

Record and Practice Journal Answer Key

Chapter 1

Fair Game Review

1. -4 2. -12 3. -8 4. -8
5. 7 6. -7 7. 6 8. -12
9. 58°F 10. 2 floors 11. -10 12. -15
13. 30 14. 16 15. 6 16. 8
17. -3 18. -8 19. \$60 20. 7 groups

1.1 Activity

1.

Triangle	Angle A	Angle B	Angle C	A + B + C
a.	60	60	60	180
b.	90	45	45	180
c.	120	30	30	180
d.	30	60	90	180

2. a. The sum of the angle measures of a triangle is 180°.
b. *Answer should include, but is not limited to:*
The sum of the angle measures of each triangle should be 180°. Some might be a little off due to rounding.
3. a. $27 + 82 + x = 180$; $x = 71$
b. $43 + 52 + x = 180$; $x = 85$
c. $x + 62.5 + 77 = 180$; $x = 40.5$
d. $33.4 + x + 51.3 = 180$; $x = 95.3$
4. *Sample answer:* If you notice a pattern, you can use inductive reasoning to write a rule. Then you can test your rule using several examples. You can use the rule to write an equation that can be used to solve a problem.

1.1 Practice

1. $x = 11$ 2. $w = 23$ 3. $z = \frac{1}{12}$
4. $y = 6$ 5. $k = 70$ 6. $n = \frac{9}{8}$
7. $x = 11$ 8. $h = 7$ 9. $p = 5.3$
10. $p - 5.16 = 15.48$; $p = \$20.64$
11. $c = 72$

1.2 Activity

1. a. $2n + 42 = 180$; $n = 69$; 69°, 69°, 42°
b. $x + (x + 10) + (x + 5) = 180$; $x = 55$;
55°, 65°, 60°
c. $5q = 180$; $q = 36$; 36°, 36°, 108°
d. $3m + (m + 10) = 180$; $m = 42.5$;
42.5°, 85°, 52.5°
e. $y + (y - 30) + 90 = 180$; $y = 60$;
60°, 30°, 90°
f. $(t + 10.5) + 2t + 90 = 180$; $t = 26.5$;
37°, 53°, 90°
2. $f = 65$; $k = 135$; $m = 30$; $n = 60$; $p = 75$;
 $s = 15$; $t = 90$; $w = 25$; $x = 45$; $y = 40$
indigo: 45°, 45°, 90°
violet: 60°, 60°, 60°
orange: 75°, 65°, 40°
yellow: 25°, 60°, 95°
blue: 75°, 75°, 30°
green: 15°, 135°, 30°

3. a–d.

	Monday	Tuesday	Wednesday
Degrees	36°	54°	90°
Percent	10%	15%	25%
People	20	30	50

	Thursday	Friday
Degrees	108°	72°
Percent	30%	20%
People	60	40

4. *Sample answer:* To solve a multi-step equation, use inverse operations. To check the reasonableness of a solution, make sure the solution makes sense and substitute the solution back into the equation.

1.2 Practice

1. $x = 11$ 2. $b = 1.5$ 3. $z = 2$
4. $w = 64$ 5. $a = 1$ 6. $q = 7$
7. $w = 4$ cm 8. $m = 4$ months

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1.3 Activity

1. a. $2x + 6 = 3x$; $x = 6$; 18 ft; 18 ft²
 b. $2x + 8 = 4x$; $x = 4$; 16 ft; 16 ft²
 c. $2x + 36 = 18x$; $x = 2\frac{1}{4}$; 40.5 ft; 40.5 ft²
 d. $2x + 5 = \frac{5}{2}x$; $x = 10$; 25 ft; 25 ft²
 e. $2x + 8 = 3x + 2$; $x = 6$; 20 ft; 20 ft²
 f. $2x + 16 = 2x + 4(x + 1)$; $x = 3$; 22 ft; 22 ft²
 g. $6x + 10 = 9x + x + x$; $x = 2$; 22 ft; 22 ft²
2. a. $12x + 72 + 12x = 36x$; $x = 6$; 216 in.²; 216 in.³
 b. $8x + 16x + 64 = 32x$; $x = 8$; 256 in.²; 256 in.³
3. smaller triangle: 6, 8, 10; larger triangle: 9, 12, 15

4. Collect the variable terms on one side and the constant terms on the other side.

Sample answer:

$$4(x + 2) = x - 1$$

$$4x + 8 = x - 1$$

$$4x - x + 8 = -1$$

$$3x + 8 = -1$$

$$3x = -9$$

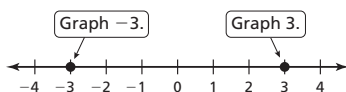
$$x = -3$$

1.3 Practice

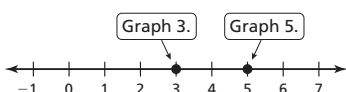
1. $x = 2$ 2. $y = -9$ 3. $p = 10$
4. $g = 41$ 5. $n = 0.7$ 6. $w = 11$
7. $100 + 10x = 15x$; $x = 20$
8. 200

1.3 Extension

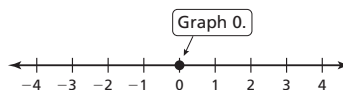
1. $x = 3$ or $x = -3$



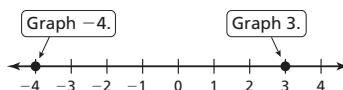
2. $x = 5$ or $x = 3$



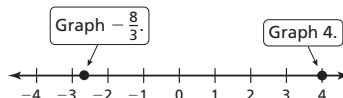
3. $x = 0$



4. $x = 3$ or $x = -4$

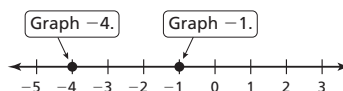


5. $x = 4$ or $x = -\frac{8}{3}$

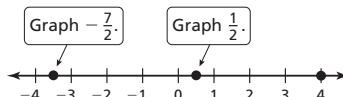


6. no solution

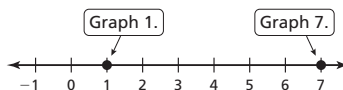
7. $x = -1$ or $x = -4$



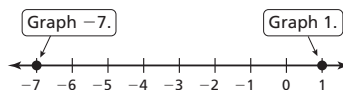
8. $x = \frac{1}{2}$ or $x = -\frac{7}{2}$



9. $x = 7$ or $x = 1$



10. $x = 1$ or $x = -7$



11. $|x - 4| = 1.5$

1.4 Activity

1. a. $P = 2w + 2\ell$; $w = \frac{P - 2\ell}{2}$; $w = 4$ in.
 b. $A = \frac{1}{2}bh$; $h = 2\frac{A}{b}$; $h = 8$ in.
 c. $C = 2\pi r$; $r = \frac{C}{2\pi}$; $r = 4$ cm

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d. $A = \frac{1}{2}h(b + B); h = \frac{2A}{b + B}; h = 3 \text{ in.}$

e. $A = bh; h = \frac{A}{b}; h = 7 \text{ m}$

2. a. $V = Bh; h = \frac{V}{B}; h = 5 \text{ in.}$

b. $V = \frac{1}{3}Bh; B = \frac{3V}{h}; B = 16 \text{ ft}^2$

c. $V = Bh; B = \frac{V}{h}; B = 4\pi \text{ cm}^2$

d. $V = \frac{1}{3}Bh; h = \frac{3V}{B}; h = 6 \text{ m}$

3. *Sample answer:* You can solve a given formula for a different variable to form a new formula that can be used to solve for the variable.

1.4 Practice

1. $y = -2x - 9$

2. $y = \frac{2}{5}x - \frac{6}{5}$

3. $y = -12x + 78$

4. $w = \frac{V}{\ell h}$

5. $r = 2f - 6.5$

6. $h = \frac{S - 2\pi r^2}{2\pi r}$

7. a. $h = \frac{2A}{b}$

b. $h = 9 \text{ in.}$

Chapter 2

Fair Game Review

1. 5

2. 16

3. -5

4. $-38\frac{1}{2}$

5. 108

6. 65

7. $-3\frac{7}{19}$

8. 262

9. \$50.00

10. $(-5, 0)$

11. $(3, -5)$

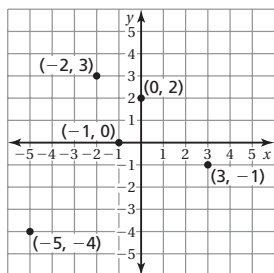
12. Point F

13. Point G

14. Point B, Point H

15. Point C, Point E

16-20.



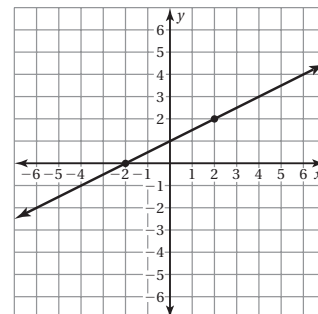
2.1 Activity

1. a. *Sample answer:*

	Solution Points	
x	-2	2
$y = \frac{1}{2}x + 1$	0	2

b. *Sample answer:* $(-2, 0), (2, 2)$

c. *Sample answer:*



d. *Sample answer:* Choose $(0, 1)$.

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

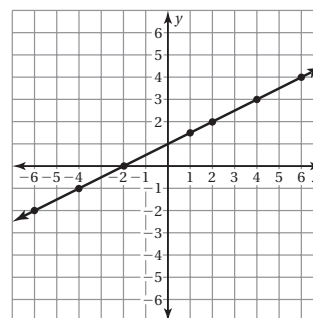
$$1 \stackrel{?}{=} \frac{1}{2}(0) + 1$$

$$1 = 1 \checkmark$$

e. yes; Because the line is the graph of the equation, all points on the line are solution points.

f. *Sample answer:*

	Solution Points				
x	-6	-4	1	4	6
$y = \frac{1}{2}x + 1$	-2	-1	$1\frac{1}{2}$	3	4



Each point lies on the line.

g. yes; The graph of the equation is the set of all solutions to the equation. So, each of these solutions falls on the line.

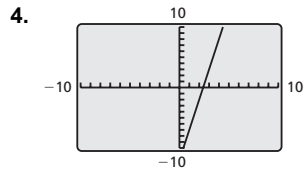
h. The graph of an equation of this form is a line.

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2. d. In the second graph, it is easier to see where the line crosses the x -axis and the y -axis.

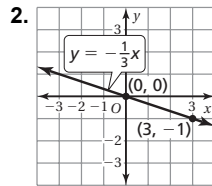
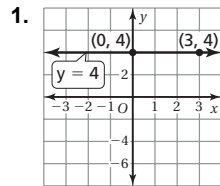
3. A linear equation is of the form $y = ax + b$.
Its graph is a line and can be drawn by finding solution points to an equation and drawing a line through them.

Sample answer: $y = 4x + 3$ (linear)
 $y = 8x^2 + 9$ (not linear)

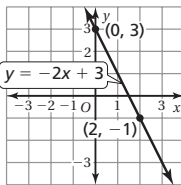


- a. yes; no; You can see that the graph crosses the x -axis between 2 and 3. You cannot see where the graph crosses the y -axis.
- b. Sample answer: You can choose a lower minimum y -value.
5. Sample answer: You should use a graphing calculator because if you graph it by hand you will have to scale your axes by tenths.

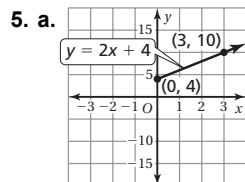
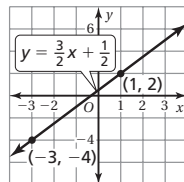
2.1 Practice



3. $y = -2x + 3$



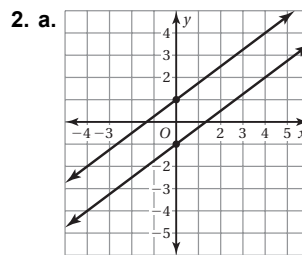
4. $y = \frac{3}{2}x + \frac{1}{2}$



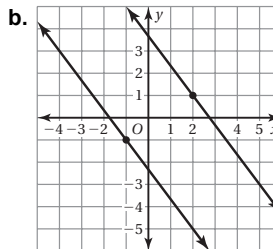
b. \$10.00

2.2 Activity

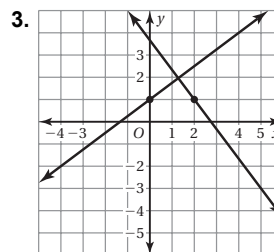
1. a. $\frac{1}{2}$; $\frac{1}{2}$; yes; It appears that the slope between any two points on a line is the same.
- b. -1 ; -1 ; yes; It appears that the slope between any two points on a line is the same.
- c. $\frac{2}{3}$; $\frac{2}{3}$; yes; It appears that the slope between any two points on a line is the same.
- d. -3 ; -3 ; yes; It appears that the slope between any two points on a line is the same.



The two lines are parallel.



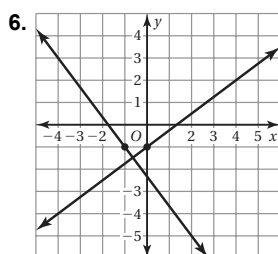
The two lines are parallel.



The two lines form a right angle. The product of the slopes of the two lines is -1 .

