Name _____ Period _____ Date _____

MathLinks

8-7
STUDENT PACKET

MATHLINKS: GRADE 8
STUDENT PACKET 7
EXPLORING FUNCTIONS

Commentary on the packet will be in red in text boxes along the way.

Welcome to a *MathLinks* Student Packet (SP). This packet is from *MathLinks*: Grade 8 and is SP7, meaning it is the 7th packet out of 16.

On the cover sheet you will find the titles, goals, and page numbers of the three concept lessons as well the location of the fourth section which is always the Skill Builders, Vocabulary, and Review.

WORD BANK

Word or Phrase	Definition or Explanation	Example or Picture
direct proportion		
function		
graph of a function		
input-output rule		
linear function		
rate		
unit rate		
variable		

All major vocabulary for the SP is found in the Word Bank, though some words are introduced and defined within the lessons. All words are defined or explained in the Resource Guide.

The Resource Guide also includes explanations and examples. It replaces the examples and glossary of a traditional textbook.

Students will receive the resource guide in two parts, roughly corresponding to the two semesters in the school year.

INTRODUCTION TO FUNCTIONS

Summary

We will explore the concept of a function. We will define the terms function and graph of a function. We will describe examples of functions and examples of non-functions.

Goals

- Define function and the graph of a function.
- Interpret different representations of functions.
- Determine when a set of ordered pairs is the graph of a function.

Warmup

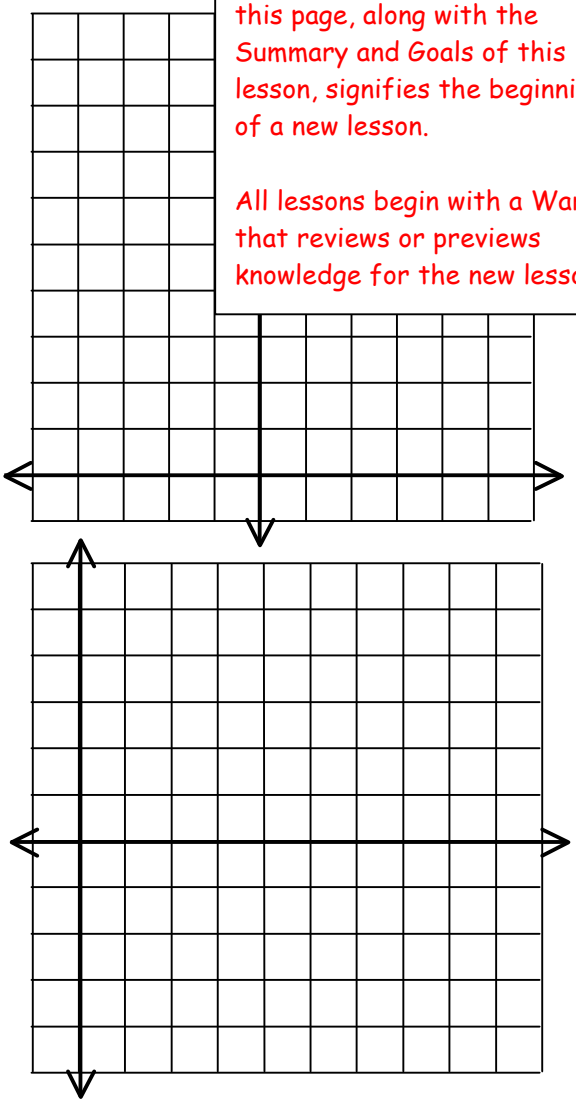
Fill in the *t*-tables and draw the graph for each rule.

1. $y = x^2 + 1$

x	y
3	
2	
1	
0	
-1	
-2	
-3	

2. $x = y^2 + 1$

x	y
	3
	2
	1
	0
	-1
	-2
	-3



The black strip along the top of this page, along with the Summary and Goals of this lesson, signifies the beginning of a new lesson.

All lessons begin with a Warmup that reviews or previews knowledge for the new lesson.

WHAT IS A FUNCTION?

A function is a rule that assigns to each input value exactly one output value.

Example 1: Consider the equation $y = x + 1$. Here are some pairs of values that satisfy this equation.

x (input)	4	3	2	1	0	-1
y (output)	5	4	3	2	1	0

Some lesson pages look like "workbook" pages, but this is generally not the intent. In this case, structured workspace gives teachers references for discussing definitions and students a place to record and apply what they are learning.

In the Teacher Packet (TP), which is in the Teacher Guide, you will find more information to help you deliver lessons.

1. Write the values in the table as ordered pairs (x, y).

2. For the input value $x = 4$, can y have a value other than 5? _____

3. Do any of the given inputs have more than one output value? _____

4. Can you think of any input values that might have more than or

5. Is the rule defined by the equation a function? _____

Example 2: Here is a list of 4 friends (inputs) and the number of pets each friend owns (outputs).

Name of friend	Number of pets
Mary	3
Kerry	1
Larry	0
Barry	0

6. Write the table as ordered pairs (input, output).

7. Can two (or more) different friends have the same number of pets? _____

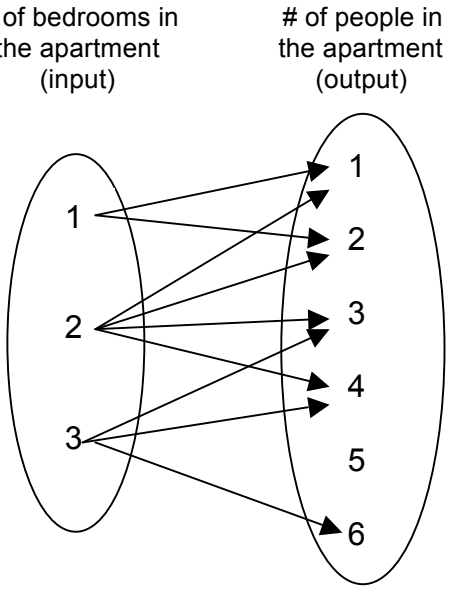
8. Mary has 3 pets. Could Mary have exactly 3 pets and at the same time have exactly 7 pets?_____

9. Can any one friend have two different numbers of pets? _____

10. Do the inputs and outputs in this table represent a function? _____

WHAT IS A FUNCTION? (Continued)

Example 3: An apartment building has nine apartments. It has two one-bedroom apartments, four two-bedroom apartments, and three three-bedroom apartments. This mapping diagram shows the number of bedrooms and people in the apartments.



11. Write the values in the mapping diagram as ordered pairs.

12. How many apartments have

    1 bedroom? _____ 2 bedrooms? _____ 3 bedrooms? _____

13. How many apartments have

    1 person living in it?_____ 2 people living in it?_____

    3 people living in it?_____ 4 people living in it?_____

    5 people living in it?_____ 6 people living in it?_____

14. If you know the number of bedrooms in an apartment, can you determine the number of people that live in that apartment?_____

15. Does this mapping diagram represent a function? _____

PRACTICE WITH FUNCTIONS

1. Which of the following input-output tables represent functions when the variable x is used for the input value and y for the output value? _____

a.

x	y
0	4
3	6
6	8
9	6
12	4

b.

x	y
0	10
2	9
4	8
6	7
8	6

c.

x	1	2	3	4	5
y	9	9	9	9	9

d.

x	9	9	9	9	9
y	1	2	3	4	5

Targeted practice is included in the lesson. More practice is located in Skill Builders in this packet and in future packets.

