Unit 2 day 6

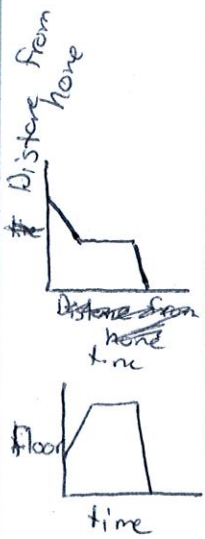*(handwritten graphs in left margin: "Distance from home" vs "time", "Distance from home" vs "time", "floor" vs "time")*

warm up

Sketch a graph for each situation. Tell whether the graph is continuous or discrete.

- A girl is walking home at a steady pace. Then she stopped to talk to a friend. After her friend left, she jogged the rest of the way home.

- Jason was on the second floor when he got a call to attend a meeting on the sixth floor. He took the stairs. After the meeting, he took the elevator to the first floor.

Review

• Discrete	independent variable
• Continuous	dependent variable
• Increasing	function notation
• Decreasing	scatter plot
• constant or remains the same	
• relation	correlation
• domain	positive correlation
• range	negative correlation
• function	no correlation

Correlation

- A **correlation** describes the relationship between the

Correlations

Positive Correlation	Negative Correlation	No Correlation
Both sets of data values increase	One set of data values increases as the other set decreases.	There is no relationship between the data sets

Do teams that spend a lot win a lot?

- Look at the following data, What do you notice? What does it make you wonder?

| Team	Team Payroll	Wins	Sport	Season
N.Y. Yankees	$223,302,212	95	MLB	2012
Oakland A's	$59,493,290	94	MLB	2012
Philadelphia Flyers	$71,072,500	47	NHL	2011 - 12
New York Islanders	$29,573,500	34	NHL	2011 - 12
Minnesota Vikings	$123,553,849	10	NFL	2011 - 12
Jacksonville Jaguars	$92,766,120	2	NFL	2011 - 12
New York Knicks	$117,224,192	36	NBA	2011 - 12
Charlotte Bobcats	$38,032,540	7	NBA	2011 - 12

Do teams that spend a lot win a lot?

- What data would we need to try to answer the question? *wins + payroll*
- What could we do with the data?

Graph the data to see if there is a connection

Do teams that spend a lot win a lot?

- You can work with a partner or by yourself but each of you are going to fill out your own answers but you can complete 2 scatter plots total in your pair.

1

NBA

NFL

NHL

MLB
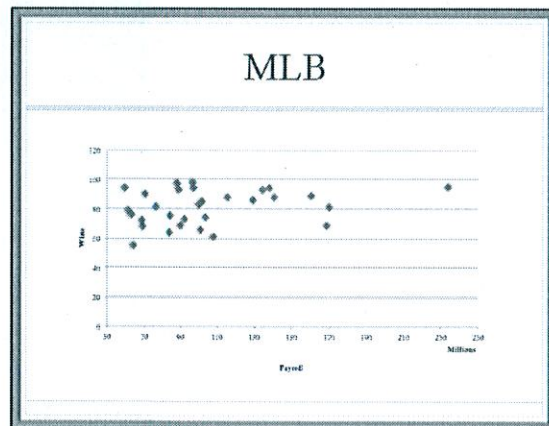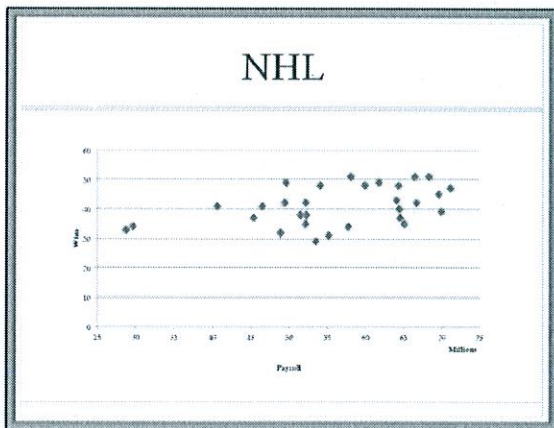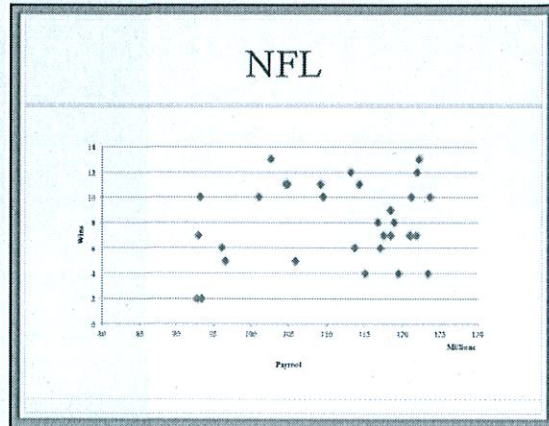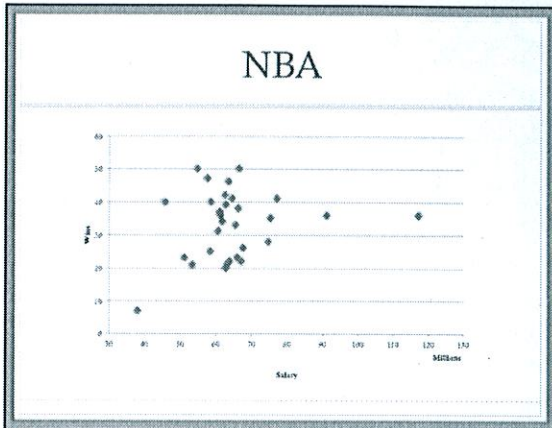
Do teams that spend a lot win a lot?