4. The slope can tell you whether the line rises or falls from left to right and how steep the line is.
5. Two different nonvertical lines in the same plane that have the same slope are parallel.

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Two lines in the same plane whose slopes have a product of -1 are perpendicular.

2.2 Practice

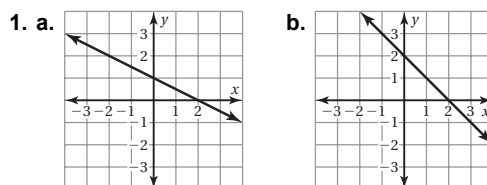
1. 2
2. $-\frac{2}{3}$
3. 0
4. undefined
5. $\frac{2}{5}$
6. staircase 2; The slope of staircase 2 is $\frac{2}{3}$ which is greater than the slope of staircase 1, $\frac{3}{5}$.

2.2 Extension

1. line B and line G ; They both have a slope of $\frac{5}{3}$.
2. line B and line R ; They both have a slope of 9.
3. yes; Both lines are vertical and have undefined slopes.
4. no; The line $x = 3$ has an undefined slope and the line $y = -3$ has a slope of 0.
5. yes; Because opposite sides have the same slope, they are parallel. Because opposite sides are parallel, the quadrilateral is a parallelogram.
6. line B and line R ; Line B has a slope of 1. Line R has a slope of -1 . The product of their slopes is $1 \cdot (-1) = -1$.
7. line R and line G ; Line R has a slope of 4. Line G has a slope of $-\frac{1}{4}$. The product of their slopes is $4 \cdot \left(-\frac{1}{4}\right) = -1$.
8. yes; The line $x = 0$ is vertical. The line $y = 3$ is horizontal. A vertical line is perpendicular to a horizontal line.
9. no; Both lines are horizontal and have a slope of 0.

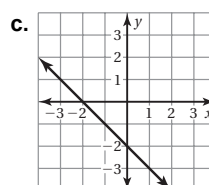
10. yes; Because the products of the slopes of intersecting sides are equal to -1 , the parallelogram is a rectangle.

2.3 Activity

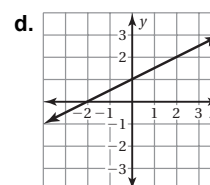


$$-\frac{1}{2}; (0, 1)$$

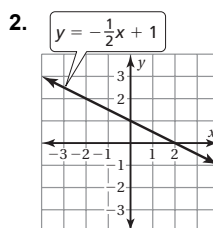
$$-1; (0, 2)$$



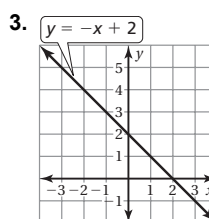
$$-1; (0, -2)$$



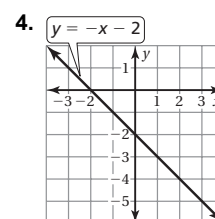
$$\frac{1}{2}; (0, 1)$$



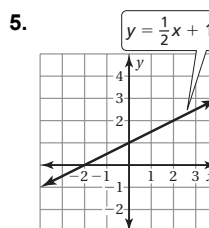
$$\text{line; } -\frac{1}{2}; (0, 1)$$



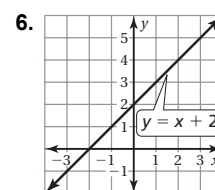
$$\text{line; } -1; (0, 2)$$



$$\text{line; } -1; (0, -2)$$

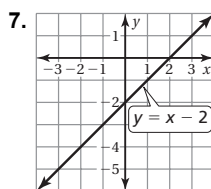


$$\text{line; } \frac{1}{2}; (0, 1)$$

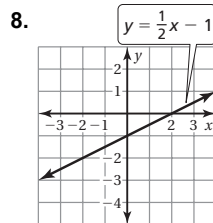


$$\text{line; } 1; (0, 2)$$

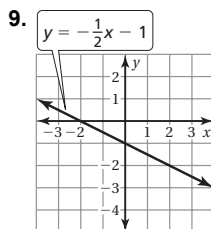
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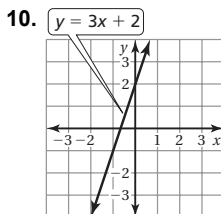
line; 1; (0, -2)



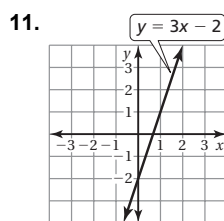
line; $\frac{1}{2}$; (0, -1)



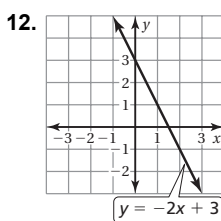
line; $-\frac{1}{2}$; (0, -1)



line; 3; (0, 2)



line; 3; (0, -2)



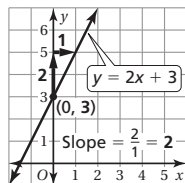
line; -2; (0, 3)

13. A line with slope m that crosses the y -axis at $(0, b)$.

- It affects the steepness of the line and whether it rises or falls from left to right.
- It affects where the graph crosses the y -axis.
- Works for any equation.

14. Because m is the slope and b is the y -intercept.

Sample answer: $y = 2x + 3$



2.3 Practice

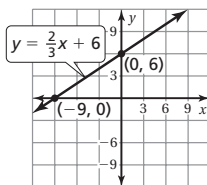
1. slope: -3; y -intercept: 9

2. slope: $-\frac{2}{5}$; y -intercept: 4

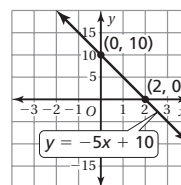
3. slope: 8; y -intercept: -6

6 Big Ideas Math Algebra 1 Answers

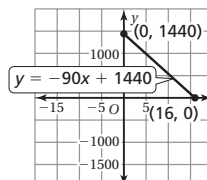
4. x -intercept: -9



5. x -intercept: 2



6. a.



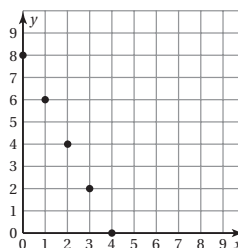
- b. The slope is -90. So, the length of each game is 90 minutes. The x -intercept is 16. So, there are 16 games in the tournament.

2.4 Activity

1. a. $4x + 2y = 16$

Number of Adult Tickets, x	0	1	2	3	4
Number of Child Tickets, y	8	6	4	2	0

c.

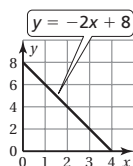


The points form a line.

- d. yes; Solve the equation from part (a) for y .

2. a. $4x + 2y = 16$

b. $y = -2x + 8$



3. Sample answer: It is a line with a slope of $-\frac{a}{b}$ and y -intercept of $\frac{c}{b}$.

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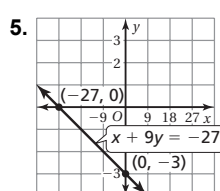
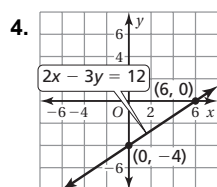
4. Activity 1 uses a table. Activity 2 uses the slope-intercept form. *Sample answer:* The slope-intercept form may be considered easier because you can use the slope and y-intercept to graph the equation.
5. *Sample answer:* You sold \$20 worth of lemonade. You sell large cups for \$4 and small cups for \$2.
6. When the equation is in standard form, you can see that when $x = 0$, $y = 10$, and when $y = 0$, $x = 10$. You can graph the equation through its x-intercept and its y-intercept.

2.4 Practice

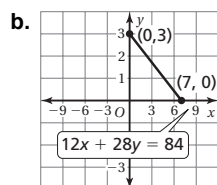
1. $y = 2x - 7$

2. $y = -\frac{1}{4}x - \frac{2}{7}$

3. $y = \frac{3}{5}x + 4$



6. a. $12x + 28y = 84$



The x-intercept is 7. So, you can buy 7 shirts if you don't buy any jeans. The y-intercept is 3. So, you can buy 3 jeans if you don't buy any shirts.

2.5 Activity

1. a. top line: slope: $\frac{1}{2}$; y-intercept: 4; $y = \frac{1}{2}x + 4$

middle line: slope: $\frac{1}{2}$; y-intercept: 1; $y = \frac{1}{2}x + 1$

bottom line: slope: $\frac{1}{2}$; y-intercept: -2;

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

The lines are parallel.

b. right line: slope: -2; y-intercept: 3;

$$y = -2x + 3$$

middle line: slope: -2; y-intercept: -1;

$$y = -2x - 1$$

left line: slope: -2; y-intercept: -5;

$$y = -2x - 5$$

The lines are parallel.

c. line passing through (3, 2):

slope: $-\frac{1}{3}$; y-intercept: 3; $y = -\frac{1}{3}x + 3$

line passing through (3, 7):

slope: $\frac{4}{3}$; y-intercept: 3; $y = \frac{4}{3}x + 3$

line passing through (6, 4):

slope: $\frac{1}{6}$; y-intercept: 3; $y = \frac{1}{6}x + 3$

The lines have the same y-intercept.

d. line passing through (1, 2):

slope: 2; y-intercept: 0; $y = 2x$

line passing through (1, -1):

slope: -1; y-intercept: 0; $y = -x$

line passing through (3, 1):

slope: $\frac{1}{3}$; y-intercept: 0; $y = \frac{1}{3}x$

The lines have the same y-intercept.

2. a. 42 square units; $y = 4$; $y = -2$; $y = -2x + 8$;
 $y = -2x - 6$

The opposite sides have the same slope.

b. 28 square units; $y = 5$; $y = -2$; $y = x + 5$;
 $y = x + 1$

The opposite sides have the same slope.

3. a. 100 mi b. 50 mi/h c. 6 hours d. 400 mi

4. Let the slope be m and the y-intercept be b . Then the equation of the line is $y = mx + b$.

Sample answer: What is the equation of a line with a slope of $\frac{2}{3}$ and y-intercept of 1?

$$y = \frac{2}{3}x + 1$$

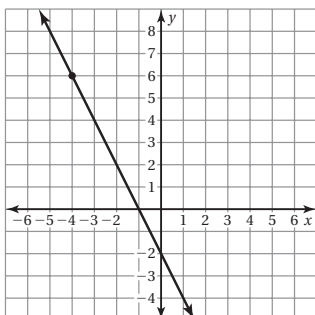
Record and Practice Journal Answer Key

2.5 Practice

1. $y = 2x + 7$
2. $y = 5x - 3$
3. $y = -x - 6$
4. $y = -3x + 4$
5. $y = 8$
6. $y = -3x + 15$
7. $y = 0$
8. $y = 20x + 30$

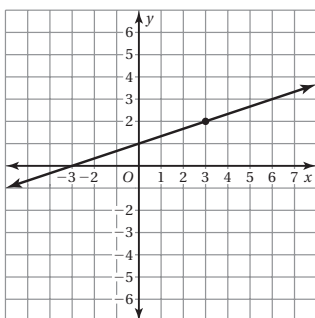
2.6 Activity

1. a.



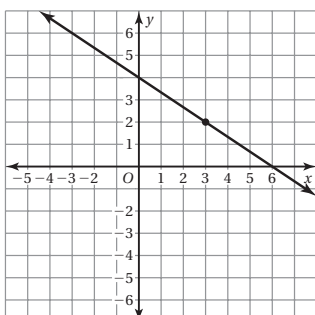
y -intercept: -2
 $y = -2x - 2$

b.



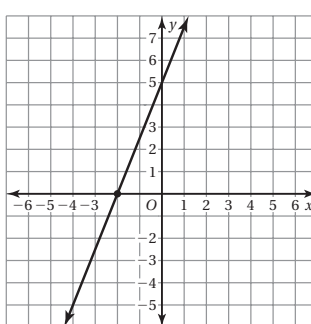
y -intercept: 1
 $y = \frac{1}{3}x + 1$

c.



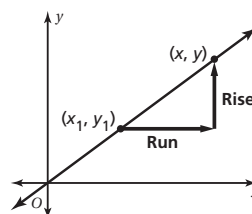
y -intercept: 4
 $y = -\frac{2}{3}x + 4$

d.



y -intercept: 5
 $y = \frac{5}{2}x + 5$

2. a–c. Sample answer:

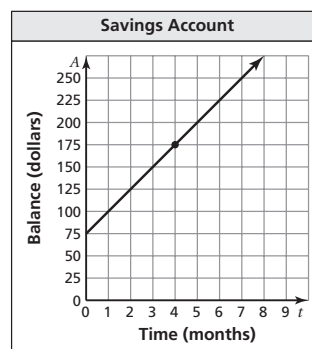


d. Sample answer: The rise is the change in y , or difference in the y -coordinates. The run is the change in x , or difference in the x -coordinates.

e. $m = \frac{y - y_1}{x - x_1}$

f. $y - y_1 = m(x - x_1)$; This result represents the equation of a line with slope m that passes through the point (x_1, y_1) .

3.



$A = 25t + 75$

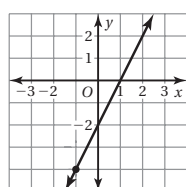
4. The results are the same. The formula from Activity 2 can be used to write the equations in slope-intercept form.