2. Which of the following sets of ordered pairs represent functions? _____

a. (10, 5), (10, 6), (10, 7), (10, 8)

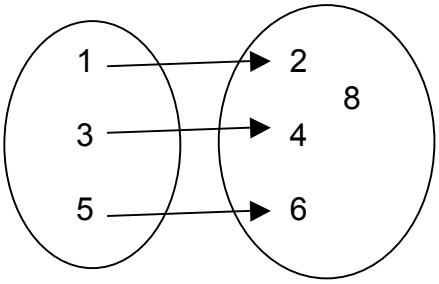
b. (1, 5), (2, 6), (3, 5), (4, 6)

c. (0, 4), (1, 4), (2, 4), (3, 4)

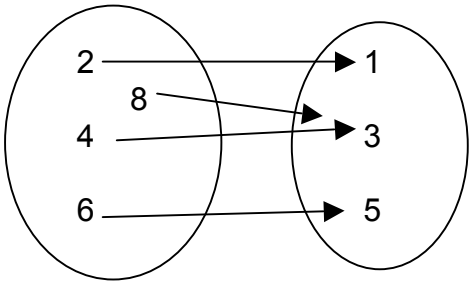
d. (10, -20), (-20, 10), (-10, -5), (10, 5)

3. Which of the following mapping diagrams represent functions? _____

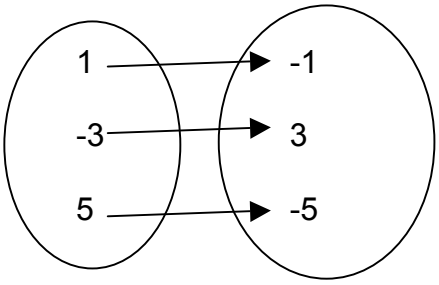
a.



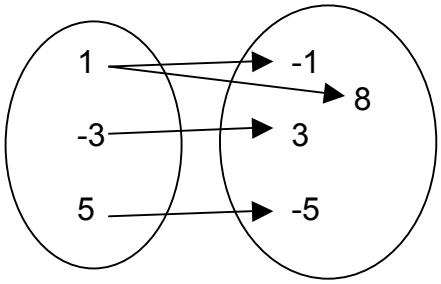
b.



c.



d.



4. Choose one example from above that is not a function and explain why.

THE GRAPH OF A FUNCTION

The graph of a function is the set of all ordered pairs (x, y) where y is the output for the input value x.

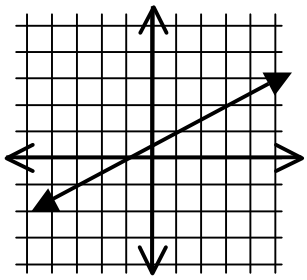
If x and y are real numbers, then we can represent the graph of a function as points in the coordinate plane.

The vertical line test provides a way to determine if a set in the coordinate plane is the graph of a function.

If some vertical line intersects the set in more than one point, then the set is NOT the graph of a function.

Use the vertical line test. Which of the following graphs could represent a function? Which of the graphs appear to be linear?

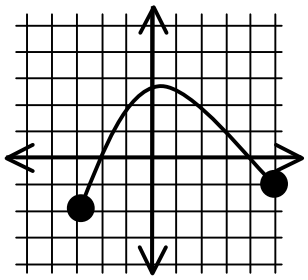
1.



function? _____

linear? _____

2.



function? _____

linear? _____

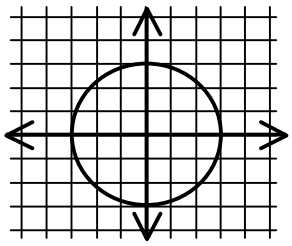
3.

linear? _____

There is structured work space in every lesson, and the layout is not overwhelming to students.

Note that the language used throughout is mathematically precise and consistent. We encourage teachers to help students translate definitions into their own words on the Word Bank (page 0).

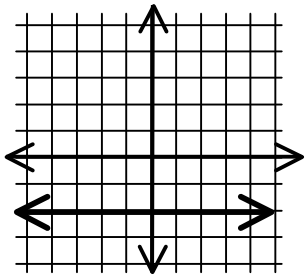
4.



function? _____

linear? _____

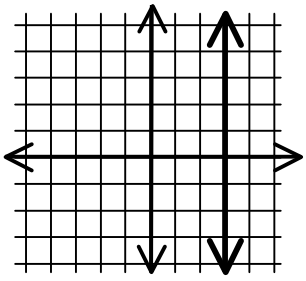
5.



function? _____

linear? _____

6.



function? _____

linear? _____

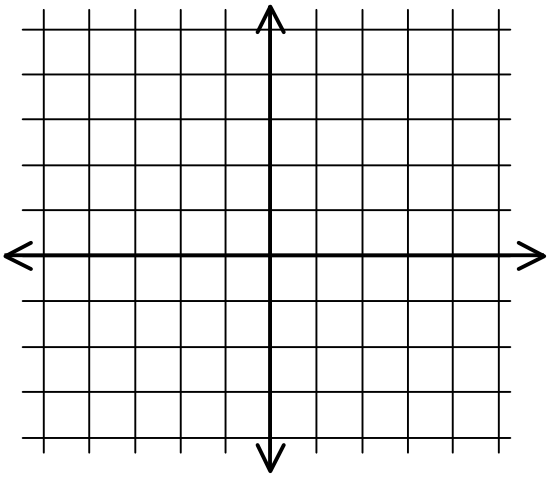
7. Try the vertical line test on the graphs you drew in the warmup. Explain whether either of these graphs could represent a function. Does either of these graphs appear linear?

DRAWING GRAPHS

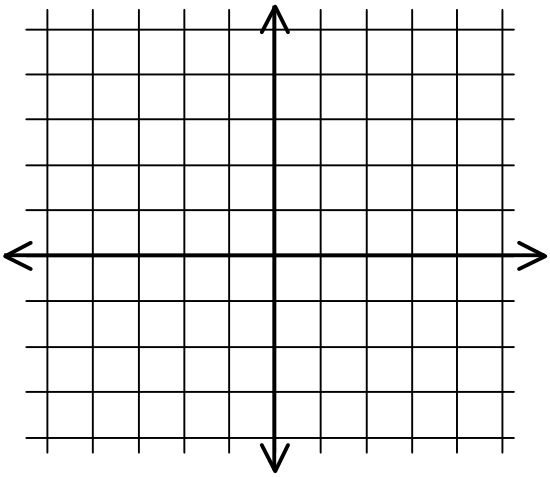
This page is intended to be done individually and then with partners so that discussion is included.

Draw graphs to fit each description.

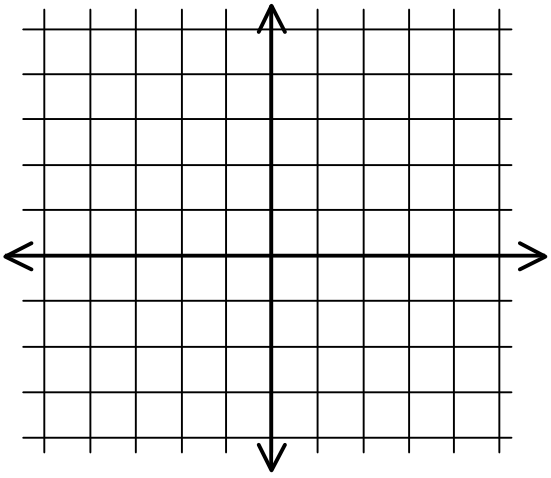
1. A linear function
   (a function whose graph is a line)



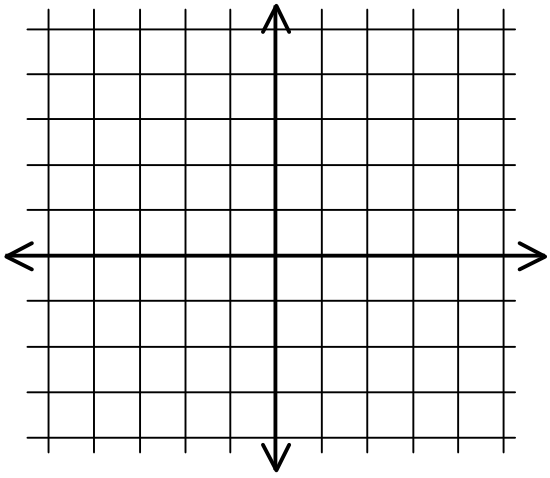
2. A nonlinear function
   (a function whose graph is not a line)