- Which of the sports show the strongest association between team salaries and total team wins? Which of the sports show the weakest association?

  Strongest – NHL
  weakest – MLB, NFL

- Based on the data from the 4 sports would you say that there is a relationship between team salaries and team wins in the sporting world? Explain…

- Would other information be useful to answer this? age of players

- What does this mean for the sports world?

  larger payroll doesn't guarantee

Success

Homework due on Test day (2 days to work on it)

- Pages 214 – 217
- 5 – 17, 21 – 31, 35 (odd)

Do teams that spend a lot win a lot?

We often hear about teams that spend a lot of money to bring talented players to their team. It makes us wonder, does a large payroll equal more wins? In this activity we will compare sports teams payroll with their team's total wins.

1. Choose two of the following sports leagues:
   - NBA (National Basketball Association)
   - MLB (Major League Baseball)
   - NFL (National Football League)
   - NHL (National Hockey League)

   Collect the data sheets from your teacher based on the sports leagues that you select.

2. From the data what are the variables in this situation? Which is the independent variable? Which is the dependent variable? In general how do you determine independent and dependent variables for a given situation?

3. Create a scatter plot of the data using the given graph paper. Be careful to consider which variable belongs on the x-axis and which belongs on the y-axis. Carefully consider the scales that you use for each axis. It may make sense to talk this out with your partner or ask the teacher for guidance.

4. Does there appear to be an association between team salary and total team wins? If so describe the association, is it positive, is it negative?

5. Are there any data points that appear to be outliers (numbers that clearly don't follow the overall trend)? If so which teams? How did you decide these data points were outliers?

6. Would this graph represent a function? Think about what would make the data not a function.

7. How would you go about predicting how many games a new team that had a salary of 90,000,000 dollars would win? What would you predict of this new team in each of the two leagues that you analyzed.

Major League Baseball payrolls versus win statistics
2012

Team	Total Payroll for 2012	Wins for 2012
N.Y. Yankees	$223,302,212	95
Philadelphia	$169,728,180	81
Boston	$168,614,614	69
L.A. Angels	$160,146,581	89
Detroit	$140,701,213	88
San Francisco	$138,149,994	94
Texas	$134,283,218	93
L.A. Dodgers	$129,080,186	86
St. Louis	$115,449,953	88
Chicago Cubs	$107,708,021	61
N.Y. Mets	$103,710,802	74
Chicago White Sox	$101,763,212	85
Minnesota	$101,165,992	66
Milwaukee	$99,931,760	83
Atlanta	$97,254,832	94
Washington	$96,704,070	98
Toronto	$92,133,335	73
Miami	$89,875,132	69
Baltimore	$89,060,253	93
Cincinnati	$88,106,393	97
Seattle	$84,450,157	75
Colorado	$84,194,072	64
Arizona	$77,162,625	81
Tampa Bay	$70,425,489	90
Cleveland	$69,172,878	68
Kansas City	$68,609,031	72
Houston	$63,941,672	55
San Diego	$62,878,686	76
Pittsburgh	$61,300,313	79
Oakland	$59,493,290	94