Record and Practice Journal Answer Key

5. It is the formula that can be used to write the equation of a line given a “point” on the line and the “slope” of the line. The “slope” and the coordinates of the “point” are substituted into the formula to get the equation. It is important because it allows you to write the equation of a line given a point and a slope.

6. Plot the given point and use the slope to plot additional points to find the y -intercept. Then use the slope m and y -intercept b to write the equation $y = mx + b$.

Sample answer: What is the equation of the line with a slope of 2 that passes through $(-1, -4)$?



$$y = 2x - 2$$

2.6 Practice

1. $y = -3x - 6$
2. $y = -\frac{4}{3}x + 3$
3. $y = 3x + 9$
4. $y = -\frac{5}{3}x$
5. a. $y = 4x + 2$ b. \$2; the y -intercept

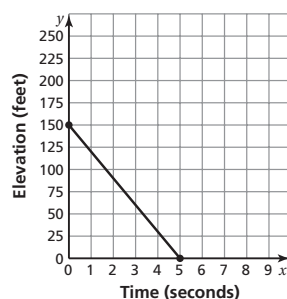
2.6 Extension

1. $y = 2x + 1$
2. $y = -3x - 8$
3. $y = \frac{3}{5}x + 4$
4. $y = -\frac{7}{2}x + 2$
5. $y = 3x - 1$
6. $y = 3x - 5$
7. $y = 3x - 9$
8. $y = 3x + 3$
9. $y = -2x + 3$
10. $y = -\frac{1}{3}x + 6$
11. $y = \frac{1}{2}x - 7$
12. $y = \frac{7}{4}x + 24$
13. $y = -2x + 4$
14. $y = -2x - 8$
15. $y = -2x$
16. $y = -2x + 6$

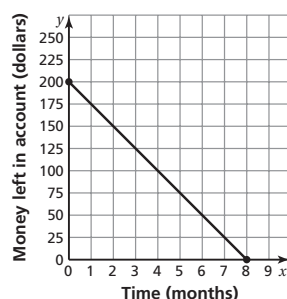
2.7 Activity

2. *Answer should include, but is not limited to:* Make sure students interpret the slope, y -intercept, and x -intercept from the story. Make sure the table values are possible in this situation.

3. a. *Sample answer:* A hot air balloon is 150 feet above the ground. After 5 seconds, it has descended all the way to the ground.



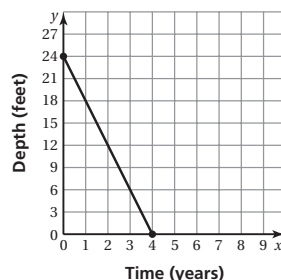
- b. *Sample answer:* You withdraw \$25 per month from your savings account. After 8 months, you have no money left in the account.



4. *Sample answer:* You can represent y as a unit and x as a unit and then its slope as a rate.
miles per gallon; dollars per year; cost per unit

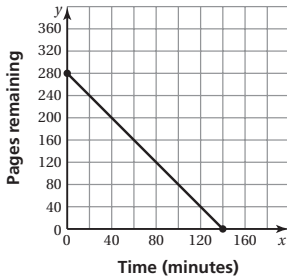
2.7 Practice

1. *Sample answer:* the depth of a pond

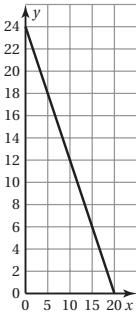


Record and Practice Journal Answer Key

2. *Sample answer:* recycling paper



3. a.



b. y-intercept: You can buy at most 24 short-sleeved shirts if you buy no long-sleeved shirts.
x-intercept: You can buy at most 20 long-sleeved shirts if you buy no short-sleeved shirts.

4. $y = -5x + 100$

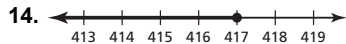
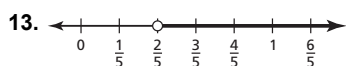
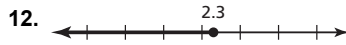
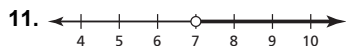
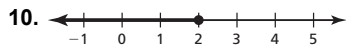
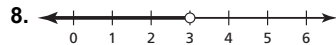
Chapter 3

Fair Game Review

1. $>$ 2. $=$ 3. $<$

4. $<$ 5. $>$ 6. $<$

7. your friend; 5.6 ft is about 5 ft and 7 in.



3.1 Activity

1. a. $t \geq -36$;

b. $e \leq 1951.5$;

2. a. $x \geq 1$; all values of x greater than or equal to 1

b. $x > 1$; all values of x greater than 1

c. $x \leq 1$; all values of x less than or equal to 1

d. $x < 1$; all values of x less than 1

3. $S + M > L$

a. yes; $4 + 5 > 7$

b. no; $4 + 5 < 10$

c. no; $2 + 5 = 7$

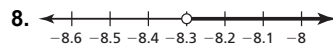
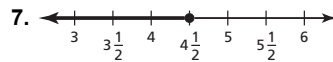
4. You can use inequalities to describe real-life statements where a value has a limit, but also has many possible values.

Sample answer: The number of students in a class is no less than 12. Each item is allowed at most 3 timeouts.

3.1 Practice

1. $p \leq -6$ 2. $\frac{n}{-2} \geq \frac{1}{2}$ 3. solution

4. not a solution 5. solution 6. not a solution



9. $8x \leq 35$; 4

3.2 Activity

1. (b), (d), (g), and (h) are true; (b) is true because if there are no incomplete passes, then $C + N = A$, but there are times where there are incomplete passes, so $C + N \leq A$. (d) is true because a completed pass is either a touchdown or not a touchdown, so $T \leq C$. (g) is true because attempts minus completed passes is equal to the sum of incomplete and intercepted passes, so $A - C \geq M$. (h) is true because an attempt can be either completed, intercepted, or incomplete, so $A = C + N + M$.

2. A, C

Record and Practice Journal Answer Key

3. Sample answers are given.

- $A = 10, C = 2, Y = 10, T = 0, N = 2$; all values of P less than 0
- $A = 390, C = 244, Y = 3105, T = 30, N = 9$; all values of P greater than or equal to 150
- $A = 390, C = 350, Y = 4700, T = 50, N = 2$; all values of P greater than 230
- $A = 188, C = 89, Y = 1167, T = 6, N = 15$; all values of P greater than or equal to 90
- $A = 350, C = 275, Y = 3105, T = 50, N = 2$; all values of P greater than 170

4. Add or subtract the same number from each side of the inequality to get the variable alone on one side.

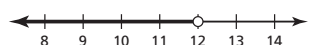
- $P < 0$
- $P \geq 150$
- $P > 230$
- $P \geq 90$
- $P > 170$

5. You can use addition or subtraction to solve an inequality just like you solve an equation, by adding or subtracting the same number from each side.

6. You subtract 3 from each side to solve both. However, the solution to the inequality is a set of numbers, and the solution to the equation is one number.

3.2 Practice

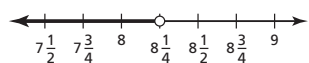
1. $x < 12$



2. $p \geq -2$



3. $y < 8\frac{1}{4}$



4. $z \geq -7.5$



5. $10 + 2x < 15; x < \frac{5}{2}$

6. $x + 4 > 9; x > 5$

7. a. $x \geq 50$

b. $x + 26 \geq 50; x \geq 24$

3.3 Activity

1. a.

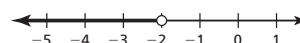
x	-1	0	1	2	3	4	5
$3x$	-3	0	3	6	9	12	15
$3x \leq 6$	T	T	T	T	F	F	F



$x \leq 2$

b.

x	-5	-4	-3	-2	-1	0	1
$-2x$	10	8	6	4	2	0	-2
$-2x > 4$	T	T	T	F	F	F	F



$x < -2$

2. a.

x	-4	-3	-2	-1	0	1	2
$3x$	-12	-9	-6	-3	0	3	6
$3x > 3$	F	F	F	F	F	F	T

$x > 1$

b.

x	-4	-3	-2	-1	0	1	2
$4x$	-16	-12	-8	-4	0	4	8
$4x \leq 4$	T	T	T	T	T	T	F

$x \leq 1$

c.

x	-5	-4	-3	-2	-1	0	1
$-2x$	10	8	6	4	2	0	-2
$-2x \geq 6$	T	T	T	F	F	F	F

$x \leq -3$

Record and Practice Journal Answer Key

d.

x	-5	-4	-3	-2	-1	0	1
$-5x$	25	20	15	10	5	0	-5
$-5x < 10$	F	F	F	F	T	T	T

$$x > -2$$

If you divide each side of an inequality by the same positive number, the inequality remains true. If you divide each side of an inequality by the same negative number, you must reverse the direction of the inequality symbol for the inequality to remain true.

$$3x > 3 \quad 4x \leq 4 \quad -2x \geq 6 \quad -5x < 10$$

$$\frac{3x}{3} > \frac{3}{3} \quad \frac{4x}{4} \leq \frac{4}{4} \quad \frac{-2x}{2} \leq \frac{6}{-2} \quad \frac{-5x}{-5} > \frac{10}{-5}$$

$$x > 1 \quad x \leq 1 \quad x \leq -3 \quad x > -2$$

3. a.

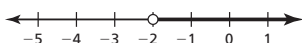
x	-1	0	1	2	3	4	5
$\frac{x}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	1	$\frac{3}{2}$	2	$\frac{5}{2}$
$\frac{x}{2} \geq 1$	F	F	F	T	T	T	T



$$x \geq 2$$

b.

x	-5	-4	-3	-2	-1	0	1
$\frac{x}{-3}$	$\frac{5}{3}$	$\frac{4}{3}$	1	$\frac{2}{3}$	$\frac{1}{3}$	0	$-\frac{1}{3}$
$\frac{x}{-3} < \frac{2}{3}$	F	F	F	F	T	T	T



$$x > -2$$

4. a.

x	-1	0	1	2	3	4	5
$\frac{x}{4}$	$-\frac{1}{4}$	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{5}{4}$
$\frac{x}{4} \geq 1$	F	F	F	F	F	T	T

$$x \geq 4$$

b.

x	-1	0	1	2	3	4	5
$\frac{x}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	1	$\frac{3}{2}$	2	$\frac{5}{2}$
$\frac{x}{2} < \frac{3}{2}$	T	T	T	T	F	F	F

$$x < 3$$

c.

x	-5	-4	-3	-2	-1	0	1
$\frac{x}{-2}$	$\frac{5}{2}$	2	$\frac{3}{2}$	1	$\frac{1}{2}$	0	$-\frac{1}{2}$
$\frac{x}{-2} > 2$	T	F	F	F	F	F	F

$$x < -4$$

d.

x	-5	-4	-3	-2	-1	0	1
$\frac{x}{-5}$	1	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{2}{5}$	$\frac{1}{5}$	0	$-\frac{1}{5}$
$\frac{x}{-5} \leq \frac{1}{5}$	F	F	F	F	T	T	T

$$x \geq -1$$

If you multiply each side of an inequality by the same positive number, the inequality remains true.

If you multiply each side of an inequality by the same negative number, you must reverse the direction of the inequality symbol for the inequality to remain true.

$$\frac{x}{4} \geq 1$$

$$\frac{x}{4} \cdot 4 \geq 1 \cdot 4$$

$$x \geq 4$$

$$\frac{x}{2} < \frac{3}{2}$$

$$\frac{x}{2} \cdot 2 < \frac{3}{2} \cdot 2$$

$$x < 3$$

$$\frac{x}{-2} > 2$$

$$\frac{x}{-2} \cdot (-2) < 2 \cdot (-2)$$

$$x < -4$$

$$\frac{x}{-5} \leq \frac{1}{5}$$

$$\frac{x}{-5} \cdot (-5) \geq \frac{1}{5} \cdot (-5)$$

$$x \geq -1$$

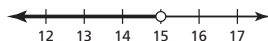
Record and Practice Journal Answer Key

5. If you multiply or divide each side of an inequality by the same positive number, the inequality remains true.

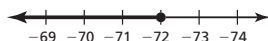
If you multiply or divide each side of an inequality by the same negative number, the direction of the inequality symbol must be reversed for the inequality to remain true.

3.3 Practice

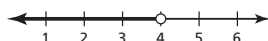
1. $n < 15$



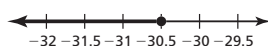
2. $x \leq -72$



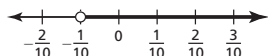
3. $t < 4$



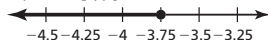
4. $q \leq -30.5$



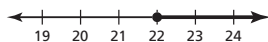
5. $p > -\frac{1}{10}$



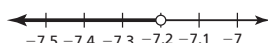
6. $m \leq -3.75$



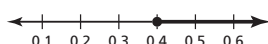
7. $r \geq 22$



8. $t < -7.2$



9. $q \geq 0.4$



10. $4x \geq 60; x \geq 15$

3.4 Activity

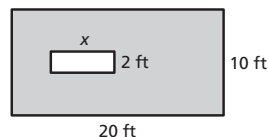
1. a. $x > 0$ and $x < 3$
b. $x > 1$ and $x < 5$
c. $y > 0$ and $y \leq 1$
d. $y > 0$ and $y \leq 2$
e. $w > 8$
f. $w > 8$
g. $x > \pi$ and $x < 2\sqrt{3}$
h. $x > 0$ and $x < 2$

2. a. $x \geq 3$ b. $x > 2$

3. The width can be greater than 6 feet but less than $15\frac{2}{3}$ feet.

4. *Sample answer:* You can bound the area or perimeter by a number and then find what the possibilities are for the missing side.