3. A linear "non-function"
   (a graph that is a line, and does not represent a function)



4. A nonlinear "non-function"
   (a graph that is not a line, and does not represent a function)



5. Explain why your graphs for problems 1 and 2 represent functions.

6. Explain why your graphs for problems 3 and 4 do not represent functions.

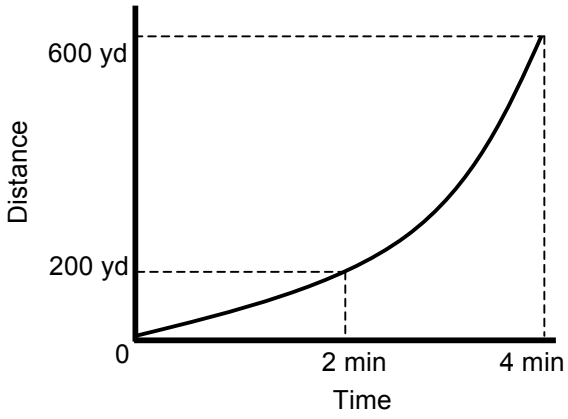
RATE GRAPHS

Summary	Goals
We will use words, pictures, tables of numbers, and graphs to represent rates. We will compare representations of functions.	• Solve problems involving rates, average speed, distance, and time. • Represent situations graphically and interpret the meaning of specific parts of a graph.

Warmup

Chris went jogging at the park.
Use the graph to complete the table.
The graph is not drawn to scale.

The black strip tells us we are starting the second lesson. Summary, Goals, and Warmup always kick off the start



	Time Period	Number of Minutes	Distance Traveled	Average Rate of Speed
1.	From 0 minutes to 2 minutes			
2.	From 2 minutes to 4 minutes			
3.	From 0 minutes to 4 minutes			

This may be a challenging warmup for students, but should generate some good discussion prior to jumping into the rest of the lesson. Small group and whole class discussions should be a huge focus of this entire lesson.

4. In what part of the jog did Chris run faster, the initial two minutes or the last two minutes? Explain by referencing numbers and the shape of the graph.

5. Could Chris' graph represent a function? _____ Does it appear to be linear? _____

POURING WATER 1

Your teacher will give you a small cup and a clear container. Fill up the small cup with water and pour it into the clear container. After each pour, you will measure and record the height of the water in millimeters.

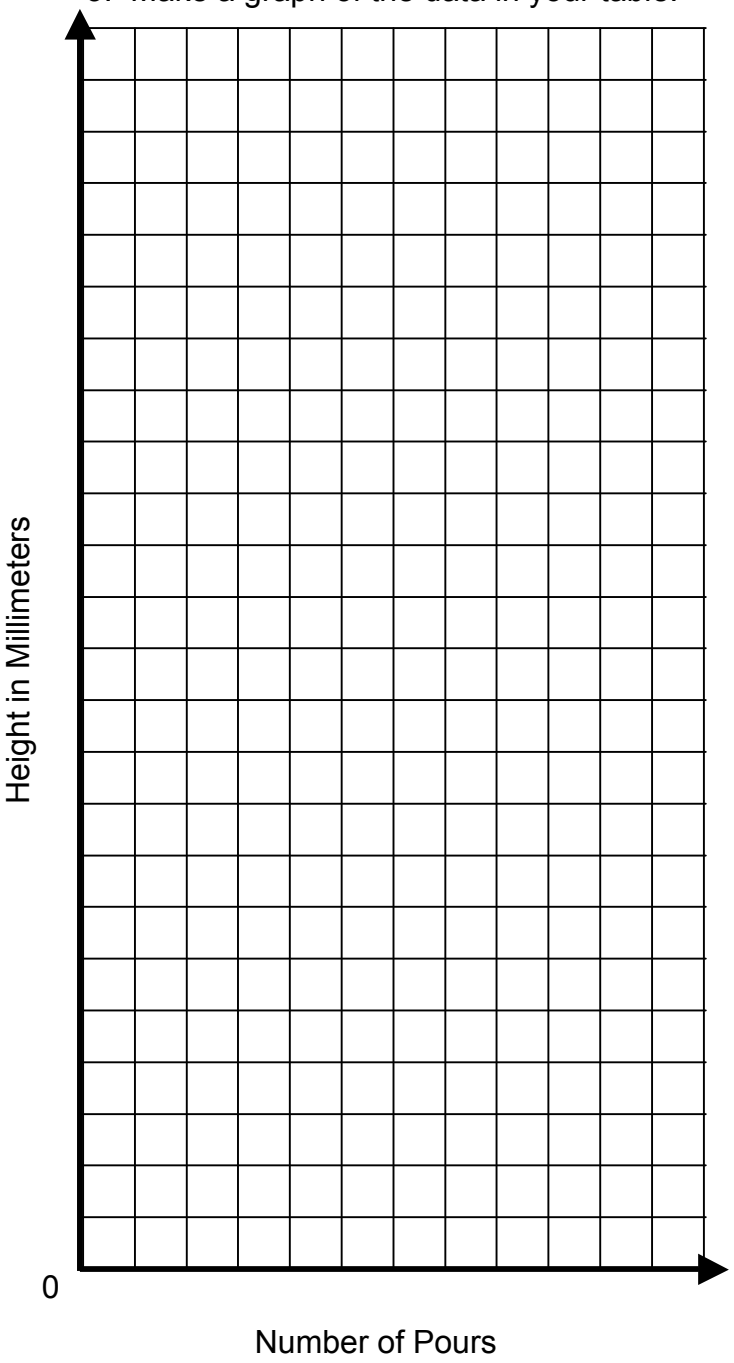
1. Make a sketch of the clear container used.

Though we encourage the hands-on experience for students, some teachers may feel more comfortable demonstrating the water pouring in front of the class. But skipping this page entirely may prevent students from understanding what follows.

2. Record your data in the table.

Number of pours	Height in mm
1	
2	
3	
4	
5	
6	

3. Make a graph of the data in your table.



4. As the number of pours increases, does height increase or decrease?

5. Moving from left to right on the graph, does the graph appear to increase or decrease?

6. Does this graph appear to be linear?

7. Could this graph represent a function?

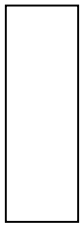
POURING WATER 2

Suppose you poured water into these containers at a constant rate.

- Match each container with an appropriate graph below.
- Write one or two sentences to justify each choice.

Shading each picture with a horizontal back-and-forth motion from bottom to top simulates filling the "containers" with water.

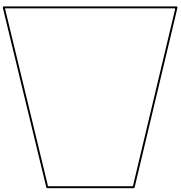
1. Container 1



Graph: _____

Explain:

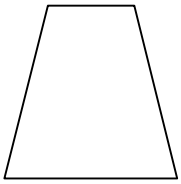
2. Container 2



Graph: _____

Explain:

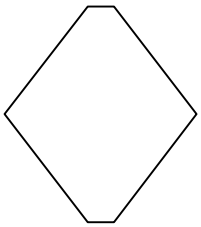
3. Container 3



Graph: _____

Explain:

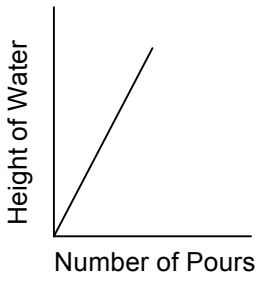
4. Container 4



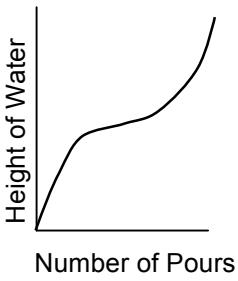
Graph: _____

Explain:

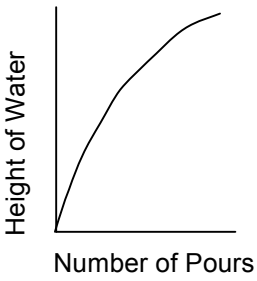
A.