National Basketball Association team payroll versus wins statistics
2011 - 2012

Team	Team payroll	Wins
New York Knicks	$117,024,192	36
Dallas Mavericks	$91,171,846	36
Los Angeles Lakers	$77,109,822	41
Philadelphia 76ers	$75,206,185	35
Portland Trail Blazers	$74,608,595	28
Minnesota Timberwolves	$67,479,003	26
New Jersey Nets	$66,985,348	22
San Antonio Spurs	$66,359,832	50
Denver Nuggets	$66,168,524	38
Golden State Warriors	$65,832,355	23
Phoenix Suns	$65,399,240	33
Memphis Grizzlies	$64,451,991	41
Sacramento Kings	$63,731,020	22
Miami Heat	$63,450,821	46
Cleveland Cavaliers	$62,992,729	21
Boston Celtics	$62,622,805	39
Washington Wizards	$62,607,522	20
Indiana Pacers	$62,397,586	42
Houston Rockets	$61,682,117	34
Utah Jazz	$61,158,598	36
Orlando Magic	$61,013,311	37
Milwaukee Bucks	$60,498,470	31
Los Angeles Clippers	$58,484,155	40
Detroit Pistons	$58,349,927	25
Oklahoma City Thunder	$57,644,508	47
Chicago Bulls	$54,754,904	50
New Orleans/Oklahoma City Hornets	$53,185,473	21
Toronto Raptors	$51,131,694	23
Atlanta Hawks	$45,690,622	40
Charlotte Bobcats	$38,032,540	7

National Football League team payrolls versus wins statistics
2011 - 2012

Team	Payroll	Wins
Minnesota Vikings	$123,553,646	10
Philadelphia Eagles	$123,382,065	4
Atlanta Falcons	$122,188,308	13
Houston Texans	$121,904,836	12
St. Louis Rams	$121,835,786	7
Baltimore Ravens	$121,145,293	10
New Orleans Saints	$121,042,487	7
Carolina Panthers	$120,884,226	7
Detroit Lions	$119,379,953	4
Pittsburgh Steelers	$118,875,502	8
Miami Dolphins	$118,447,435	7
New York Giants	$118,357,838	9
San Diego Chargers	$117,510,200	7
Tennessee Titans	$117,037,579	6
Dallas Cowboys	$116,700,139	8
Oakland Raiders	$115,063,751	4
Indianapolis Colts	$114,259,317	11
New York Jets	$113,688,194	6
New England Patriots	$113,156,066	12
Washington Redskins	$109,474,372	10
Green Bay Packers	$109,198,003	11
Arizona Cardinals	$105,870,949	5
Seattle Seahawks	$104,887,632	11
San Francisco 49ers	$104,604,488	11
Denver Broncos	$102,627,531	13
Chicago Bears	$101,032,032	10
Cleveland Browns	$96,659,589	5
Buffalo Bills	$96,114,524	6
Kansas City Chiefs	$93,446,708	2
Cincinnati Bengals	$93,268,320	10
Tampa Bay Buccaneers	$92,988,777	7
Jacksonville Jaguars	$92,768,120	2

National Hockey League team payrolls versus wins statistics
2011 – 2012

Team	Total Payroll	Wins
Philadelphia Flyers	$71,072,500	47
Buffalo Sabres	$69,830,000	39
Chicago Blackhawks	$69,490,000	45
Vancouver Canucks	$68,211,000	51
Washington Capitals	$66,587,500	42
Pittsburgh Penguins	$66,350,000	51
Toronto Maple Leafs	$65,010,000	35
Calgary Flames	$64,492,500	37
Los Angeles Kings	$64,390,000	40
Detroit Red Wings	$64,275,000	48
San Jose Sharks	$63,986,667	43
Boston Bruins	$61,650,000	49
New Jersey Devils	$59,842,500	48
New York Rangers	$58,012,500	51
Anaheim Ducks	$57,705,500	34
Montreal Canadiens	$55,111,700	31
Nashville Predators	$54,015,000	48
Columbus Blue Jackets	$53,400,000	29
Florida Panthers	$52,216,607	38
Phoenix Coyotes	$52,150,000	42
Minnesota Wild	$52,057,500	35
Tampa Bay Lightning	$51,446,785	38
St. Louis Blues	$49,529,167	49
Dallas Stars	$49,355,000	42
Edmonton Oilers	$48,820,000	32
Carolina Hurricanes	$48,728,333	33
Ottawa Senators	$46,450,000	41
Winnipeg Jets	$45,352,585	37
Colorado Avalanche	$40,620,000	41
New York Islanders	$29,573,500	34