Sample answer: Area $< 190 \text{ ft}^2$



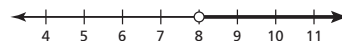
$$200 - 2x < 190$$

$$-2x < -10$$

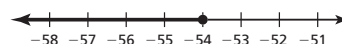
$$x > 5 \text{ ft}$$

3.4 Practice

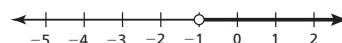
1. $x > 8$



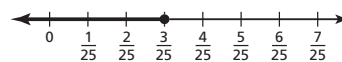
2. $d \leq -54$



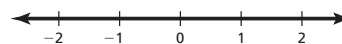
3. $n > -1$



4. $z \leq \frac{3}{25}$



5. all real numbers

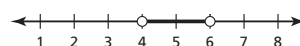


6. no solution

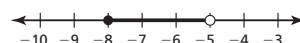
7. 405 days

3.4 Extension

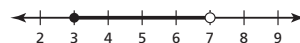
1. $4 < q < 6$



2. $-8 \leq r < -5$

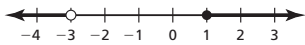


3. $3 \leq s < 7$

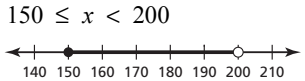


Record and Practice Journal Answer Key

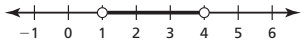
4. $t \geq 1$ or $t < -3$



5. $x < -2$ or $x \geq 1$



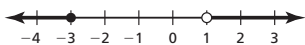
6. $150 \leq x < 200$



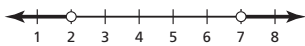
7. $1 < a < 4$



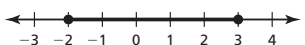
8. $3 < x \leq 6$



9. $b > 1$ or $b \leq -3$



10. $y < 2$ or $y > 7$



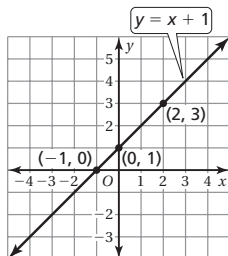
11. $c \leq 3$ and $c \geq -2$

12. no solution

13. $|x - 3| \leq 0.02$; The least weight of the coin that the country's mint will allow to be released into circulation is 2.98 grams. The greatest weight of the coin that the country's mint will allow to be released into circulation is 3.02 grams.

3.5 Activity

1. a.



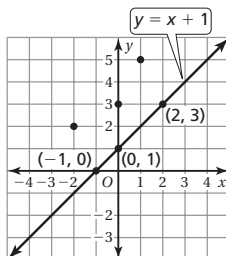
b. Sample answer:

$(0, 3)$; $3 > 1$ ✓

$(1, 5)$; $5 > 2$ ✓

$(-2, 2)$; $2 > -1$ ✓

All of the points result in true statements.



c. Sample answer:

$(1, 0)$; $0 > 1$ ✗

$(3, -3)$; $-3 > 4$ ✗

$(-1, -4)$; $-4 > 0$ ✗

None of the points result in true statements.

d. above

e. Sample answer:

$(1, 2)$; $2 > 2$ ✗

no; When $y = x + 1$, the statement $y > x + 1$ is not true because it states y is greater than $x + 1$, not greater than or equal to $x + 1$.

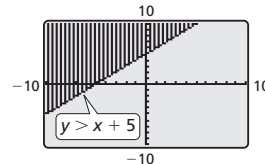
f. To include the points that lie on the graph of $y = x + 1$, use the "greater than or equal to" sign ($\geq$) instead of the "greater than" sign ($>$) in the inequality.

2. a. $y = x - 3$

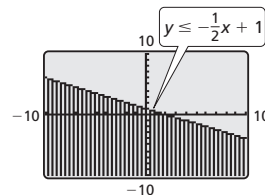
b. The solutions of the inequality are all ordered pairs (x, y) such that y is less than $x - 3$.

c. $y < x - 3$; <; The line is dashed so it does not include the points on the line.

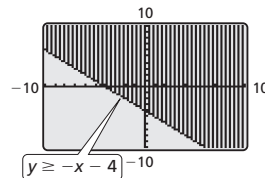
4. a.



b.



c.

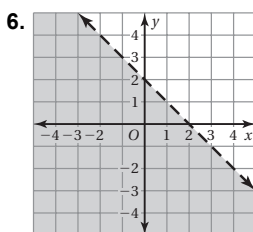
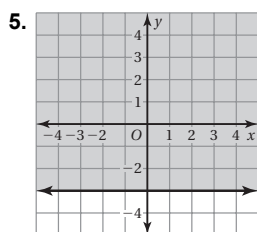


5. You can use a coordinate plane to solve problems involving linear inequalities by representing the solutions of the inequality as a shaded region separated from the points that do not satisfy the inequality by a dashed or solid line depending on whether the points on the line make the inequality true (solid line) or do not make the inequality true (dashed line).

Record and Practice Journal Answer Key

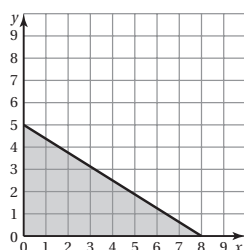
3.5 Practice

1. yes 2. no 3. yes 4. no



7. a. Let x be pounds of tomatoes and y be pounds of red peppers.

$$2.5x + 4y \leq 20$$



- b. Two possible solutions are $(4, 2)$ and $(2, 2)$.

So, you can buy 4 pounds of tomatoes and 2 pounds of red peppers, or 2 pounds of tomatoes and 2 pounds of red peppers.

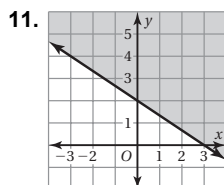
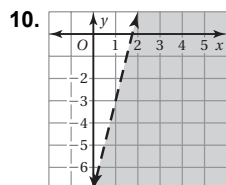
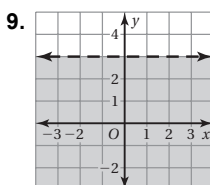
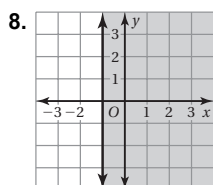
Chapter 4

Fair Game Review

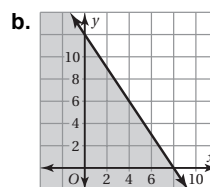
1. $y = 2$ 2. $a = -3$ 3. $k = 5$

4. $m = 6$ 5. $t = -4$ 6. $h = 9$

7. 45 calculators



12. a. $150x + 100y \leq 1200$



- c. yes; $4(150) + 5(100) = 1100 \leq 1200$

4.1 Activity

1. a. $C = 10x + 500$

- b. $R = 60x$

- c. $C = 10x + 500$

$$R = 60x$$

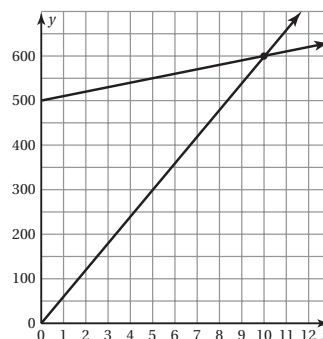
2. a.

x	0	1	2	3	4	5
C	500	510	520	530	540	550
R	0	60	120	180	240	300

x	6	7	8	9	10	11
C	560	570	580	590	600	610
R	360	420	480	540	600	660

- b. 10 nights

3. a-b.



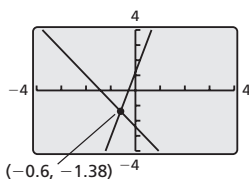
- c. $(10, 600)$; 10 nights; This is the same break-even point that was determined in Activity 2.

5. Use a table to determine when the equations have the same value, or graph both equations and find the point of intersection. Check your solution by substituting it into each equation and making sure both are satisfied.

Record and Practice Journal Answer Key

6. Sample answers:

a.



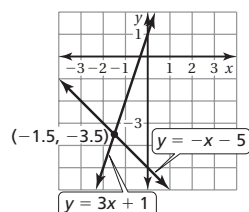
$(-0.6, -1.38)$; Used a graphing calculator because of the decimals

b.

x	0	1	2	3	4
$y = x$	0	1	2	3	4
$y = -2x + 9$	9	7	5	3	1

$(-3, 3)$; Used a table because of the equation $y = x$

c.



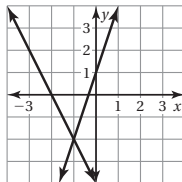
$(-1.5, -3.5)$; Sketched a graph to estimate the point of intersection

4.1 Practice

1. 360;

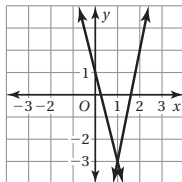
x	0	1	2	3	4	5	6	7	8
C	210	235	260	285	310	335	360	385	410
R	0	60	120	180	240	300	360	420	480

2.



$(-1, -2)$

3.



$(1, -3)$

4. $(18, 14)$

5. $(5, -2)$

6. 11 boys, 15 girls

4.2 Activity

1. a. $(2, 1)$ b. $(4, 3)$ c. $(1, 2)$ d. $(0, -2)$

e. $(-3, 2)$ f. $(3, 2)$

Method 1: Substitute the expression for x into the second equation and solve for y . Then substitute the value of y into one of the equations and solve for x .

Method 2: Substitute the expression for y into the second equation and solve for x . Then substitute the value of x into one of the equations and solve for x .

The solutions are the same using both methods.

2. Sample answer:

a. $(1, 5)$

b. $x + y = 6$

$$5x - y = 0$$

c. Partner's system:

$$2x + y = 12$$

$$x - y = 0$$

Solution: $(4, 4)$

3. Give me a place to stand, and I will move the Earth.

4. Solve for a variable in one equation. Substitute the expression for that variable into the other equation and solve the equation. Substitute the variable value that you know into one of the equations to find the value of the other variable.

4.2 Practice

1. $(3, -2)$ 2. $\left(11, \frac{1}{4}\right)$ 3. $(2, 6)$ 4. $(9, -6)$

5. a. $x + y = 4500$

$$2x = 7y$$

b. Regular: 3500 gal; Premium: 1000 gal

4.3 Activity

1. a. $(1, 2)$ b. $(1, -1)$ c. $(1, 3)$

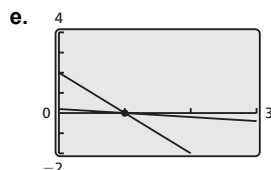
Method 1: Once you have subtracted the equations and eliminated a variable, you can solve for the remaining variable, then substitute its value into one of the equations and solve for the other variable.

Method 2: Once you have added the equations and eliminated a variable, you can proceed as above to solve for both variables.

The solutions are the same using both methods.

Record and Practice Journal Answer Key

2. a. Yes, but you have to multiply one of the equations by a constant first so that a variable is eliminated when you add or subtract.
 b. Multiply the equation by 5.
 c. Multiply the equation by 2.
 d. The solution for both is $(1, 0)$.



3. Hypatia

4. Add or subtract the two equations so that one variable cancels out. You may have to multiply one or both equations by a constant first. After eliminating a variable, solve for the remaining variable, then substitute its value into one of the equations and solve for the other variable.

5. You can add equations if the coefficient of one of the variables in one equation is the negative of that variable's coefficient in the other equation.

Example: $5x - 2y = 4$

$$x + 2y = 2$$

You can subtract equations when one variable has the same coefficient in both equations.

Example: $2x + 3y = -5$

$$6x + 3y = 3$$

You have to multiply first if neither of the above is true.

Example: $3x + 4y = -8$

$$2x - 2y = 18$$

6. The Multiplication Property of Equality states that multiplying both sides of an equation by the same constant produces an equivalent equation.

4.3 Practice

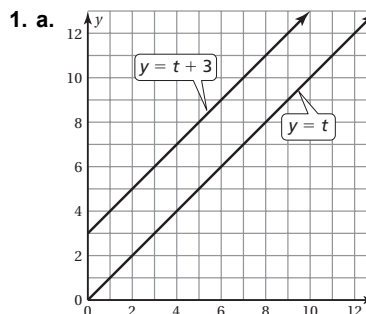
1. $(2, 5)$ 2. $(-6, 4)$ 3. $(11, 9)$ 4. $(-3, -7)$

5. a. $x + y = 850$

$$x = y + 60$$

- b. 455 females; 395 males

4.4 Activity



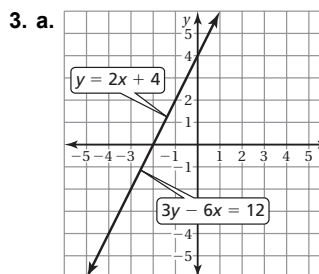
- b. 3; difference between you and your cousin's age
 c. no; You and your cousin will never be the same age at the same time.