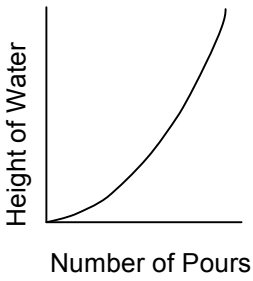
B.



C.



D.



5. As the number of pours increases, which of the graphs above appears to show height increase:

   a. at a constant rate? _____

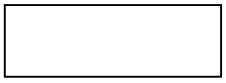
   b. at a rate that starts "slower" and then increases? _____

POURING WATER 2 (Continued)

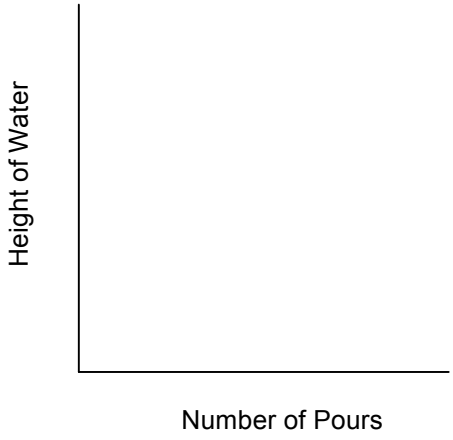
Suppose you poured water into these different containers at a constant rate.

- Sketch a graph for each.
- Write one or two sentences to justify each sketch.

6. Container 5

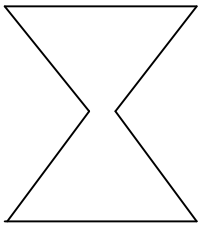


Graph:

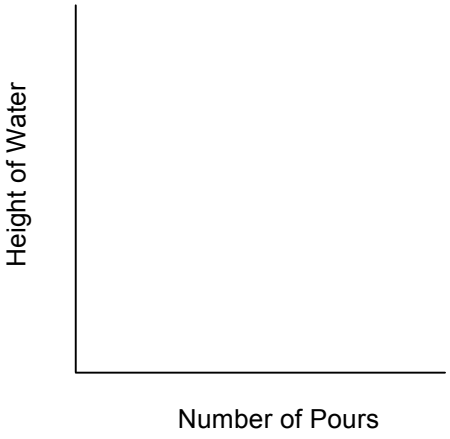


Explain:

7. Container 6



Graph:



Explain:

8. Does either of these graphs appear to be linear? Explain.

9. Could either of these graphs represent a function? Explain.

As in the first lesson, notice the multiple representations used in this lesson as well Students use pictures, numbers in tables, graphs, and writing to inform and explain their thinking. You will see this in the third lesson too.

MATCH THE TABLE TO THE GRAPH

Without plotting points, match each input-output table with a graph below. Write one or two sentences to justify each choice. Look for constant, increasing, or decreasing rates of change.

1.

Input (x)	Output (y)
0	1
1	3
2	5
3	7
4	9
5	11
6	13

Graph: _____
Explain:

2.

Input (x)	Output (y)
0	1
1	4
2	7
3	10
4	13
5	16
6	19

Graph: _____
Explain:

3.

Input (x)	Output (y)
0	1
1	2
2	4
3	7
4	11
5	16
6	22

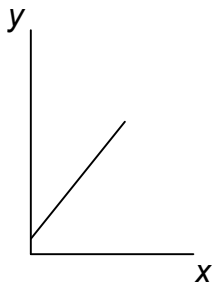
Graph: _____
Explain:

4.

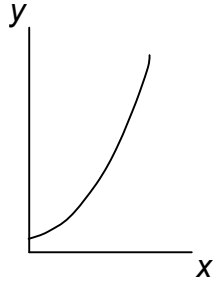
Input (x)	Output (y)
0	1
1	7
2	12
3	16
4	19
5	21
6	22

Graph: _____
Explain:

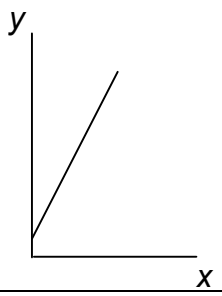
A.



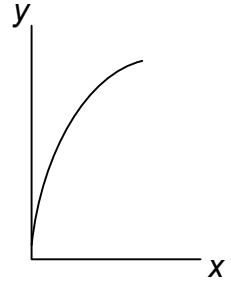
B.



C.



D.



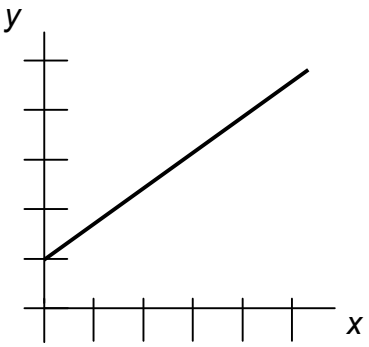
5. Ethan says that the graph for D is decreasing. Is Ethan right? Explain.

MAKE THE NUMBERS FIT

Estimate appropriate ordered pairs for each graph and "x" all correct statements for each.

1.

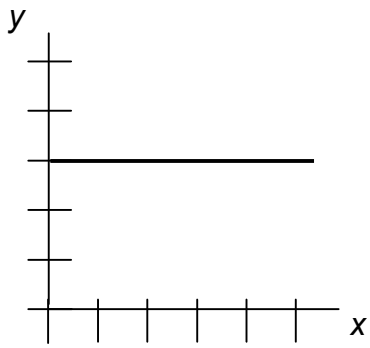
x	*y*



___This graph could represent a function.
___This graph could not represent a function.
___This graph increases.
___This graph decreases.
___This graph is linear.
___This graph is nonlinear.

2.

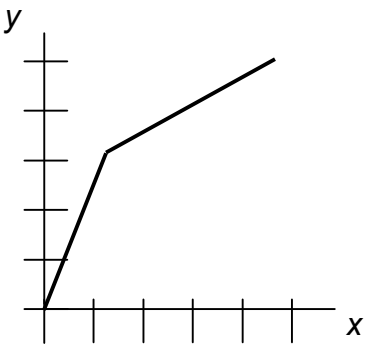
x	*y*



___This graph could represent a function.
___This graph could not represent a function.
___This graph increases.
___This graph decreases.
___This graph is linear.
___This graph is nonlinear.

3.

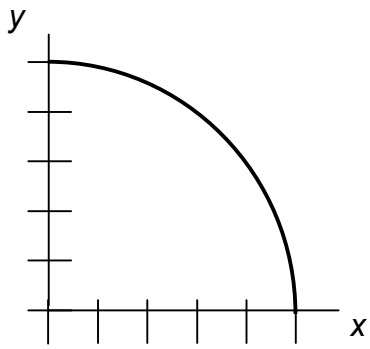
x	*y*



___This graph could represent a function.
___This graph could not represent a function.
___This graph increases.
___This graph decreases.
___This graph is linear.
___This graph is nonlinear.

4.

x	*y*



___This graph could represent a function.
___This graph could not represent a function.
___This graph increases.
___This graph decreases.
___This graph is linear.
___This graph is nonlinear.

BEST BUY PROBLEMS

Summary	Goals
We will use numbers and graphs to help determine which choices are better buys, based on price. We will learn about a special linear function called a direct proportion.	• Use tables, graphs, rules, and verbal descriptions to determine the best buy, based on price. • Write equations that represent relationships between cost and quantity. • Define and identify functions modeling proportional relationships. • Identify unit rates from equations and graphs.

Warmup

You are running out of your favorite pens and pencils, so you compare prices at two stores before making a purchase.

