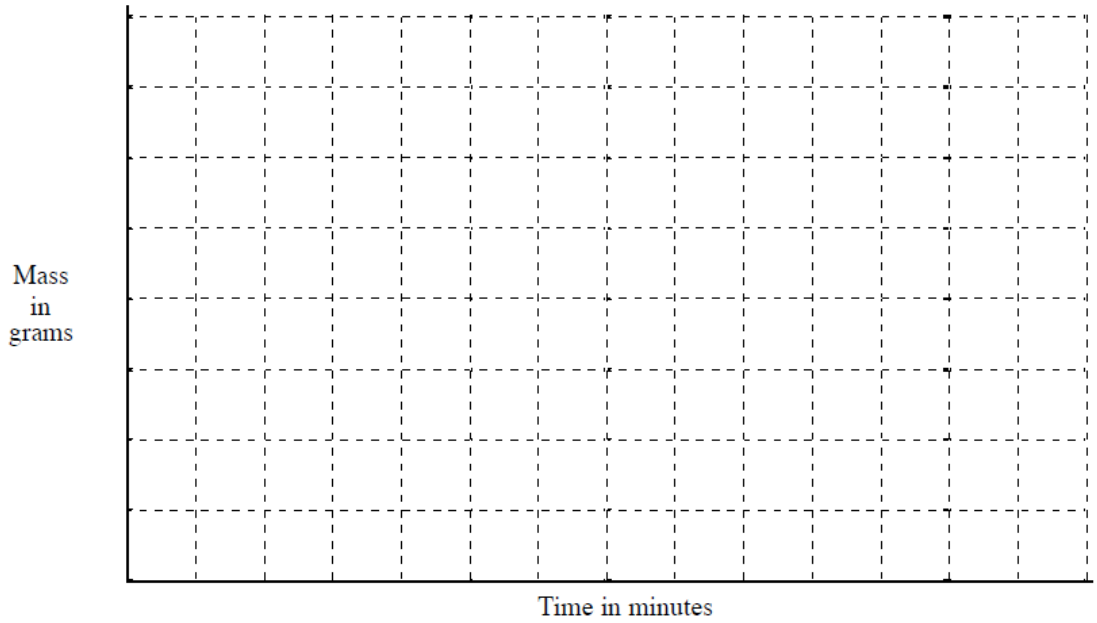
_____

_____

Graph #3: Eating Cherries

Kara is eating cherries from a bag. After eating a cherry, she puts the stone back into the bag before taking out the next cherry.

1. On the grid, draw a graph to show the changes in the mass of the bag of cherries as time passes.



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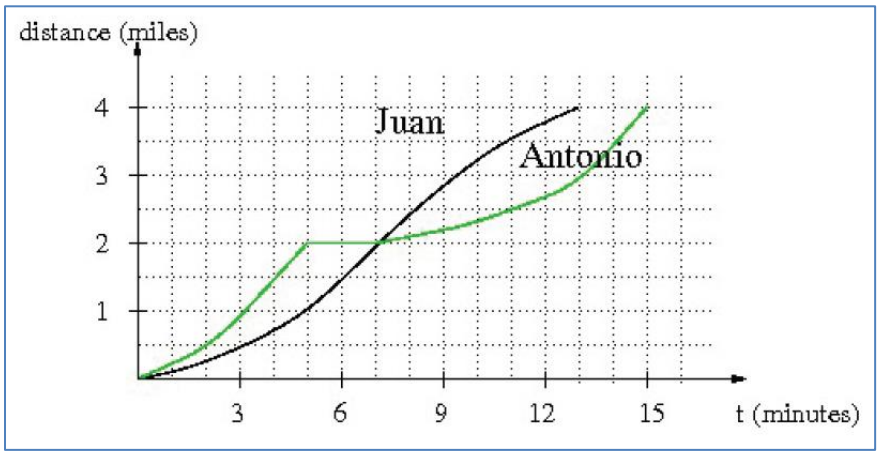
Graph #4: Bike Race

Antonio and Juan are in a 4-mile bike race. The graph below shows the distance of each racer (in miles) as a function of time (in minutes).



1. Who wins the race? How do you know?

_____

2. Give a possible explanation for Antonio's progress during minutes 5 to 7 of the race.

_____

_____

3. Imagine you were watching the race and had to announce it over the radio. Write a short story describing what happened in the race.

_____

_____

_____

_____

_____