2. a.

x	0	1	2	3	4	5
C	500	515	530	545	560	575
R	0	15	30	45	60	75

x	6	7	8	9	10
C	590	605	620	635	650
R	90	105	120	135	150

- b. Your company will never break even. You need to sell each backpack for more than \$15 to make up the \$500 you invested for equipment.



- b. yes; They intersect at every point because they are the same line.
 c. Any point on the line $y = 2x + 4$.

d.

x	0	1	2	3	4	5
y	4	6	8	10	12	14

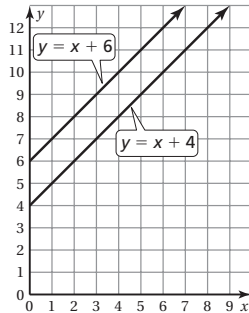
x	6	7	8	9	10
y	16	18	20	22	24

- e. yes
 f. There are many solutions. The solution of the system is all points on the line $y = 2x + 4$.

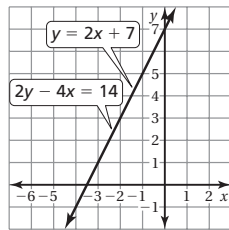
Record and Practice Journal Answer Key

4. A system of linear equations can have no solution if the two lines are parallel because parallel lines do not intersect. A system of linear equations can have many solutions if the equations are the same when written in slope-intercept form.

Sample answer: The system of equations consisting of $y = x + 4$ and $y = x + 6$ has no solution because the lines are parallel, as you can see from the graph.



The system of equations consisting of $y = 2x + 7$ and $2y - 4x = 14$ has many solutions because they are the same line, as you can see from the graph.



4.4 Practice

- no solution
- infinitely many solutions
- infinitely many solutions
- no solution
- no; You have a 20 page head start and you both read at the same pace.
- You both buy the same number of songs.

4.4 Extension

- $x = 1$
- $x = 3$
- $x = -10$
- $x = 2$
- yes; You earn the same amount each day if $x = \frac{9}{10}$.

6. 4 min

7. a. $25x + 500 = 15x + 750$ b. 25 years

4.5 Activity

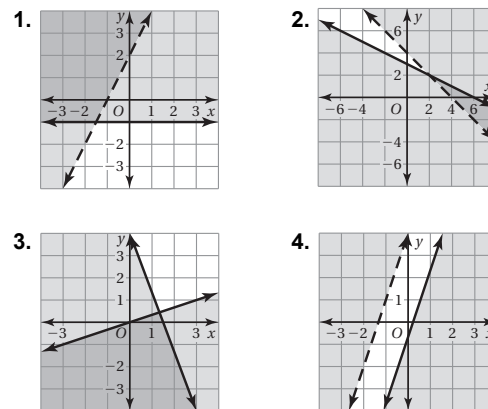
1. a. Inequality 1 b. Inequality 2

2. When you graph both inequalities in the same coordinate plane, you get a coordinate plane divided into four regions.

The pink region represents points that satisfy Inequality 2 but not Inequality 1. The blue region represents points that satisfy Inequality 1 but not Inequality 2. The purple region represents points that satisfy both Inequalities. The unshaded region represents points that satisfy neither Inequality.

- $x + y \leq 4$
 - $x + y \geq -4$
 - $x - y \leq 4$
 - $x - y \geq -4$
- Wyoming, Colorado; The state must have straight edges and be shaped such that a line between any two points inside the state doesn't cross the state boundary.
- Graph each inequality in the same coordinate plane and shade in the solution of each. The solution to the system is the region where the shading overlaps.
- The region where the solutions of each inequality overlap is the solution to the system. No, not all systems have a solution. If the lines in the graphs of the two inequalities are parallel, their solutions could never overlap.

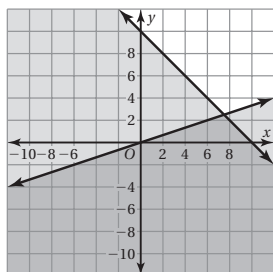
4.5 Practice



Record and Practice Journal Answer Key

5. a. $x + y \leq 10$

$x \geq 3y$



b. no; If $x = 7$ and $y = 3$, $x \geq 3y$ is not satisfied.

Chapter 5

Fair Game Review

- As the input increases by 1, the output increases by 2.
- As the input increases by 2, the output increases by 5.
- As the input increases by 4, the output increases by 3.
- As the input increases by 1, the output decreases by 7.
- As the hours increase by 1, the customers increase by 15.

6. Input Output

1	→	3
3	→	5
5	→	7
7	→	9

As the input increases by 2, the output increases by 2.

7. Input Output

-4	→	-1
-3	→	2
-2	→	5
-1	→	8

As the input increases by 1, the output increases by 3.

8. Input Output

0	→	0
2	→	-2.5
4	→	-5
6	→	-7.5

As the input increases by 2, the output decreases by 2.5.

9. Input Output

-3	→	3
1	→	4
5	→	5
9	→	6

As the input increases by 4, the output increases by 1.

10. Input Output

0	→	0
2	→	4
4	→	8
6	→	12
8	→	16

5.1 Activity

- $y = 8 - 2x$
 - 0, 1, 2, 3, 4; $x = 5$ is not in the domain because the output y becomes negative, and you cannot sell a negative amount of child tickets. $x = \frac{1}{2}$ is not in the domain because you cannot sell half of an adult ticket.
 - 0, 2, 4, 6, 8
 - (0, 8), (1, 6), (2, 4), (3, 2), (4, 0)

2. a.

x	-2	-1	0	1	2
y	10	7	4	1	-2

domain: -2, -1, 0, 1, 2

range: 10, 7, 4, 1, -2

b.

x	0	1	2	3	4
y	-6	-5.5	-5	-4.5	-4

domain: 0, 1, 2, 3, 4

range: -6, -5.5, -5, -4.5, -4

c.

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

domain: 1, 3, 5, 7, 9

range: 9, 7, 5, 3, 1

d.

x	2	3	4	6	9
y	0	1	2	4	7

domain: 2, 3, 4, 6, 9

range: 0, 1, 2, 4, 7

- The domain is the set of all possible input values. The range is the set of all possible output values.

Record and Practice Journal Answer Key

4. a. women: $y = \frac{1}{3}x + 7$

men: $y = \frac{1}{3}x + 7.3$

b and c.

women:

x (Domain)	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$
y (Range)	8.8	9	9.2	9.3	9.5

x (Domain)	8	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10
y (Range)	9.7	9.8	10	10.2	10.3

x (Domain)	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12
y (Range)	10.5	10.7	10.8	11

men:

x (Domain)	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$
y (Range)	9.1	9.3	9.5	9.6	9.8

x (Domain)	8	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10
y (Range)	10	10.1	10.3	10.5	10.6

x (Domain)	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12
y (Range)	10.8	11	11.1	11.3

5.1 Practice

- The domain is 1, 2, and 3. The range is 1, 3, and 5.
- The domain is $-4, -2, 0, 2$, and 4. The range is $-4, -2$, and 0.

3.

x	-2	-1	0	1
y	-9	-7	-5	-3

The domain is $-2, -1, 0$, and 1. The range is $-9, -7, -5$, and -3 .

4.

x	0	2	4	6
y	3	2	1	0

The domain is 0, 2, 4, and 6. The range is 0, 1, 2, and 3.

5. a. $y = 18,000x$

b.

x	1	2	4	8	10
y	18,000	36,000	72,000	144,000	180,000

c. The domain is 1, 2, 4, 8, and 10. The range is 18,000, 36,000, 72,000, 144,000, and 180,000.

5.1 Extension

- not a function
- function
- function
- not a function
- not a function
- function
- function
- not a function

9. a.

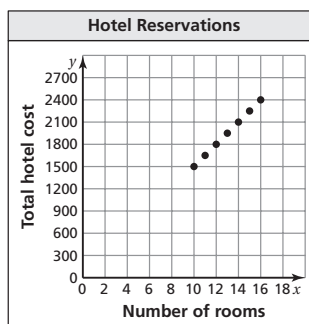
Input, x	1	2	3	4	5	6
Output, y	31	28	31	30	31	30

Input, x	7	8	9	10	11	12
Output, y	31	31	30	31	30	31

- b. yes; Each input has exactly one output.
- c. no; Some inputs will have multiple outputs. For example, input 30 has outputs 4, 6, 9, and 11.

5.2 Activity

2. a. $y = 150x$



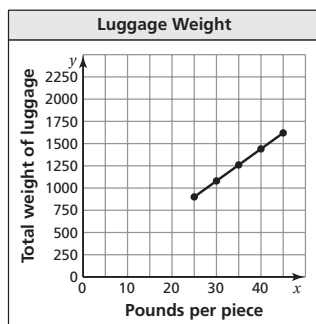
domain: 10, 11, 12, 13, 14, 15, 16

range: 1500, 1650, 1800, 1950, 2100, 2250, 2400

The domain is discrete.

Record and Practice Journal Answer Key

b. $y = 36x$



domain: $x \geq 25$ and $x \leq 45$

range: $y \geq 900$ and $y \leq 1620$

The domain is continuous.

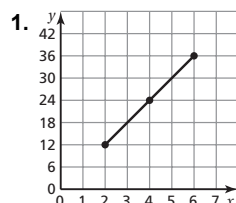
3. A discrete domain is a set of input values that consists of only certain numbers in an interval. A continuous domain is a set of input values that consists of all numbers in an interval.

Sample answer:

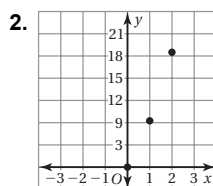
discrete domain: The total cost of families attending a football game.

continuous domain: The height of a building.

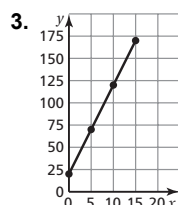
5.2 Practice



The domain is continuous.



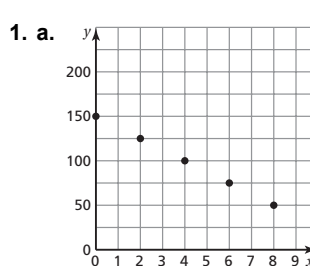
The domain is discrete.



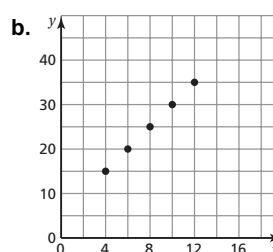
The domain is continuous.

4. a. Yes, because you can buy 8 cards.
b. Yes, because you can buy 16 cards for \$40.

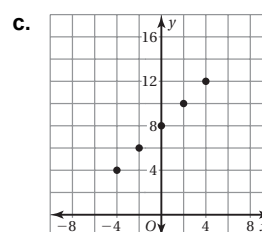
5.3 Activity



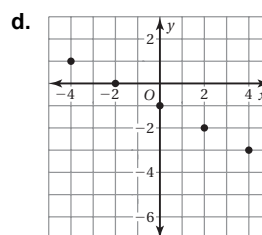
$$y = -\frac{25}{2}x + 150$$



$$y = \frac{5}{2}x + 5$$

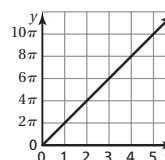


$$y = x + 8$$

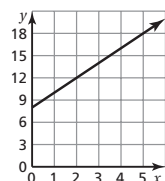


$$y = -\frac{1}{2}x - 1$$

2. a. $y = 2\pi x$; x is the radius; y is the circumference

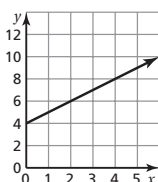


- b. $y = 2x + 8$; x is the width of the rectangle; y is the perimeter

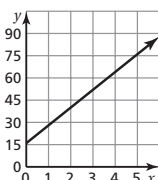


Record and Practice Journal Answer Key

- c. $y = x + 4$; x is the length of one of the bases;
 y is the area



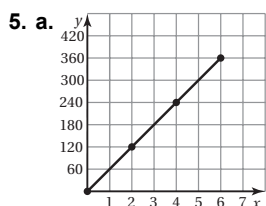
- d. $y = 12x + 16$; x is the width of the prism; y is the surface area



3. *Sample answer:* A linear function helps you to see the relationship between x and y . The slope shows the rate at which y is changing for each increase of 1 in x .
4. *Sample answer:* After plotting the points, you can find the slope between the points. Then, you can draw a line through the points to find the y -intercept and write the linear function.

5.3 Practice

- $y = 3x$
- $y = 2$
- $y = 2x + 5$
- $y = -\frac{1}{2}x - 2$

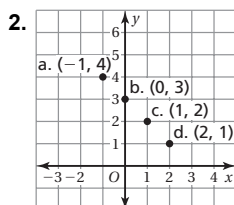


The domain is continuous.

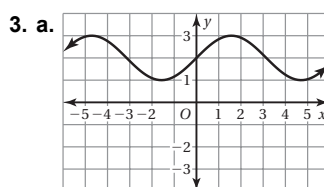
- b. $y = 60x$ c. 180 miles

5.4 Activity

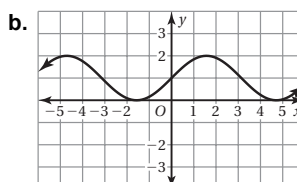
1. a. B b. D c. A d. C



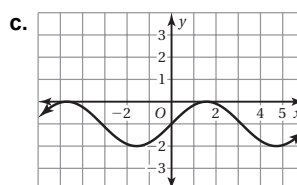
I evaluated $f(x)$ at x and plotted $(x, f(x))$.