VALUE-MART

Pens: 6 for $7.50

Pencils: 12 for $6.80

SAVINGS HUT

Pens: 6 for $8.25

Pencils: 14 for $6.80

1. At which store are pens cheaper? Explain.

This warmup sets the stage for what we mean by a "better buy."

2. At which store are pencils cheaper? Explain.

BAGELS

SHMEAR 'N THINGS
4 bagels for $3.00

HOLE-Y BREAD
5 bagels for $4.00

1. Complete the tables. Assume a proportional relationship between the number of bagels and the cost.

SHMEAR 'N THINGS	
# of bagels (x)	cost (y)
4	
8	
12	
16	
20	

HOLE-Y BREAD	
# of bagels (x)	cost (y)
5	
10	
15	
20	
25	

2. Which shop has the better buy? Use entries in the tables to explain your reasoning.

3. Write equations to relate the number of bagels to cost.

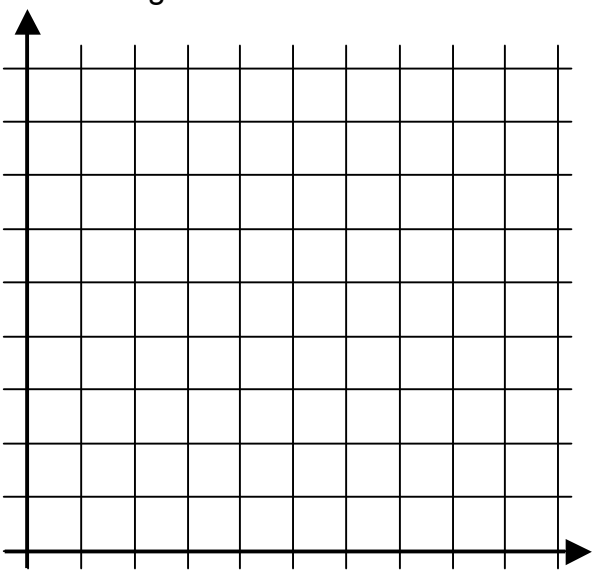
SHMEAR 'N THINGS $y =$ _____

HOLE-Y BREAD $y =$ _____

The linear functions you wrote above are both in the form $y = mx$. This is called a direct proportion equation because y is directly proportional to (is a multiple of) x.

4. How is the direct proportion equation different from the linear function $y = mx + b$?

5. Title, label, and scale the grid. Graph the data using two different colors.



6. Explain which graph illustrates a slower rise in price.

7. Identify the coordinates when $x = 1$

SHMEAR 'N THINGS (1, ____)

HOLE-Y BREAD (1, ____)

What do these y-coordinates represent in the context of the problem?

A big part of mathematical thinking is the ability to go back and forth between representations. Students may be comfortable with some representations and not others, and this also provides practice for them to get better with those that they are not familiar with.

TORTILLAS

FLAT 'N ROUND	WRAP IT UP
3 tortillas for $0.60	4 tortillas for $1.00

1. Complete the tables. Assume a proportional relationship between the number of tortillas and cost.

FLAT 'N ROUND	
# of tortillas (x)	cost (y)
3	
6	

WRAP IT UP	
# of tortillas (x)	cost (y)
4	
8	

2. Which shop has the better buy? Use entries in the tables to explain your reasoning.

3. Write equations to relate the number of tortillas to cost.

   FLAT 'N ROUND $y =$ _____

   WRAP IT UP $y =$ _____

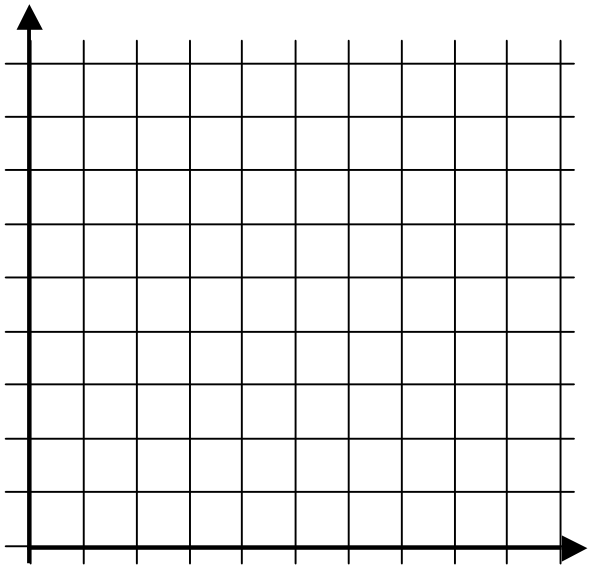
4. Identify the coordinates when $x = 1$

   FLAT 'N ROUND (1, ____)

   WRAP IT UP (1, ____)

   How are these coordinates related to the unit rate for one tortilla?

5. Title, label, and scale the grid. Graph the data using two different colors.



6. Explain which graph illustrates a slower rise in price.

> In the linear function $y = mx + b$, b represents the y-intercept.

7. Write coordinates for the y-intercepts for each function.

   FLAT 'N ROUND (0, ____)

   WRAP IT UP (0, ____)

   What do these y-coordinates represent in the context of the problem?

PITA BREAD

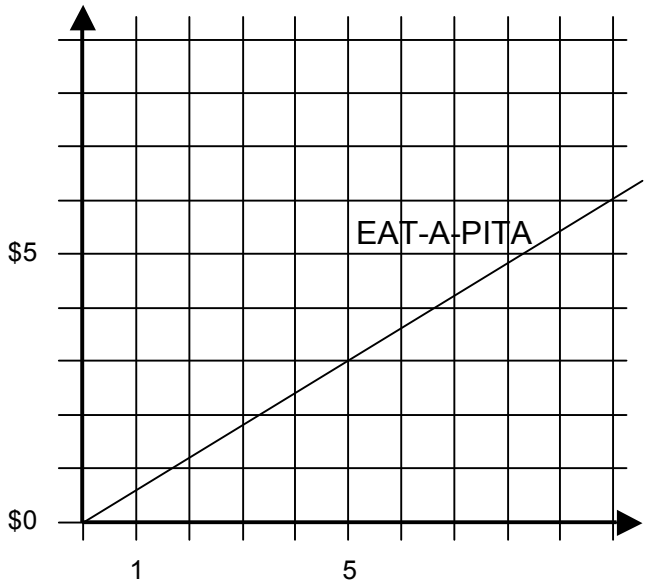
PAPA'S PITA
6 pitas for $____

EAT-A PITA
10 pitas for $____

1. Complete the tables and graphs. The graph for EAT-A PITA is provided. A partial table for PAPA'S PITA is provided. Use tables and graphs to extend the pricing information above. Assume proportional relationships between the number of pitas and cost.

PAPA'S PITA	
# of pitas (x)	cost (y)
2	$1.00

EAT-A PITA	
# of pitas (x)	cost (y)



2. Which shop has the better buy? Use entries in the tables or graphs to explain your reasoning.

3. Write equations to relate the number of pitas to cost.

   PAPA'S PITA y = _____

   EAT-A PITA y = _____

   How can you determine unit rates from these equations?

4. Identify the coordinates when $x = 1$.

   PAPA'S PITA (1, ____)

   EAT-A PITA (1, ____)

   What do these y-coordinates represent in the context of the problem?

5. Identify the coordinates when $x = 0$.

   PAPA'S PITA (0, ____)

   EAT-A PITA (0, ____)

   What do these y-coordinates represent in the context of the problem?

