CHAPTER 4

Family Letter

Section A

What We Are Learning

Function Concepts

VOCABULARY
These are the math words we are learning:

continuous graph a graph that is made up of connected lines or curves

dependent variable the *y*-coordinate

discrete graph a graph that is made up of only distinct points

domain the set of first coordinates (*x*-values) of the ordered pairs

function a special type of relation that pairs each domain value with exactly one range value

function notation defines the dependent variable in terms of the independent variable; often written $f(x)$

independent variable the *x*-coordinate

range the set of second coordinates (*y*-values) of the ordered pairs

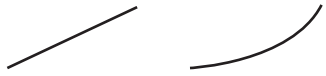
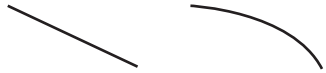
relation a set of ordered pairs

Dear Family,

In this section, the student work with graphs, relations, and functions. The student has been introduced to basic function concepts in previous courses, and now will examine this subject matter in more depth.

Graphs show different situations and relationships, so it is necessary for the student to accurately interpret graphs. Words in a problem are associated with aspects of graphs, and these can help the student interpret a graph.

Interpreting Graphs

Words	On the Graph
stays constant; stayed the same; was unchanged	a horizontal line segment
increases or rises steadily, quickly, or slowly	a segment or curve slanting upward from left to right 
decreases, falls, drops steadily, slowly, or quickly	a segment or curve slanting downward from left to right 

The student will identify two types of graphs: continuous and discrete.

- A **continuous graph** is just like it sounds; there is a continuous line or curve that represents the relationship.
- A **discrete graph** is a graph of only distinct points. Typically a discrete graph represents whole number values, like numbers of people or objects.

These types of graphs will be used throughout the text as the student learns to graph functions and equations on a coordinate plane.

Family Letter

Section A continued

The student will use **ordered pairs** to represent relationships.
Ordered pairs:

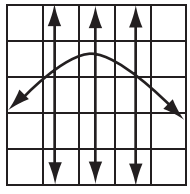
- represent a **relation**.
- have two values: an *x*-coordinate and a *y*-coordinate.
- The *x*-coordinate is *always* written first
- The ***x*-coordinates** are the **domain** of the relation.
- The ***y*-coordinates** are the **range** of the relation.

(x, y)	$(6, 4)$
(domain, range)	(domain: 6, range: 4)

A **function** is a special type of relation that pairs each *x*-coordinate with one *y*-coordinate. The student will need to be able to identify functions. One way to do this on a graph is by using the **vertical line test**.

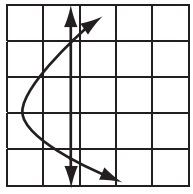
Have the student draw a vertical line through the graph. If any vertical line intersects the graph more than once, then the graph is *not* a function.

Graph of a function



Any vertical line passes through only one point on this graph.

Graph of a non-function



A vertical line passes through 2 points on this graph.

In a function, the **independent variable** is the ***x*-value** and the **dependent variable** is the ***y*-value**. Think: the value of the dependent variable *depends* on the value of the independent variable: *y is a function of x*.

The student should know that $f(x) = 2x$ means the same thing as $y = 2x$ — substitute y for $f(x)$ if it is helpful.

Sincerely,

Name _____ Date _____ Class _____

CHAPTER 4

At-Home Practice

Function Concepts

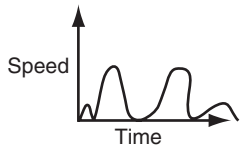
Choose the graph that best represents each situation.

1. A person gradually speeds up on the highway and then uses cruise control to drive the car at a constant rate.

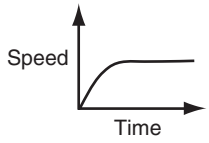
2. A person is driving a car on a busy street with a lot of traffic and stop lights.

3. A person is driving a car that suddenly has a flat tire.

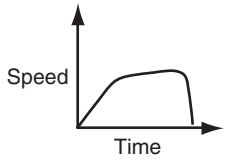
A.



B.



C.



4. A basketball player is counting the number of 3-point shots he can make in 60 seconds. Is the graph of this data discrete or continuous?

Give the domain and range of each relation. Tell whether the relation is a function.

5. {(3, 4), (4, 5), (5, 6), (6, 7)}

domain _____ range _____

function? _____

6.

x	3	6	3	9
y	5	8	4	10

domain _____ range _____

function? _____

Identify the independent and dependent variables. Write a rule in function notation for each situation.

7. Admission to a theater is $25 a ticket.

8. A pitching coach charges $30 per hour.

9. A plumber charges $45 per hour plus a $60 service call fee.

Evaluate each function for the given input values.