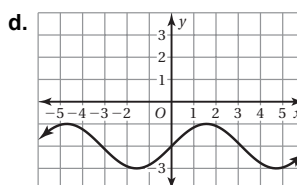
$g(x)$ is equal to $f(x)$ shifted up 2 units.



$g(x)$ is equal to $f(x)$ shifted up 1 unit.



$g(x)$ is equal to $f(x)$ shifted down 1 unit.



$g(x)$ is equal to $f(x)$ shifted down 2 units.

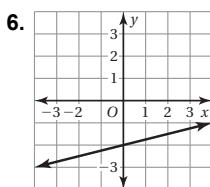
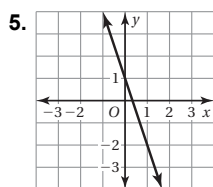
4. You can name a linear function f . The notation $f(x)$ is another name for y . So, the function $y = 2x + 5$ becomes $f(x) = 2x + 5$. Functions in standard notation and function notation both look the same on the right hand side, but they differ on the left hand side as described above.

5. The graph of $y = f(x) + c$ is the graph of $y = f(x)$ shifted up c units. If c is negative, the function is shifted down.

5.4 Practice

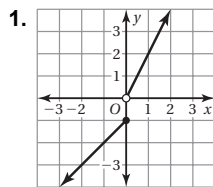
- $x = 2$
- $x = -7$
- $x = -6$
- $x = \frac{1}{4}$

Record and Practice Journal Answer Key

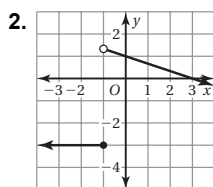


7. a. \$234 b. 8 times

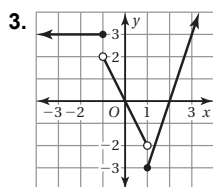
5.4 Extension



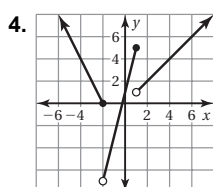
Domain: all real numbers
Range: $y \leq -1, y > 0$



Domain: all real numbers
Range: $y < \frac{4}{3}$

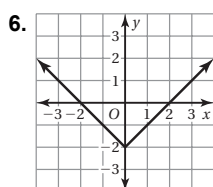


Domain: all real numbers
Range: $y \geq -3$

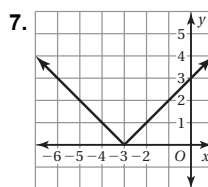


Domain: all real numbers
Range: $y > -7$

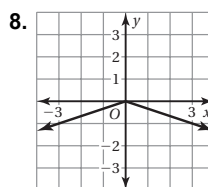
5.
$$y = \begin{cases} x + 1, & \text{if } x < 1 \\ -2x + 5, & \text{if } x \geq 1 \end{cases}$$



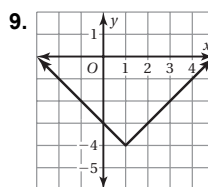
Translation 2 units down
of $y = |x|$
Domain: all real numbers
Range: $y \geq -2$



Translation 3 units left
of $y = |x|$
Domain: all real numbers
Range: $y \geq 0$



Opens down and is wider
than $y = |x|$
Domain: all real numbers
Range: $y \leq 0$



Translation 1 unit right and
4 units down of $y = |x|$
Domain: all real numbers
Range: $y \geq -4$

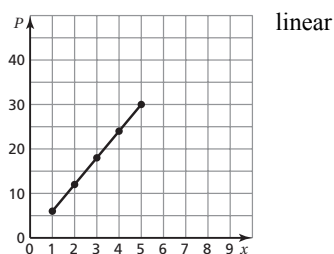
10. $y = |x - 3|$

11. $y = |x + 8| - 2$

5.5 Activity

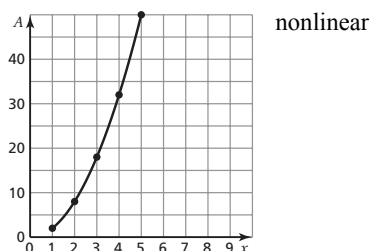
1. a.

x	1	2	3	4	5
P	6	12	18	24	30



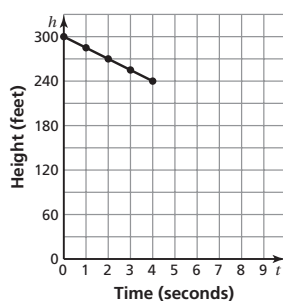
b.

x	1	2	3	4	5
A	2	8	18	32	50

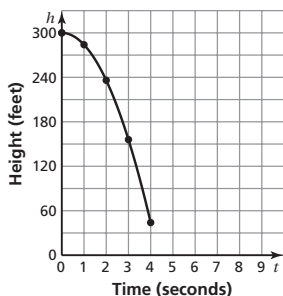


Record and Practice Journal Answer Key

2. a. linear



b. nonlinear



The bowling ball has an increasing speed.

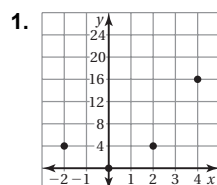
3. If the rate of change is constant, the pattern is linear.

Sample answer:

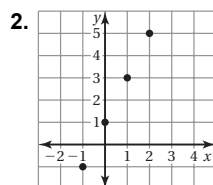
linear: area of a triangle with a base of 6 and a height of x

nonlinear: height and age

5.5 Practice



The graph is nonlinear.



The graph is linear.

3. linear; The graph is a line.

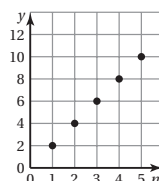
4. nonlinear; The graph is not a line.

5. nonlinear; The area increases by different amounts as the side length increases by one.

5.6 Activity

1. a.

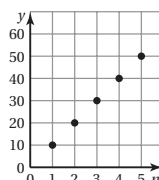
Number of rows, n	1	2	3	4	5
Number of dots, y	2	4	6	8	10



y -values increase by 2 each time.

b.

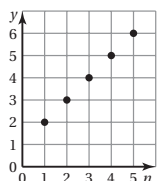
Number of stars, n	1	2	3	4	5
Number of sides, y	10	20	30	40	50



y -values increase by 10 each time.

c.

n	1	2	3	4	5
Number of circles, y	2	3	4	5	6



y -values increase by 1 each time.

2.

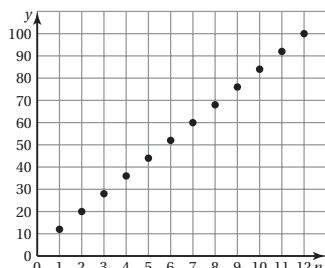
Number of molecules, n	1	2	3	4	5
Number of atoms, y	3	6	9	12	15

The y -values increase by 3 each time.

There are 69 atoms in 23 molecules.

Record and Practice Journal Answer Key

3. The values increase by 8 each month. *Answer should include, but is not limited to:* Students should write a story that uses the information given in the table. Students should include drawings and graphs.



4. Arithmetic sequences show the value for each term of a pattern. *Sample answer:* You start with \$60. You save \$10 each month. An arithmetic sequence to represent your savings is 60, 70, 80, 90, 100, ...

5.6 Practice

1. 15, 27, 39
2. 6.3, 7.6, 8.9
3. 4
4. 0.7
5. 300
6. 37, 46, 55
7. $10, 10\frac{1}{3}, 10\frac{2}{3}$
8. 70, 85, 100
9. no
10. yes; $\frac{5}{6}$
11. a. 45, 90, 135, 180, 225, ...
- b. 3 times; After three visits the regular admission has cost you \$135 and the season pass is only \$112.

Chapter 6

Fair Game Review

1. 3
2. -35
3. 23
4. -4
5. 9
6. -5
7. ± 4
8. $s = 7$ ft
9. $a_n = 4n - 3$
10. $a_n = -12n + 13$
11. $a_n = -6n + 24$
12. $a_n = 9n - 33$
13. a. $g_n = -2.5n + 22$
- b. 2 gal

6.1 Activity

1. a. $s = \sqrt{81} = 9$ ft
- b. $s = \sqrt{121} = 11$ yd
- c. $s = \sqrt{324} = 18$ cm
- d. $s = \sqrt{361} = 19$ mi
- e. $s = \sqrt{2.89} = 1.7$ in.
- f. $s = \sqrt{6.25} = 2.5$ m
- g. $s = \sqrt{\frac{16}{25}} = \frac{4}{5}$ ft
2. a. no; $\sqrt{36} + \sqrt{64} = 14$, but $\sqrt{36 + 64} = 10$.
no; It is not true in this example, so it is not true in general.
- b. yes; $\sqrt{4} \cdot \sqrt{9} = 6$ and $\sqrt{4 \cdot 9} = \sqrt{36} = 6$.
yes; $\sqrt{a} \cdot \sqrt{b} = a^{1/2} \cdot b^{1/2}$
 $= (a \cdot b)^{1/2}$
 $= \sqrt{a \cdot b}$.
- c. no; $\sqrt{64} - \sqrt{36} = 2$, but $\sqrt{64 - 36} = \sqrt{28} \approx 5.3$.
no; It is not true in this example, so it is not true in general.
- d. yes; $\frac{\sqrt{100}}{\sqrt{4}} = 5$ and $\sqrt{\frac{100}{4}} = \sqrt{25} = 5$.
yes; $\frac{\sqrt{a}}{\sqrt{b}} = \frac{a^{1/2}}{b^{1/2}} = \left(\frac{a}{b}\right)^{1/2} = \sqrt{\frac{a}{b}}$.

3. a. $\sqrt{a} \cdot \sqrt{b} = \sqrt{a \cdot b}$
- b. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

6.1 Practice

1. $2\sqrt{11}$
2. $-5\sqrt{7}$
3. $-\frac{\sqrt{10}}{7}$
4. $\frac{\sqrt{6}}{3}$
5. $2 - \sqrt{7}$
6. $\frac{-1 + \sqrt{2}}{3}$
7. $6y\sqrt{x}$
8. $5xz\sqrt{2yz}$
9. 14 ft

Record and Practice Journal Answer Key

6.1 Extension

Activity 1:

Sum or product	Answer	Rational or Irrational?
$12 + 5$	17	Rational
$-4 + 9$	5	Rational
$\frac{4}{5} + \frac{2}{3}$	$\frac{22}{15}$	Rational
$0.74 + 2.1$	2.84	Rational
3×8	24	Rational
-4×6	-24	Rational
3.1×0.6	1.86	Rational
$\frac{3}{4} \times \frac{5}{7}$	$\frac{15}{28}$	Rational

Activity 2:

Sum or product	Answer	Rational or Irrational?
$1 + \sqrt{5}$	$1 + \sqrt{5}$	Irrational
$\sqrt{2} + \frac{5}{6}$	$\frac{6\sqrt{2} + 5}{6}$	Irrational
$4 + \pi$	$4 + \pi$	Irrational
$-8 + \sqrt{10}$	$-8 + \sqrt{10}$	Irrational

1. yes; yes; The sum and product of each pair of rational numbers is rational.

2. The sum is irrational.

Activity 3:

Sum or product	Answer	Rational or Irrational?
$6 \cdot \sqrt{12}$	$12\sqrt{3}$	Irrational
$-2 \cdot \pi$	-2π	Irrational
$\frac{2}{5} \cdot \sqrt{3}$	$\frac{2\sqrt{3}}{5}$	Irrational
$0 \times \sqrt{6}$	0	Rational

Activity 4:

Sum or product	Answer	Rational or Irrational?
$3\sqrt{2} + 5\sqrt{2}$	$8\sqrt{2}$	Irrational
$\sqrt{12} + \sqrt{27}$	$5\sqrt{3}$	Irrational
$\sqrt{7} + \pi$	$\sqrt{7} + \pi$	Irrational
$-\pi + \pi$	0	Rational
$\pi \cdot \sqrt{7}$	$\sqrt{7}\pi$	Irrational
$\sqrt{5} \times \sqrt{2}$	$\sqrt{10}$	Irrational
$4\pi \cdot \sqrt{3}$	$4\pi\sqrt{3}$	Irrational
$\sqrt{3} \times \sqrt{3}$	3	Rational

3. no; The product is rational when the rational factor is 0. Otherwise, the product of a nonzero rational number and an irrational number is irrational.

4. no; no; The sum two irrational numbers can be rational or irrational. The product of two irrational numbers can be rational or irrational.

5. no; $\frac{\sqrt{3}}{\sqrt{3}} = 1$

6. *Sample answer:* Let $\frac{a}{b}$ and $\frac{c}{d}$ be rational numbers where $a, b, c,$ and d are integers and $b, d \neq 0$.

For addition, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd} \cdot \frac{ad + bc}{bd}$ is rational because the set of integers is closed under addition and multiplication. So, $ad, bc,$ and bd are all integers and the sum $ad + bc$ is an integer.

For multiplication, $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$. Because the integers are closed under multiplication, ac and bd are integers. So $\frac{ac}{bd}$ is rational.