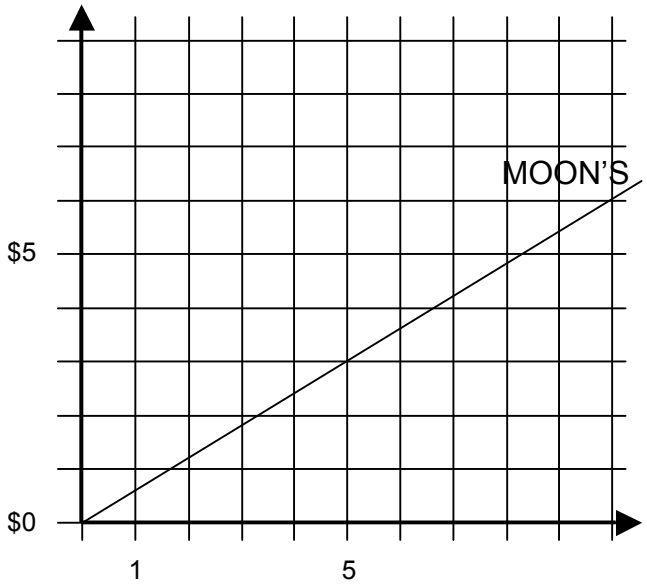
CROISSANTS

MOON'S	CURVEY'S
5 croissants for $____	8 croissants for $____

1. Complete the tables and graphs. The graph for Moon's Croissants is provided. A partial table for Curvey's is provided. Use tables and graphs to extend pricing information above.

MOON'S	
# of croissants (x)	cost (y)

CURVEY'S	
# of croissants (x)	cost (y)
4	$2.00



2. Which shop has the better buy? Use entries in the tables or graphs to explain your reasoning.

3. Write equations to relate the number of croissants to cost.

   MOON'S y = _____

   CURVEY'S y = _____

   How can you determine unit rates from these equations?

4. Identify the coordinates when x = 1.

   MOON'S (1, ____)

   CURVEY'S (1, ____)

   What do these y-coordinates represent in the context of the problem?

5. Identify the coordinates when x = 0.

   MOON'S (0, ____)

   CURVEY'S (0, ____)

   What do these y-coordinates represent in the context of the problem?

SKILL BUILDERS, VOCABULARY, AND REVIEW

SKILL BUILDER 1

Simplify.

1. $-25 + (-35)$	2. $-280 + 80$	3. $36 - (-4)$
4. $-100 - 50$	5. $-12(-3)$	6. $(1 - 4) \bullet 2 - 5$
7. $-48 \div (-4)$	8. $-2 \bullet 153$	9. $\frac{-240}{3}$
10. $3 - 5(-2)$	11. $\lvert -3 + 12 \rvert$	12. $\lvert -3 - 12 \rvert$
13. $-20 \div 10 \bullet (-2)$	14. $-6 + (-5.2)^2$	15. $-6 - 5.2^2$

Skill Builders usually have 3-4 pages of review at the start, strategically built in, both to include review for fluency's sake, and to support learning in the current or an upcoming packet.

Evaluate each expression for $m = \frac{1}{2}$ and $n = \frac{3}{4}$.

16. $2m + 2n$	17. $2(m + n)$	18. $n - m$
19. $m - n$	20. $-(m + n)$	21. $\frac{m + n}{2}$

SKILL BUILDER 2

Check each solution. If a step is not correct, circle the mistake, and rework the problem from that point on. If all steps are correct, write what was done for each step. Use pictures if needed.

1.

Equation/Steps	Describe what was done or make corrections
$-5 + 10x = 15x + 10$ $\underline{-10x} \quad \underline{-10x}$ $-5 = 5x + 10$ $\underline{-10} \quad \underline{-10}$ $\frac{-5}{5} = \frac{5x}{5}$ $-1 = x$	given equation subtract $10x$ from both sides; addition (subtraction) property of equality
Check your solution using substitution:	

2.

Equation/Steps	Describe what was done or make corrections
$-6x - 5 = 4x + 20$ $\underline{+6x} \quad \underline{+6x}$ $-5 = 10x + 20$ $\underline{-20} \quad \underline{-20}$ $\frac{-25}{10} = \frac{10x}{10}$ $\frac{-5}{2} = x$	given equation
Check your solution using substitution:	

SKILL BUILDER 3

Solve each equation.

1. $2.5x - 6 = -4 - x - 2.5x$	2. $3(x - 2.1) = 2(x + 1.2)$
3. $3x - \frac{3}{4} = 1\frac{1}{2}$	4. $\frac{1}{4}x - 4 = -6$
5. $-5x + \frac{1}{3} = 2x - \frac{5}{6}$	6. $\frac{25}{4} = \frac{x}{10}$
7. $\frac{3}{4}x + \frac{1}{2} - x = \frac{1}{2}(x - \frac{1}{4})$	8. Solve $3x + 5y = 12$ For x: For y:

SKILL BUILDER 4

For problems 1-6, write "YES" below each table, set of ordered pairs, or graph that could represent a function. Below those that could not represent a function, write "NO" and explain why not.

1.

x	*y*
9	1
7	3
5	5
3	7
1	9

2.

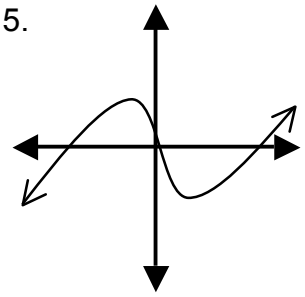
x	*y*
1	9
1	7
3	8
3	6
5	2

3. (0, 0), (1, 1), (2, 2), (3, 3)

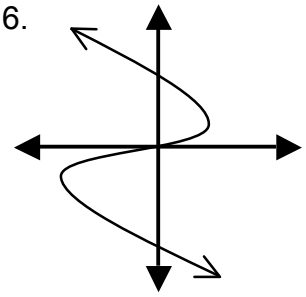
4. (1, 2), (2, 1), (-1, -2), (-2, -1)

First page of practice of current packet's work appears here.

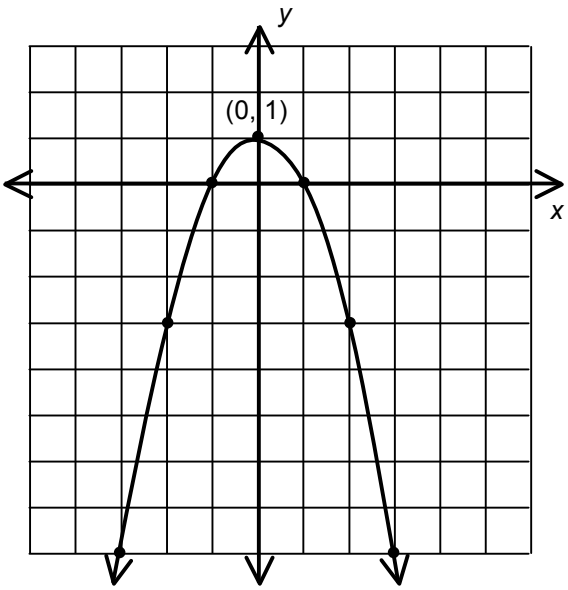
5.



6.



Use the graph to the right for problems 7-10.



7. Is this graph linear or nonlinear?

8. Trace your finger over the graph from left to right.

   Describe where the graph is increasing.

   Describe where the graph is decreasing.

9. Could this graph represent a function? Explain.

10. Circle ALL equations below that could represent this graph.

$y = x^2 + 1$ $y = x^2 - 1$ $y = -x^2 + 1$ $y = -x^2 - 1$ $y = 1 - x^2$ $y = 1 + x^2$

SKILL BUILDER 5

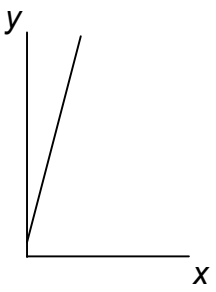
Without plotting ordered pairs, match each input-output table with a graph below.
Write one or two sentences to justify each choice.