Study Guide: Review

Vocabulary

arithmetic sequence	function	range
common difference	function notation	relation
continuous graph	function rule	scatter plot
correlation	independent variable	sequence
dependent variable	negative correlation	term
discrete graph	no correlation	trend line
domain	positive correlation	

Complete the sentences below with vocabulary words from the list above.

1. The set of x-coordinates of the ordered pairs of a relation is called the ___?___ .

2. If one set of data values increases as another set of data values decreases, the relationship can be described as having a(n) ___?___ .

3. A sequence is an ordered list of numbers where each number is a(n) ___?___ .

3-1 Graphing Relationships

EXAMPLES

Sketch a graph for each situation. Tell whether the graph is continuous or discrete.

■ A parking meter has a limit of 1 hour. The cost is $0.25 per 15 minutes and the meter accepts quarters only.
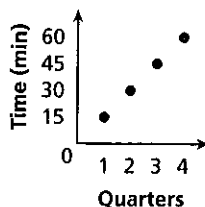
Since only quarters are accepted, the points are not connected.

The graph is discrete.

■ Ian bought a cup of coffee. At first, he sipped slowly. As it cooled, he drank more quickly. The last bit was cold, and he dumped it out.

As time passes the coffee was sipped slowly, drank more quickly, and then dumped out.
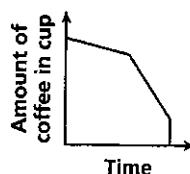
The graph is continuous.

EXERCISES

Sketch a graph for each situation. Tell whether the graph is continuous or discrete.

4. A girl was walking home at a steady pace. Then she stopped to talk to a friend. After her friend left, she jogged the rest of the way home.

5. A ball is dropped from a second story window and bounces to a stop on the patio below.

6. Jason was on the second floor when he got a call to attend a meeting on the sixth floor. He took the stairs. After the meeting, he took the elevator to the first floor.

Write a possible situation for each graph.
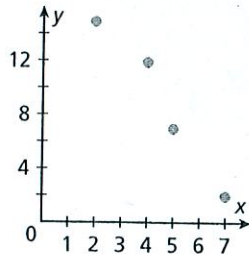
7.
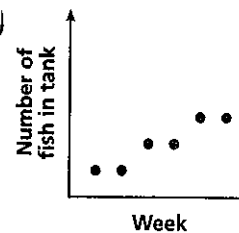
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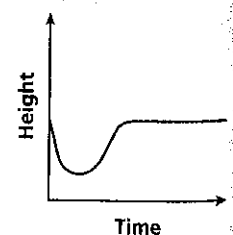
3-2 Relations and Functions

EXAMPLES

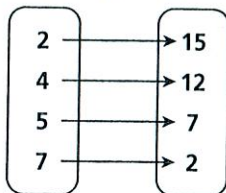■ Express the relation $\{(2, 15), (4, 12), (5, 7), (7, 2)\}$ as a table, as a graph, and as a mapping diagram.

Table

x	y
2	15
4	12
5	7
7	2

Graph

Mapping Diagram

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

■

x	y
−3	0
−2	0
−1	1

D: $\{-3, -2, -1\}$

R: $\{0, 1\}$

The relation is a function because each domain value is paired with exactly one range value.

■
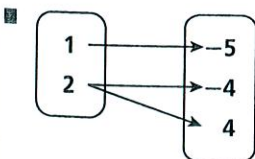
D: $\{1, 2\}$

R: $\{-5, -4, 4\}$

The relation is not a function because one domain value is paired with two range values.