6.2 Activity

1. a. 3^7 b. 2^5 c. 4^6 d. 5^8 e. x^8

The product of two powers with the same base is that base raised to the sum of the powers.

2. a. 3^2 b. 4^1 c. 2^3 d. x^3 e. 3^0

The quotient of two powers with the same base is that base raised to the difference of the powers.

Record and Practice Journal Answer Key

3. a. 3^6 b. 2^8 c. 7^6 d. y^9 e. x^8

The power of a power is the base of the powers raised to the product of the powers.

4. a. $(2^3)(3^3)$ b. $(2^2)(5^2)$ c. $(5^3)(4^3)$
d. $(6^4)(a^4)$ e. $(3^2)(x^2)$

The power of a product is the product of the factors each raised to the power.

5. a. $\frac{3^4}{2^4}$ b. $\frac{2^2}{3^2}$ c. $\frac{4^3}{3^3}$ d. $\frac{x^3}{2^3}$ e. $\frac{a^4}{b^4}$

The power of a quotient is the quotient of the dividend raised to the power and the divisor raised to the power.

6. If the same pattern holds true for every example you encounter, you can use inductive reasoning to write a general rule stating that the pattern is always true.

7. 9^3

6.2 Practice

1. m^9 2. $\frac{1}{t^2}$ 3. 729
4. $\frac{1}{h^2}$ 5. $256p^4$ 6. $\frac{y^3}{125}$
7. $\frac{a^5}{243}$ 8. $\frac{1}{128w^7}$ 9. $\frac{3x^5}{y}$

6.3 Activity

1. a. $s = \sqrt[3]{27} = 3$ ft; Check: $3^3 = 27$
b. $s = \sqrt[3]{125} = 5$ cm; Check: $5^3 = 125$
c. $s = \sqrt[3]{3375} = 15$ in.; Check: $15^3 = 3375$
d. $s = \sqrt[3]{3.375} = 1.5$ m; Check: $1.5^3 = 3.375$
e. $s = \sqrt[3]{1} = 1$ yd; Check: $1^3 = 1$
f. $s = \sqrt[3]{\frac{125}{8}} = \frac{5}{2} = 2.5$ mm;

$$\text{Check: } \left(\frac{5}{2}\right)^3 = \frac{125}{8}$$

Cube D is the largest because it has the greatest side length, 1.5 m. Cubes A and E are the same size because they have the same side lengths, 3 ft = 1 yd.

2. a. C; $\sqrt[4]{25} \approx 2.24$ because $2.24^4 \approx 25$.

b. A; $\sqrt{0.5} \approx 0.71$ because $0.71^2 \approx 0.5$.

c. B; $\sqrt[5]{2.5} \approx 1.20$ because $1.20^5 \approx 2.5$.

d. E; $\sqrt[3]{65} \approx 4.02$ because $4.02^3 \approx 65$.

e. D; $\sqrt[3]{55} \approx 3.80$ because $3.80^3 \approx 55$.

f. F; $\sqrt[6]{20,000} \approx 5.21$ because $5.21^6 \approx 20,000$.

3. If x is a number, you can write the n th root of x as $\sqrt[n]{x}$. You can evaluate this by finding a number y such that $y^n = x$.

4. $C \approx 512.7$ mm

6.3 Practice

- | | | |
|-------|--------|----------|
| 1. 3 | 2. 4 | 3. 12 |
| 4. 9 | 5. 100 | 6. 512 |
| 7. 27 | 8. 128 | 9. 3 in. |

6.4 Activity

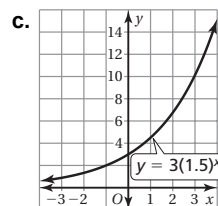
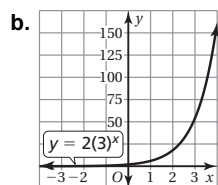
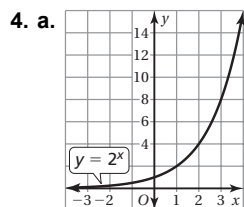
1. a. The graph curves upward with each successive increase in population greater than the last.
b. percent; Earth's population increased by around 40% during each 500-year period.
c. about 592 million
d. about 6.07 billion; The pattern did not continue. The industrial revolution and improvements in medicine caused the population to increase dramatically faster than predicted.

Record and Practice Journal Answer Key

2.

Year	t	Population from Activity 1	P
5000 B.C.	-5000	5	5.03
4500 B.C.	-4500	7	7.08
4000 B.C.	-4000	10	9.95
3500 B.C.	-3500	14	13.99
3000 B.C.	-3000	20	19.68
2500 B.C.	-2500	28	27.66
2000 B.C.	-2000	39	38.90
1500 B.C.	-1500	55	54.69
1000 B.C.	-1000	77	76.89
500 B.C.	-500	108	108.11
1 B.C.	0	152	152.00
500 A.D.	500	214	213.71
1000 A.D.	1000	301	300.48
1500 A.D.	1500	423	422.47

3. An exponential function is a function whose output increases or decreases at a constant rate.



Yes, each of these functions increases at a constant rate.

6.4 Practice

1. 16

2. 25,000

3. 8

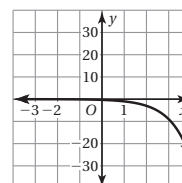
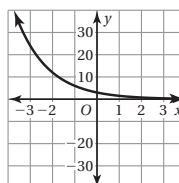
4. -686

5. Domain: all real numbers

6. Domain: all real numbers

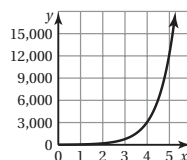
Range: $y > 0$

Range: $y < 0$



7. a. Domain: $x \geq 0$

Range: $y \geq 12$



b. 768 visitors

6.4 Extension

1. $x = 3$

2. $x = -3$

3. $x = -1$

4. no solution

5. $x = 4$

6. $x = 6$

7. $x \approx 2.80$

8. $x \approx -0.21$

9. $x \approx 0.61$

10. $x \approx -0.57$

11. no solution

12. $x \approx -1.95$

13. a. on the third day ($x = 3$)

b. $A = 4^3 = 64$, $B = 2^{9-3} = 64$

6.5 Activity

1. a. Consecutive points increase by a constant amount, 3, so the pattern is linear.

b. Consecutive points increase by around the same factor, 1.4, so the pattern is approximately exponential.

c. Consecutive points neither increase by the same factor or the same amount, so the pattern is neither exponential nor linear.

d. Consecutive points neither increase by the same factor or the same amount, so the pattern is neither exponential nor linear.

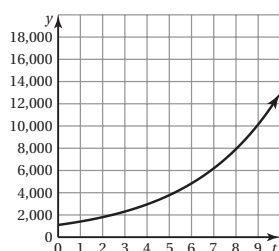
Pattern (b)

Record and Practice Journal Answer Key

2. The pattern is approximate exponential growth with each term increasing by an average factor of 1.5. If the pattern continues, the population will return to 100,000 nesting pairs around the year 2035.
3. In exponential growth, a quantity increases by a constant factor over time. Other growth patterns increase according to different rules, for example a linear growth pattern would increase by the same amount over equal time intervals.
4.
 - a. exponential growth; Excluding deposits and withdrawals, savings accounts increase by a constant factor, determined by the interest rate.
 - b. not exponential growth; The speed of the moon doesn't grow by a constant factor, it increases and decreases repeatedly because of its elliptical orbit.
 - c. not exponential growth; The height of the ball is decreasing, not increasing. It is also not decreasing exponentially.

6.5 Practice

1. $a = 250$; $r = 1\%$; 260.2
2. $a = 14$; $r = 35\%$; 46.5
3. $a = 4.2$; $r = 90\%$; 54.7
4. $a = 1800$; $r = 5.9\%$; 2263.9
5. $y = 1100(1.28)^t$



6. a. $y = 675(1.017)^{2t}$ b. \$734.36

6.6 Activity

1.
 - a. Consecutive points neither decrease by the same factor or the same amount, so the pattern is neither exponential nor linear.
 - b. Consecutive points decrease by a constant amount, 3, so the pattern is linear.
 - c. Consecutive points decrease by about the same factor, 0.8, so the pattern is approximately exponential.
 - d. Consecutive points neither decrease by the same factor or the same amount, so the pattern is neither exponential nor linear.

Pattern (c)

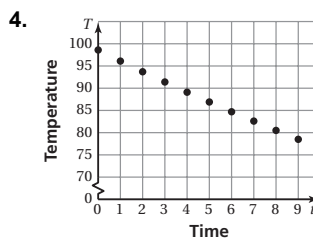
2. a. about 10%

b.

Time	Temperature
0	98.6
1	94.7
2	91.2
3	88.1
4	85.3
5	82.8
6	80.5
7	78.5
8	76.7
9	75.0
10	73.5

6 P.M.

3. In exponential decay, a quantity decreases by a constant factor over time. Other decay patterns decrease according to different rules, for example a linear decay pattern would decrease by the same amount over equal time intervals.



5. about 69.2°F

Record and Practice Journal Answer Key

6.6 Practice

1. exponential decay
2. neither
3. exponential growth
4. exponential decay
5. 22%
6. 60%
7. a. $A(t) = 35(0.871)^t$ b. about 20.1 mg

6.7 Activity

1. a.

Step	1	2	3	4	5
Calculator display	2	4	8	16	32

The calculator display doubles for each step.

b.

Step	1	2	3	4	5
Calculator display	64	32	16	8	4

The calculator display is halved for each step.

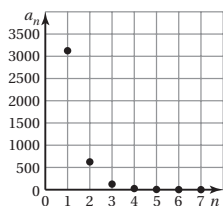
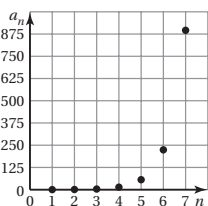
c. Sample answer:

Step	1	2	3	4	5
Calculator display	1	3	9	27	81

2. a. 0.2 mm b. 0.4 mm c. 6.4 mm
d. Sample answer: 8; 25.6 mm
e. Sample answer: yes; The paper would be about 3276.8 millimeters high. This is about 10.5 feet, so the paper would be taller than any person.
3. In the end, the king would have to give the beggar millions of grains of rice. *Answer should include, but is not limited to:* Students should write a story about doubling or tripling a small object.
4. Geometric sequences are used to describe patterns where something is multiplied by the same amount several times. *Sample answer:* On a game show, for each correct question, the prize money is double or nothing.

6.7 Practice

1. 3
2. $-\frac{1}{4}$
3. 8
4. 56, 224, 896
5. 5, 1, $\frac{1}{5}$



6. arithmetic
7. neither
8. geometric

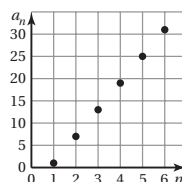
9. a. Multiply by 3 for the next row.

b. 27, 81, 243

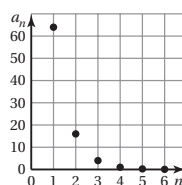
c. geometric; You multiply by the same amount each time, so this is the common ratio of a geometric sequence.

6.7 Extension

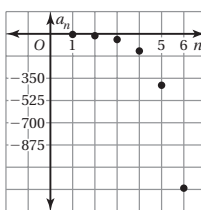
1. 1, 7, 13, 19, 25, 31



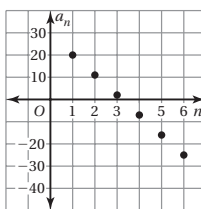
2. 64, 16, 4, 1, $\frac{1}{4}$, $\frac{1}{16}$



3. -5, -15, -45, -135, -405, -1215



4. 20, 11, 2, -7, -16, -25



5. $a_1 = 24, a_n = a_{n-1} + 7$

6. $a_1 = -5, a_n = -6a_{n-1}$

7. $a_1 = 200, a_n = 7a_{n-1}$

Record and Practice Journal Answer Key

8. $a_n = 54\left(\frac{1}{3}\right)^{n-1}$ 9. $a_n = 12n - 12$
10. $a_1 = 60, a_n = a_{n-1} - 25$
11. $a_1 = 16, a_n = 1.5a_{n-1}$
12. $a_1 = 3, a_2 = 8, a_n = a_{n-1} + a_{n-2}; 49, 79, 128$
13. $a_1 = 1, a_2 = 2, a_n = a_{n-1} - a_{n-2}; 1, -1, -2$
14. $a_1 = 1.25, a_2 = 4, a_n = a_{n-1}a_{n-2}; 2000, 200,000$
15. $a_1 = -3, a_2 = -2, a_n = a_{n-1}a_{n-2}; 864, -62,208$

Chapter 7

Fair Game Review

- | | |
|--------------|--------------|
| 1. $-4y + 6$ | 2. $h + 7$ |
| 3. $5a - 4$ | 4. $-2m - 9$ |
| 5. $3d - 22$ | 6. $7q - 11$ |
| 7. $2x + 10$ | 8. $14x - 6$ |
| 9. 3 | 10. 5 |
| 11. 6 | 12. 16 |
| 13. 2 | 14. 15 |
| 15. 8 | 16. 21 cm |

7.1 Activity

1. *Sample answers:*
- a. Monosyllabic; The infant had started speaking but still had a monosyllabic vocabulary.
 - b. Biped; Humans are a well-known type of biped.
 - c. Tricycle; Our son is too young to balance on a bicycle so we got him a tricycle.
 - d. Polydactyl; The polydactyl cat had six toes on its front paws instead of 5.
2. a. $-x + 2$; binomial; it has two terms.
 b. $3x + 3$; binomial; it has two terms.
 c. x^2 ; monomial; it has one term.
 d. $3x^2 - x + 1$; trinomial; it has three terms.
 e. $-x^2 - 2x$; binomial; it has two terms.
 f. $-x^2 + x$; binomial; it has two terms.