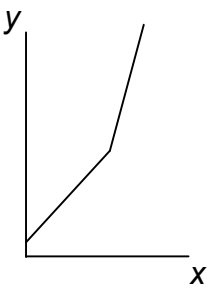
1. Graph: _____ Explain:

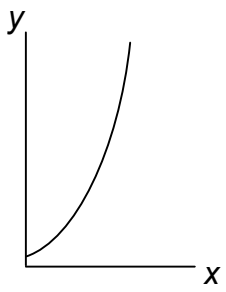
Input (x)	Output (y)
0	1
1	5
2	9
3	13
4	17
5	21
6	25

2. Graph: _____ Explain:

Input (x)	Output (y)
0	1
1	2
2	4
3	7
4	11
5	16
6	22

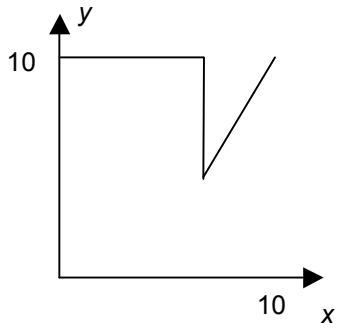
A. 

B. 

C. 

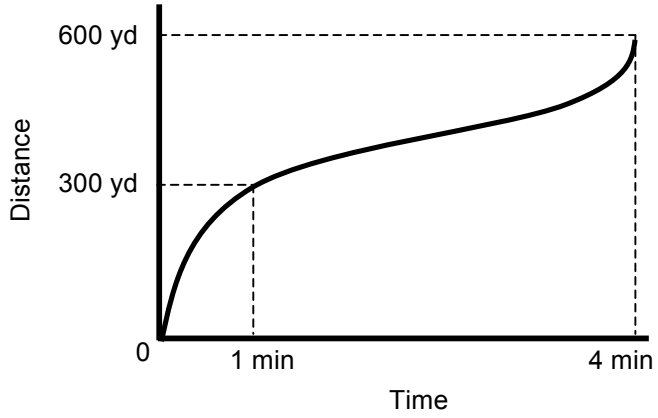
3. Estimate appropriate ordered pairs for the graph. Could this graph represent a function? Explain.

x	y



SKILL BUILDER 6

Chaz went running at the park. Use the graph to complete the table.



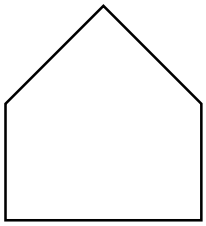
Graph is not drawn to scale.

	Time period	Distance traveled	Average rate of speed
1.	From 0 minutes to 1 minute		
2.	From 1 minute to 4 minutes		
3.	From 0 minutes to 4 minutes		

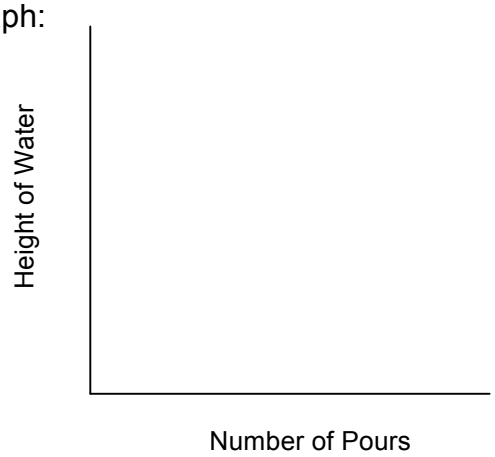
4. In what part of the jog did Chaz run faster, the initial one minute or the last three minutes? Explain by referencing numbers and the shape of the graph.

5. Suppose you poured water into this container at a constant rate. Sketch a graph relating the height of the water to the number of pours, and explain your reasoning.

Explain:



Graph:



SKILL BUILDER 7

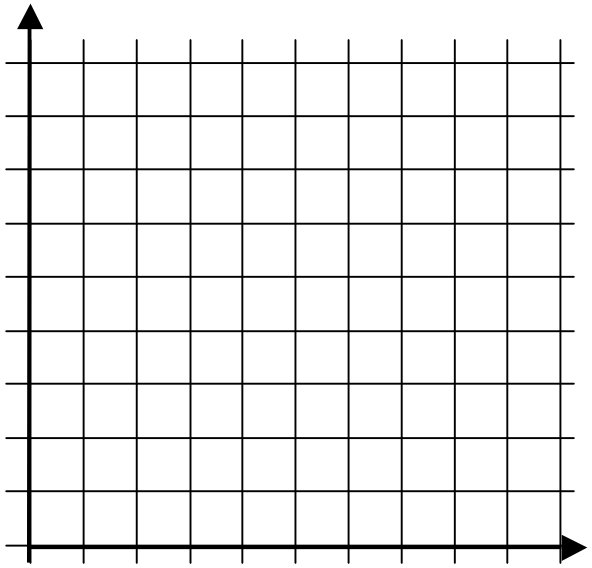
SOCKS 'R WE
4 pairs of socks for $6.00

HOSIERY HUT
6 pairs of socks for $7.80

SOCKS 'R WE	
# of pairs (x)	cost (y)

HOSIERY HUT	
# of pairs (x)	cost (y)

1. Fill in the table, assuming a proportional relationship between the number of pairs of socks and cost. Which shop has the better buy? Use entries in the tables to explain your reasoning.



2. Title, label and scale the grid. Graph the data using two different colors. Explain which graph illustrates a slower rise in price.

3. Find the unit rates for pairs of socks at both shops. Use these numbers to explain which has the better buy.

4. Write equations to relate the number of pairs of socks to cost.

   SOCKS 'R WE $y =$ _____ HOSIERY HUT $y =$ _____

5. How can you determine unit rate from the equation?

SKILL BUILDER 8

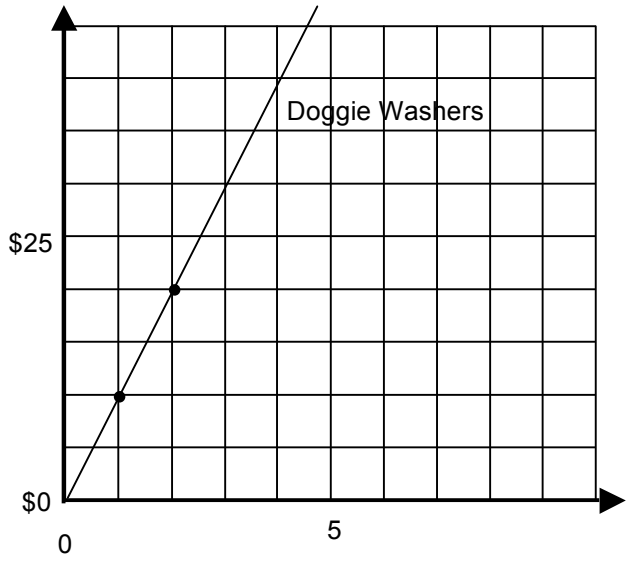
DOGGIE WASHERS
5 washes for $____

POOCH CLEANERS
4 washes for $____

1. Complete the tables and graphs. Assume a proportional relationship between the number of washes and the cost. The graph for Doggie Washers is provided. A partial table for Pooch Cleaners is provided. Use tables and graphs to fill in the pricing information above.

DOGGIE WASHER	
# of washes (x)	cost (y)

POOCH CLEANERS	
# of washes (x)	cost (y)
4	$32
6	$48



2. Which shop has the better buy? Use entries in the tables or graphs to explain your reasoning.

3. Write equations to relate the number of dog washes to cost.

   DOGGIE WASHERS y = _____

   POOCH CLEANERS y = _____

4. How can you determine unit rate from the equation?

5. Identify the coordinates when $x = 1$.

   DOGGIE WASHERS (1, ____)

   POOCH CLEANERS (1, ____)

   What do these ordered pairs represent in the context of the problem?

6. Identify the coordinates when $x = 0$.

   DOGGIE WASHERS (0, ____)

   POOCH CLEANERS (0, ____)

   What do these ordered pairs represent in the context of the problem?