10. for $f(x) = 5x - 8$
when $x = 4$ and when $x = -5$

11. for $f(x) = -\frac{1}{3}x - 4$
when $x = 6$ and when $x = 3$

Answers: 1. B; **2.** A; **3.** C; **4.** discrete; **5.** domain: {3, 4, 5, 6}; range: {4, 5, 6, 7}; a function; **6.** domain: {3, 6, 9}; range: {4, 5, 8, 10}; not a function; **7.** independent variable (x): number of tickets, dependent variable (y): total cost of admission, $f(x) = 25x$; **8.** independent variable (x): number of hours, dependent variable (y): total charge, $f(x) = 30x$; **9.** independent variable (x): number of hours, dependent variable (y): total charge, $f(x) = 45x + 60$; **10.** $f(4) = 12$; $f(-5) = -33$; **11.** $f(6) = -6$; $f(3) = -5$

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CHAPTER 4

Family Fun

Function Memory

Materials: 10 ordered pair slips and 10 function slips (below)
Timer (optional)

Objective: To find an order pair that is a point on the graph of a function.

Directions:

- Cut out the slips and place them in the bag.
- Select two slips from the bag. If the two slips show one ordered pair and one function *and* if the ordered pair is a point on the graph of the function, the two cards are a match and the player gets another turn.
- The Wild Card is a match with any of the cards.
- If the two cards are *not* a match, the player returns them to the bag and it is the other player's turn.
- For a timed game, the player with the most matches in 12 minutes is the winner. Otherwise, the first player with 3 matches wins.

$f(x) = 3x + 2$	$f(x) = 15x - 12$	$\left(\frac{1}{2}, -1\right)$
$f(x) = -x + 10$	$f(x) = 4x - 8$	$(-2, 15)$
$f(x) = \frac{1}{4}x + 5$	$f(x) = 3x - 2$	$\left(\frac{3}{4}, 0\right)$
$f(x) = 12x - 7$	Wild Card	$(4, 1)$
$f(x) = -5x + 5$	$(1, 5)$	$(1, 3)$
$f(x) = 8x - 6$	$(10, 0)$	$\left(\frac{1}{2}, -6\right)$
$f(x) = \frac{2}{3}x - \frac{1}{3}$	$(8, 7)$	$(1, 1)$

CHAPTER 4

Family Letter

Section B

What We Are Learning

Applying Functions

VOCABULARY
These are the math words we are learning:

arithmetic sequence the terms of a sequence differ by the same nonzero number

common difference the same difference between two consecutive terms in a sequence

correlation describes a relationship between two sets of data

no correlation there is no relationship between the data sets

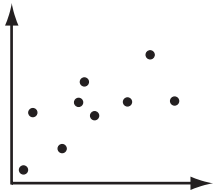
scatter plot a graph with points plotted to show a possible relationship between two sets of data

sequence a list of numbers that often form a pattern

Dear Family,

In this section, the student will continue to investigate the relationship between data sets using graphs to visualize the relationship.

Scatter plots of points are graphs of two data sets that may show a possible relationship between them. Scatter plots are helpful for showing trends in data and are used in the real world for business and marketing strategies.



Ask the student these questions to clarify a scatter plot:

- *How is the data displayed?*
- *Are the points grouped together or spread apart?*
- *Does there seem to be a pattern?*
- *Do the sets of data values climb (increase) or drop (decrease) from left to right on the graph?*

The student will use a **trend line** on a scatter plot to help show the relationship between the two sets of data—a line that the student draws on the graph to show where most of the data is gathered.

A word for describing a relationship between two data sets is **correlation**. There are three types of correlations.

1. **Positive correlation** occurs when both sets of data values increase. For example: the amount of rainfall and the amount of water in a reservoir. The trend line will slant upward from left to right on a scatter plot.
2. **Negative correlation** occurs when one set of data value *decreases* as the other set increases. For example: test scores and the number of classes missed. The trend line will slope downward from left to right. Remind the student that a negative correlation does *not* mean there is *no* correlation.
3. **No correlation** occurs when there is no discernable relationship between the data sets. For example, the number of siblings a person has and her shoe size.

Family Letter

Section B continued

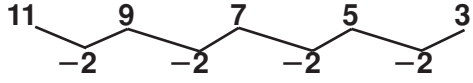
Brainstorm with the student some relationships that would be positively correlated and compare those to some relationships that would be negatively correlated.

Think of sets of data that would have no correlation. These can be quite amusing.

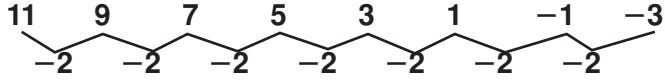
The student will also study **sequences**. The student has worked with patterns since pre-school. Patterning is an important skill in math, reading, and problem solving. An **arithmetic sequence** is a number sequence or pattern where the terms of the sequence have a common difference.