■
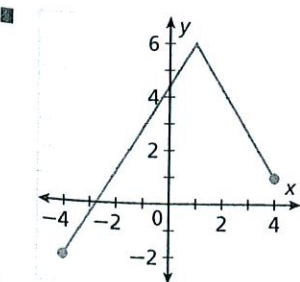
D: $-4 \leq x \leq 4$

R: $-2 \leq y \leq 6$

The relation is a function because every x-value is paired with exactly one y-value.

EXERCISES

Express each relation as a table, as a graph, and as a mapping diagram.

9. $\{(-1, 0), (0, 1), (2, 1)\}$

10. $\{(-2, -1), (-1, 1), (2, 3), (3, 4)\}$
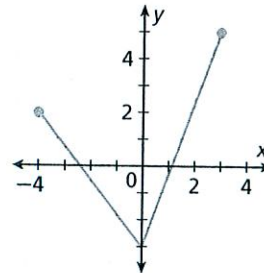
Give the domain and range of each relation.

11. $\{(-4, 5), (-2, 3), (0, 1), (2, -1)\}$

12. $\{(-2, -1) (-1, 0), (0, -1), (1, 0), (2, -1)\}$

13.

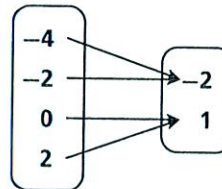| x	0	1	4	1	4
y	0	−1	−2	1	2

14.

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

15. $\{(-5, -3), (-3, -2), (-1, -1), (1, 0)\}$

16.

17.

x	1	2	3	4	1
y	3	2	1	0	−1

18. A local parking garage charges $5.00 for the first hour plus $1.50 for each additional hour or part of an hour. Write a relation as a set of ordered pairs in which the x-value represents the number of hours and the y-value represents the cost for x hours. Use a domain of 1, 2, 3, 4, 5. Is this relation a function? Explain.

19. A baseball coach is taking the team for ice cream. Four students can ride in each car. Create a mapping diagram to show the number of cars needed to transport 8, 10, 14, and 16 students. Is this relation a function? Explain.

3-3 Writing Functions

EXAMPLES

■ Determine a relationship between the x- and y-values in the table. Write an equation.

x	1	2	3	4
y	−3	−6	−9	−12

What are possible relationships between the x-values and the y-values?

$1 - 4 = -3 \qquad 1(-3) = -3$

$2 - 4 \neq -6 ✗ \quad 2(-3) = -6 \checkmark$

$\qquad\qquad\qquad 3(-3) = -9 \checkmark$

$\qquad\qquad\qquad 4(-3) = -12 \checkmark$

$y = -3x$ *Write an equation.*

■ Nia earns \$5.25 per hour. Identify the independent and dependent variables. Write an equation in function notation for the situation.

Nia's pay depends on the number of hours she works.
Dependent: pay
Independent: hours
Let h represent the number of hours Nia works.
The function for Nia's pay is $f(h) = 5.25h$.

EXERCISES

Determine the relationship between the x- and y-values. Write an equation.

20.

x	1	2	3	4
y	−6	−5	−4	−3

㉑ $\{(1, 9), (2, 18), (3, 27), (4, 36)\}$

Identify the independent and dependent variables. Write an equation in function notation for the situation.

22. A baker spends \$6 on ingredients for each cake he bakes.

㉓ Tim will buy twice as many CDs as Raul.

Evaluate each function for the given input values.

24. For $f(x) = -2x + 4$, find $f(x)$ when $x = -5$.

㉕ For $g(n) = -n^2 - 2$, find $g(n)$ when $n = -3$.

26. For $h(t) = 7 - |t + 3|$, find $h(t)$ when $t = -4$ and when $t = 5$.

3-4 Graphing Functions

EXAMPLE

■ Graph the function $y = 3x - 1$.

Step 1 Choose several values of x to generate ordered pairs.

x	$y = 3x - 1$	y
−1	$y = 3(-1) - 1 = -4$	−4
0	$y = 3(0) - 1 = -1$	−1
1	$y = 3(1) - 1 = 2$	2
2	$y = 3(2) - 1 = 5$	5

Step 2 Plot enough points to see a pattern.

Step 3 Draw a line through the points to show all the ordered pairs that satisfy this function.

EXERCISES

Graph each function for the domain $\{-2, -1, 1, 2\}$.

㉗ $4x + y = 2$ 28. $y = (1 - x)^2$

Graph each function.