FOCUS ON VOCABULARY

Match the words to the clues.

Words	Clues
1. _____ function	a. Its graph is a straight line. It is expressed in the form $y = mx + b$.
2. _____ graph of a funct	b. A rate for one unit of measure. Example: 80 miles per hour
3. _____ input-output rule	c. A rule that establishes an output value for each given input value. Example: $y = 6x - 2$
4. _____ linear function	l. A ratio in which the numbers have units attached to them.
5. _____ rate	e. A linear function where one variable is a multiple of another.
6. _____ unit rate	f. In the equation $d = rt$, the quantities d, r, and t are _____.
7. _____ variables	g. Ordered pairs represented on a coordinate grid.
8. _____ direct proportion	h. The set of ordered pairs (x, y) where each input has a unique output.

After Skill Builders comes Focus on Vocabulary. Most of the words used here can be found in the Word Bank in the front of this SP. Students can also look in their Resource Guides.

This page is always followed by Selected Response, Knowledge Check, and Home-School Connection.

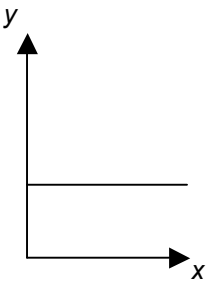
SELECTED RESPONSE

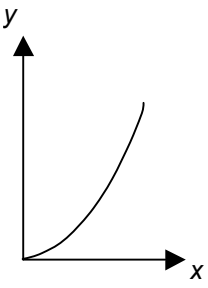
Show your work on a separate sheet of paper and choose the best answer(s).

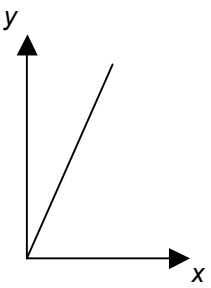
1. Which graph best matches the input-output table below?

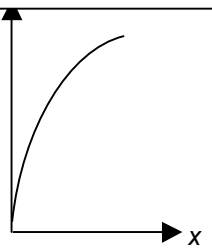
Input (x)	0	1	2	3	4	5
Output (y)	0	2	4	6	8	10

These are exercises where more than one answer may be correct help to prepare students for these types of items on SBAC or PARCC.

A. 

B. 

C. 



---

2. The Office Supply Store and Office Plus both sell notebooks. The Office Supply Store sells 8 notebooks for $7.12. Office Plus sells 5 notebooks for $5.25. Both stores will sell you any number of notebooks at the listed rate. Which store offers the better buy?

The Office Supply Store

# of notebooks (x)	8	16	24	32	40
cost (y)					

Office Plus

# of notebooks (x)	10	20	30	40	50
cost (y)					

A. Office Plus

B. The Office Supply Store

C. The prices are the same

D. Can't tell from information given.

---

3. Which representation below could match the linear function graphed here?

A. The table

Input (x)	0	2	-2	-3
Output (y)	0	-1	1	2

B. The ordered pairs

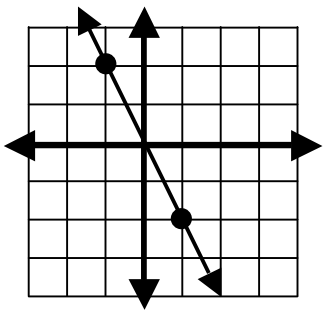
(-1, 2) (1, -2)
(2, -3) (-2, 3)

C. The equation

$y = -2x + 0$

D. The equation

$y = \frac{2}{1}x$



KNOWLEDGE CHECK

Show your work on a separate sheet of paper and write your answers on this page.

These problems are somewhat representative of those in each lesson, and may be used for review or formative assessment.

7.1 Introduction to Functions

Which of the following could represent a function? Explain.

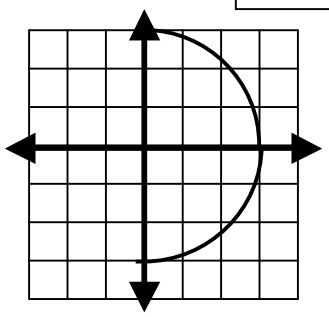
1. (2, 5) (3, 5) (4, 5) (5, 5)

2. $y = 4x - 5$

3.

x	y
0	1
1	2
1	3
2	4

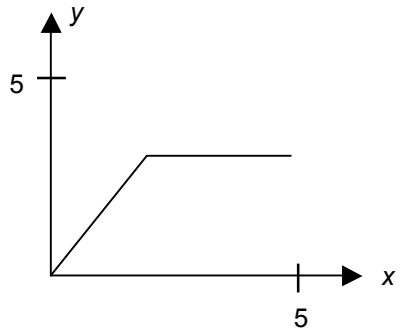
4.



7.2 Rate Graphs

5. Make an appropriate table of numbers for the graph. Use estimates only.

x	y



7.3 Best Buy Problems

T-Shirt Mania and Shirts R' Us sell souvenir t-shirts. T-Shirt Mania charges $18 for three t-shirts and Shirts R' Us charges $25 for four t-shirts.

6. Find the unit rates for t-shirts at both stores. Use the numbers to explain which store has the better buy.

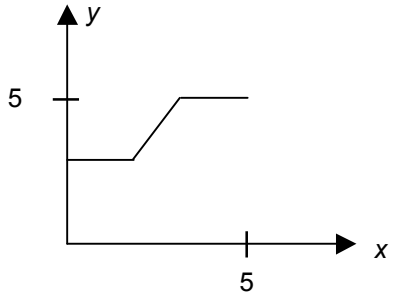
7. Write the equations to relate the number of t-shirts to cost for both stores.

HOME-SCHOOL CONNECTION

Here are some questions to review with your young mathematician.

1. Make an appropriate table of numbers for each graph. Use estimates only.

x	*y*



2. Could the graph from problem 1 represent a function? Explain.

3. Cookies n' Things charges $3.20 for 8 cookies. Cookieland charges $4.50 for 10 cookies. Assume a proportional relationship between the number of cookies and the cost. Which store has the better buy for cookies?

Cookies n' Things

# of cookies (*x*)	8	16	24	32	40
cost (*y*)					

Cookieland

# of cookies (*x*)	10	20	30	40	50
cost (*y*)					

The intent of this page is to provide an opportunity for students to explain to parents or guardians what they are learning.

At this time parents or guardians might check to see if students are completing their work in the packet.

Parent (or Guardian) Signature _____

COMMON CORE STATE STANDARDS – MATHEMATICS

STANDARDS FOR MATHEMATICAL CONTENT	
6.RP.A*	**Understand ratio concepts and use ratio reasoning to solve problems.**
6.RP.3a*	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
7.RP.A*	**Analyze proportional relationships problems.**[1]
7.RP.2b*	Identify the constant of proportionality descriptions of proportional relationshi
7.RP.2c*	Represent proportional relationships b *number n of items purchased at a con number of items can be expressed as*
7.RP.2d*	Explain what a point *(x, y)* on the grap with special attention to the points (0,
8.EE.B	**Understand the connections between proportional relationships, lines, and linear equations.**
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
8.F.A	**Define, evaluate, and compare functions.**
8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
8.F.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*
8.F.B	**Use functions to model relationships between quantities.**
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

These are the major content standards that are addressed in this packet. It is common for a standard to fully play out over multiple lessons and multiple packets.

The practice standards below are not an exhaustive list, but are good examples of MPs in these lessons (See Teacher Note 1 in TP7). All of the MPs are revisited frequently throughout each course.

*Review of content essential for success in 8th grade.

STANDARDS FOR MATHEMATICAL PRACTICE	
MP2	Reason abstractly and quantitatively.
MP3	Construct viable arguments and critique the reasoning of others.
MP4	Model with mathematics.
MP6	Attend to Precision
MP7	Look for and make use of structure

9 7 8 1 6 1 4 4 5 2 1 5 7