Determine if the sequence 11, 9, 7, 5, 3, … is an arithmetic sequence. If so, find the common difference and the next 3 terms in the sequence.

Step 1 Find the difference between two consecutive terms:



Step 2 There appears to be a common difference of -2 from each term to the previous term. So use -2 to find the next three terms.



The sequence appears to be an arithmetic sequence with a common difference of -2. The next three terms in the sequence are 1, -1, -3.

By finding common differences in the terms, the student will be able to continue the pattern.

Sincerely,

Name _____ Date _____ Class _____

CHAPTER 4

At-Home Practice

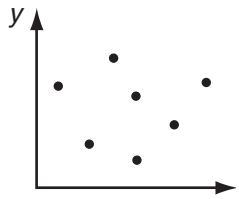
Applying Functions

Choose the scatter plot that best represents the described relationship.

1. the number of people at a restaurant and the number of dirty dishes at the end of the evening

_____

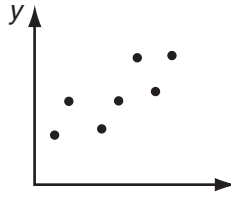
A.



2. the number of empty seats in a restaurant and the wait to be seated in the restaurant

_____

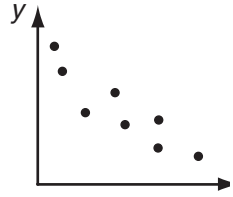
B.



3. the number of people at a restaurant and the number of people going to the theater

_____

C.



Identify the correlation you would expect between each pair of data sets.

4. hair length and shoe size

_____

5. grades and time spent playing video games

_____

6. cereal box weight and price

_____

7. the age of a ski boat and the value of the boat _____

Determine whether each sequence appears to be an arithmetic sequence. If so, find the common difference and the next three terms.

8. 5, 8, 11, 14, …

_____

9. 8, 4, 1, –1, ...

_____

10. –3, –6, –9, –12, …

_____

11. 5, 10, 20, 40, …

_____

12. $\frac{1}{4}, \frac{7}{12}, \frac{11}{12}, \frac{5}{4}, \ldots$

_____

13. $2\frac{1}{2}, 4\frac{1}{2}, 6\frac{1}{2}, \ldots$

_____

Answers: 1. B; **2.** C; **3.** A; **4.** no correlation; **5.** negative correlation; **6.** positive correlation; **7.** negative correlation; **8.** arithmetic sequence; common difference = +3; 17, 20, 23; **9.** not an arithmetic sequence; **10.** arithmetic sequence; common difference = −3; −15, −18, −21; **11.** not an arithmetic sequence; **12.** arithmetic sequence; common difference = $\frac{1}{3}, \frac{19}{12}, \frac{23}{12}, \frac{9}{4}$; **13.** arithmetic sequence; common difference = $2; 8\frac{1}{2}, 10\frac{1}{2}, 12\frac{1}{2}$

Name _____ Date _____ Class _____

CHAPTER 4

Family Fun

Hidden Terms

Objective: To become familiar with math vocabulary

Directions:

Fill in the blanks with the vocabulary words. Circle the words hidden in the puzzle. The words may be horizontal, vertical, diagonal, or backward.

1. The number of hours you study and the grade you receive on a test is an example of _____ correlation.
2. 3, 5, 7, 9, 11, … is an example of an _____ sequence with a common _____ of 2.
3. The correlation between temperature and the pounds of clothing you wear is _____.
4. A _____ _____ is a graph with points plotted to show a relationship between two data sets.
5. A _____ is made up of numbers that often form a pattern.
6. If plotted on a scatter plot, hair color and height would have no _____.
7. A _____ _____ may be drawn on a scatter plot to help show a correlation.

N	P	A	R	I	T	H	M	E	T	I	C	L
O	M	A	H	T	D	I	F	F	E	R	C	E
I	S	C	A	T	T	E	R	P	L	O	T	T
T	E	N	O	I	T	A	R	T	A	W	O	N
A	Q	P	T	R	E	N	D	L	I	N	E	F
L	N	L	S	E	R	E	I	S	G	G	E	K
E	C	O	I	M	H	T	E	R	A	L	V	S
R	E	D	U	S	E	Q	L	T	V	E	I	T
R	E	A	L	P	U	A	I	T	S	E	T	A
O	D	D	A	E	S	V	P	O	S	I	I	B
C	O	M	N	O	E	D	A	T	A	K	S	T
N	H	C	C	R	R	E	T	I	O	N	O	R
E	E	C	N	E	R	E	F	F	I	D	P	E