㉙ $3x - y = 1$ 30. $y = 2 - |x|$

㉛ $y = x^2 - 6$ 32. $y = |x + 5| + 1$

33. The function $y = 6.25x$ describes the amount of money y Peter gets paid after x hours. Graph the function. Use the graph to estimate how much money Peter gets paid after 7 hours.

3-5 Scatter Plots and Trend Lines

EXAMPLE

■ The graph shows the amount of money in a savings account. Based on this relationship, predict how much money will be in the account in month 7.

Monthly Savings
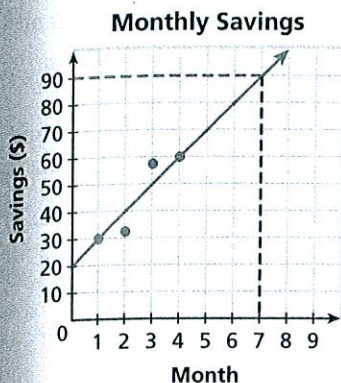
Draw a line that has about the same number of points above and below it. Your line may or may not go through data points.

*Find the point on the line whose x-value is 7.*

Based on the data, $90 is a reasonable prediction.

EXERCISES

34. The table shows the value of a car for the given years. Graph a scatter plot using the given data. Describe the correlation illustrated by the scatter plot.

Year	2000	2001	2002	2003
Value (thousand $)	28	25	23	20

35. The graph shows the results of a 2003–2004 survey on class size at the given grade levels. Based on this relationship, predict the class size for the 9th grade.

Class Size
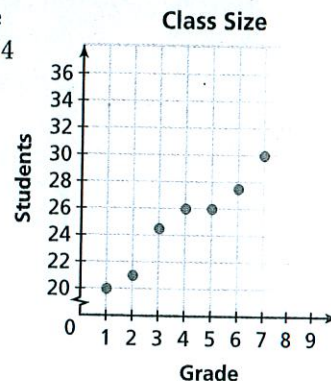
3-6 Arithmetic Sequences

EXAMPLES

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

−8, −5, −2, 1,...

Step 1 Find the difference between successive terms.

−8, −5, −2, 1,... *The common difference is 3.*
+3 +3 +3

Step 2 Use the common difference to find the next 3 terms.

−8, −5, −2, 1, 4, 7, 10
+3 +3 +3

■ Find the 18th term of the arithmetic sequence for which $a_1 = -4$ and $d = 6$.

$a_n = a_1 + (n-1)d$ *Write the rule.*
$a_{18} = -4 + (18-1)6$ *Substitute.*
$= -4 + (17)6$ *Simplify.*
$= -4 + 102$ *Simplify.*
$= 98$

The 18th term is 98.

EXERCISES

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

36. 20, 14, 8, 2,... **37.** −15, −12, −9, −4,...

38. 5, 4, 2, −1,... **39.** −8, −5.5, −3, −0.5,...

Find the indicated term of each arithmetic sequence.

40. 31st term: −15, −11, −7, −3,...

41. 24th term: $a_1 = 7$; $d = -3$

42. 17th term: $a_1 = -20$; $d = 2.5$

43. Marie has $180 in a savings account in week 1. She plans to deposit $12 each following week. Assuming that she does not withdraw any money from her account, what will her balance be in week 20?
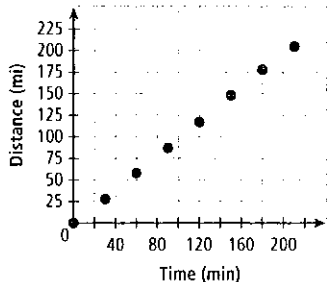
44. The table shows the temperature at the given heights above sea level. Use an arithmetic sequence to find the temperature at 8000 feet above sea level.

Height Above Sea Level (thousand feet)	1	2	3	4
Temperature (°C)	30	23.5	17	10.5

27a.

Juan's Trip

b. positive **29.** C

Check It Out! 1a. yes; $\frac{1}{2}, \frac{5}{4}, \frac{7}{4}, \frac{9}{4}$
1b. no **2a.** -343 **2b.** 19.6 **3.** 750 lb

Exercises 1. common difference
3. yes; -0.7; $-0.7, -1.4, -2.1$
5. no **7.** -53 **9.** no **11.** yes; -9;
$-58, -67, -76$ **13.** 5.9 **15.** 9500
mi **17.** $\frac{1}{4}$ **19.** -2.2 **21.** 0.07
23. $-\frac{3}{8}, -\frac{1}{2}, -\frac{5}{8}, -\frac{3}{4}$ **25.** -0.2,
$-0.7, -1.2, -1.7$ **27.** $-0.3, -0.1$,
$0.1, 0.3$ **29.** 22 **31.** 122 **33b.** \$9,
\$11, \$13, \$15; $a_n = 2n + 7$ **c.** \$37
d. no **35.** -104.5 **37.** $\frac{20}{3}$ **39a.** $a_n =$
$6 + 3(n - 1)$ **b.** 48 **c.** \$7800 **d.** $a_n =$
$7 + 3(n - 1)$; \$8200
41a.

Time Interval	Mile Marker
1	520
2	509
3	498
4	487
5	476
6	465

b. $a_n = 520 + (n - 1)(-11)$
c. number of miles per interval
d. 421 **43.** F **45.** 173 and 182; 20th
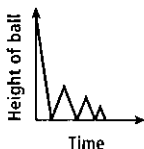and 21st terms **47a.** session 16; yes
b. Thursday

Study Guide: Review

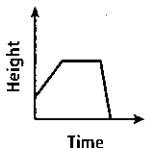**1.** domain **2.** negative
correlation **3.** term

4. continuous
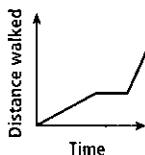
5. continuous

6. continuous

7. Possible answer: A family buys a
fish tank and some fish. After two
weeks, they buy some more fish.
After two more weeks, they buy
more fish. **8.** Possible answer: A
monkey swings from a high branch
to a lower branch. He climbs along
the branch. Then he jumps to a
higher branch and takes a nap.

9.

x	-1	0	2
y	0	1	1

10.

x	-2	-1	2	3
y	-1	1	3	4

11. D: $\{-4, -2, 0, 2\}$; R: $\{-1, 1, 3, 5\}$
12. D: $\{-2, -1, 0, 1, 2\}$; R: $\{-1, 0\}$
13. D: $\{0, 1, 4\}$; R: $\{-2, -1, 0, 1, 2\}$
14. D: $-4 \le x \le 3$; R: $-3 \le y \le 5$
15. D: $\{-5, -3, -1, 1\}$; R: $\{-3, -2,$
$-1, 0\}$; yes **16.** D: $\{-4, -2, 0, 2\}$;
R: $\{-2, 1\}$; yes **17.** D: $\{1, 2, 3, 4\}$;
R: $\{-1, 0, 1, 2, 3\}$; no **18.** $\{(1, 5.00),$
$(2, 6.50), (3, 8.00), (4, 9.50),$
$(5, 11.00)\}$; yes **19.** yes **20.** y is 7
less than x; $y = x - 7$. **21.** y is
9 times x; $y = 9x$. **22.** independent:
number of cakes; dependent: cost;
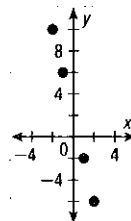$f(c) = 6c$ **23.** independent: number
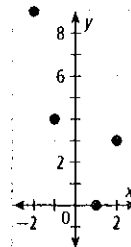of CDs Raul will buy; dependent:
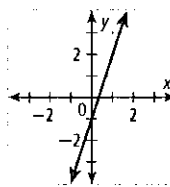number of CDs Tim will buy; $g(n)$
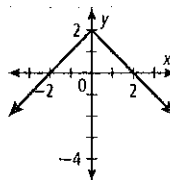$= 2n$ **24.** 14 **25.** -11 **26.** 6; -1

27.

28.

29.

30.

31.
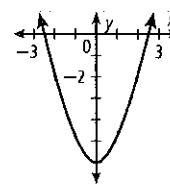
32.
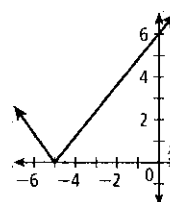
33. Possible answer: \$44
34. negative **35.** Possible answer:
33 **36.** yes; -6; $-4, -10, -16$
37. no **38.** no **39.** yes; 2.5; 2, 4.5, 7
40. 105 **41.** -62 **42.** 20 **43.** \$408
44. $-15.5\,°C$