3. A3, H7: $x^2 + 2$; 6
 A4, B3, E5, G6, I7: $2x - 2$; 2
 A6, D7, E2, H5: $x^2 - 2$; 7
 B5, F1, H3: $x + 6$; 5
 A7, F9, I4: $2x + 3$; 9
 E8, F3, I6: $-x^2 - 2x + 2$; 3
 C4, I3: $x^2 - x + 2$; 8
 B7, D1: $x^2 + x + 2$; 4

	1	2	3	4	5	6	7	8	9
A	1	4	6	2	3	7	9	8	5
B	9	8	2	6	5	1	4	7	3
C	3	5	7	8	9	4	1	6	2
D	4	6	9	3	8	5	7	2	1
E	8	7	1	4	2	9	5	3	6
F	5	2	3	7	1	6	8	4	9
G	7	9	4	5	6	2	3	1	8
H	2	3	5	1	7	8	6	9	4
I	6	1	8	9	4	3	2	5	7

4. You can use unique figures to represent each of the monomials, 1, -1 , x , $-x$, x^2 , $-x^2$, then represent a polynomial by displaying a group of figures where the number of a specific figure represents the coefficient of that monomial. The shape and dimension represent the degree of the monomial; degree-2 terms are large squares, degree-1 terms are rectangles, and degree-0 terms are small squares. The color represents the sign of the monomial; yellow, green, and blue are positive and red is negative.

7.1 Practice

1. $4v^6$; 6; monomial
2. $-2c^3 - 9c + 1$; 3; trinomial
3. $5t^5 + 8$; 5; binomial
4. $\frac{3}{4}m^8 + \frac{3}{2}m^6$; 8; binomial
5. $-\sqrt{12}g^4$; 4; monomial
6. $3.2a^{12} - a^9 + 1.8a$; 12; trinomial
7. no
8. yes; 10; trinomial
9. $-16t^2 + 1000$; 600 ft

Record and Practice Journal Answer Key

7.2 Activity

1. Step 2:

Step 3:

Step 4:

2. a. $3x^2$ b. $5x + 1$ c. $4x^2 + 2x + 7$
 d. $3x^2 - 5x + 4$ e. $2x^2 + x + 1$
 f. $3x$ g. $x^2 + x$ h. 0

3. Step 2:

Step 3:

Step 4:

Step 5:

4. a. $-x^2 + 4x - 2$ b. $3x + 5$
 c. $-2x^2 - 2x - 3$ d. $x^2 - x - 4$
5. You can add polynomials by grouping like terms, then adding the coefficients of the like terms and simplifying.
6. You can subtract polynomials by grouping like terms, then subtracting the coefficients of the like terms and simplifying.

7.2 Practice

1. $6d - 3$ 2. $8m^2 - m + 12$
 3. $-7t^2 + 3t - 8$ 4. $c^4 + 4c^2 + 3c + 4$
 5. $-6s^2 + 5s + 4$ 6. $5w^2 - 9w - 12$
 7. $4y^2 + 2$ 8. $8z^3 + 2z^2 + 7z - 5$
 9. $20x^2 + 12x + 32$

7.3 Activity

1. a. $x^2 + x - 6$ b. $4x^2 - 1$
 c. $2x^2 + 3x - 2$ d. $-x^2 + x + 6$

2. a. 1 b. -1 c. 1 d. x e. $-x$
 f. $-x$ g. x h. x^2 i. $-x^2$ j. x^2

The product of two numbers with the same sign is positive and the product of two numbers with opposite signs is negative.

3. a. $4x^2 - 2x - 2$ b. $4x^2 - 5x - 6$
 c. $-2x^2 + 2x + 4$ d. $2x^2 + 5x - 12$
 e. $-3x^2 - 5x - 2$ f. $-6x^2 + x + 2$
 g. x^2 h. $4x^2 - 12x + 9$

4. You can multiply two binomials by multiplying each term in the first binomial by each term in the second binomial (four multiplications take place) then simplifying the result.

5. a. $x - 2, x - 1$ b. $x - 2, x - 2$

7.3 Practice

1. $g^2 + 13g + 42$ 2. $12w^2 - 8w - 32$
 3. $a^2 - 9a + 18$ 4. $45d^2 - 35d - 10$
 5. $2x^2 + 10x - 72$ 6. $-3n^2 + 17n + 28$
 7. a. $2t^2 + 17t + 21$ b. \$90

7.4 Activity

1. a. $x^2 - 4$ b. $4x^2 - 1$
2. a. $a^2 - b^2$
 b. i. $x^2 - 9$ ii. $x^2 - 16$ iii. $9x^2 - 1$
 iv. $9y^2 - 16$ v. $4x^2 - 25$ vi. $z^2 - 1$
3. a. $x^2 + 4x + 4$ b. $4x^2 - 4x + 1$
4. a. $a^2 + 2ab + b^2$
 b. $a^2 - 2ab + b^2$
 c. i. $x^2 + 6x + 9$ ii. $x^2 - 4x + 4$
 iii. $9x^2 + 6x + 1$ iv. $9y^2 + 24y + 16$
 v. $4x^2 - 20x + 25$ vi. $z^2 + 2z + 1$
5. The patterns are: $(a + b)(a - b) = a^2 - b^2$,
 $(a + b)^2 = a^2 + 2ab + b^2$, and
 $(a - b)^2 = a^2 - 2ab + b^2$.

Record and Practice Journal Answer Key

7.4 Practice

1. $m^2 - 49$
2. $p^2 - 100$
3. $16s^2 - 64$
4. $81d^2 - 36$
5. $a^2 + 10a + 25$
6. $4k^2 - 16k + 16$
7. $9r^2 - 30r + 25$
8. $144f^2 + 48f + 4$
9. a. $x^2 + 22x + 121$ b. $225 \text{ ft}^2; 104 \text{ ft}^2$

7.5 Activity

1. a. C, 5 b. D, 1 c. A, 3 d. B, 4 e. E, 2
2. a. 0; 0; 2; 6; 12; 20
b. 2; 0; 0; 2; 6; 12
c. 6; 2; 0; 0; 2; 6
d. 12; 6; 2; 0; 0; 2
e. 20; 12; 6; 2; 0; 0
f. 0; -4; -6, -6, -4; 0

Conjecture: If $(x - a)$ is a factor in the factored form of an equation, then $x = a$ is a solution to the equation.

3. a. 0; Adding 0 to a number leaves it unchanged; adding 1 to a number increases it by 1.
b. 0; 0 is the only number you can multiply a nonzero number by and get 0. The product of any two numbers that are opposites is 1.
c. both; 0^2 is 0; 1^2 is 1.
d. 1; Multiplying any number by 1 leaves it unchanged.
e. 0; Multiplying any number by 0 results in 0.
f. neither; $-1 \neq 1$; 0 has no opposite.
4. Any equation that is equal to a nonzero number can be made into an equation equal to zero by subtracting the nonzero number from both sides.
5. Property b; The Zero-Product Property is used to solve equations: the equation is written in factored form, then solutions are found by setting each factor equal to zero. It is important because it can be used to solve any equation that can be written in factored form.
6. You can set each factor equal to zero and solve each of them. Each solution to one of these equations is a solution to the original equation.

7.5 Practice

1. $b = 0, 4$ 2. $k = 0, -3$ 3. $n = -6, 6$
4. $v = -11, -2$ 5. $h = 9$ 6. $x = -5, 7$
7. $r = -1, 3$ 8. $p = 4, 16$ 9. 450 ft

7.6 Activity

1. a. $x(2x + 2)$ b. $x(x - 2)$
c. $x(-2x + 1)$ d. $x(x - 4)$
2. a. $3x(x - 2)$ b. $2x(x + 4)$ c. $-4x(x - 1)$
3. a. $3x(x - 3)$ b. $7x(1 + 2x)$ c. $-2x(x - 3)$
4. a. $4x^2, -8x$ b. 1, 2, 4, $x, 2x, 4x$
c. $4x$; it is the greatest polynomial that divides both terms.
5. Find the greatest common factor of the terms, factor it out, then write the polynomial as the GCF multiplied by the sum of the divided factors.

7.6 Practice

1. $5n(n - 3)$ 2. $2t(3t^2 + 6t - 2)$
3. $a = 4$ 4. $r = 0, -\frac{1}{2}$
5. $w = -3, 0$ 6. $z = 0, 3$
7. $x = -9, 0$ 8. $p = 0, \frac{1}{3}$
9. a. $6x^2$ b. 192 ft^2

7.7 Activity

1. a. $(x - 2)(x - 1)$ b. $(x + 4)(x + 1)$
2. a. $(x - 3)(x - 4)$ b. $(x + 3)(x + 4)$
3. a. $(x + 3)^2$ b. $(x - 3)^3$
c. $(x + 4)(x + 2)$ d. $(x - 4)(x - 2)$
e. $(x + 5)(x + 1)$ f. $(x - 5)(x - 1)$

Record and Practice Journal Answer Key

4. a. To factor $x^2 + bx + c$, arrange algebra tiles that add up to the terms x^2 , bx , and c in a rectangular array that models $x^2 + bx + c$, then label the dimensions of the array with tiles so that the array forms a multiplication table with the products of the labels on the outside equal to the corresponding algebra tiles inside the array. The factors are the sums of the two groups of tiles on the outside of the table.

b. To factor $x^2 + bx + c$ without using algebra tiles, find two factors, $(x + p)$ and $(x + q)$ such that $(p + q) = b$ and $pq = c$.

5. a. $(x + 8)(x - 2)$ b. $(x - 8)(x + 2)$
c. $(x + 9)(x - 3)$

7.7 Practice

1. $(w + 3)(w + 5)$ 2. $(b + 9)(b + 3)$
3. $(y - 6)(y - 3)$ 4. $(h - 2)(h - 13)$
5. $(n + 7)(n - 6)$ 6. $(n - 7)(n + 2)$
7. $t = 3, 11$ 8. $d = -6, 9$
9. a. $x - 3$ and $x + 10$ b. 74 meters

7.8 Activity

1. $(3x + 2)(x + 1)$
2. a. $(2x - 1)(2x + 3)$ b. $(2x - 1)(x - 5)$
3. a. $(2x - 1)(x + 3)$ b. $(3x - 2)(x + 4)$
c. $(2x + 3)(2x - 1)$ d. $(2x + 5)(x + 3)$
e. $(3x - 1)^2$ f. $(4x - 1)(x + 3)$
4. To factor $ax^2 + bx + c$, find two factors, $(rx + p)$ and $(sx + q)$, such that $rs + a$, $rq + ps = b$, and $pq = c$.

5. a. $(2x + 1)^2$ b. $(3x - 1)(x + 2)$
c. $(2x - 3)(x - 5)$

7.8 Practice

1. $5(n + 2)(n + 1)$ 2. $4(h + 2)(h - 7)$
3. $(2j - 5)(j + 9)$ 4. $(3p + 4)(3p - 2)$

5. $(3b - 8)(2b + 3)$ 6. $3(x - 2)(4x - 3)$

7. $y = -\frac{1}{2}, -\frac{2}{3}$ 8. $d = -2.5, 3$ 9. 8 ft by 8 ft

7.9 Activity

1. a. $(2x + 1)(2x - 1)$. This is a special product studied in Lesson 7.4.
b. $(2x - 1)^2$. This is a special product studied in Lesson 7.4.
c. $(2x + 1)^2$. This is a special product studied in Lesson 7.4.
d. $(2x - 2)(2x - 1)$. This is a special product studied in Lesson 7.4.

2. $9x^2 - 4 = (3x + 2)(3x - 2)$
 $9x^2 + 12x + 4 = (3x + 2)^2$
 $9x^2 - 12x + 4 = (3x - 2)^2$

3. a. $(2x - 3)^2$ b. $(2x - 3)(2x + 3)$
c. $(2x + 3)^2$

4. You can tell that a polynomial can be factored $(a + b)(a - b)$ if it can be written in the form $a^2 - b^2$.

You can tell that a polynomial can be factored $(a + b)^2$ if it can be written in the form $a^2 + 2ab + b^2$.

You can tell that a polynomial can be factored $(a - b)^2$ if it can be written in the form $a^2 - 2ab + b^2$.

5. a. $(5x + 1)^2$ b. $(5x - 1)^2$
c. $(5x + 1)(5x - 1)$

7.9 Practice

1. $(b + 9)(b - 9)$ 2. $(4z + 6)(4z - 6)$
3. $(k - 7)^2$ 4. $(f + 11)^2$
5. $x = -10, 10$ 6. $r = -4$
7. $a = -\frac{2}{5}, \frac{2}{5}$ 8. $p = 13$ 9. 2 sec

Record and Practice Journal Answer Key

7.9 Extension

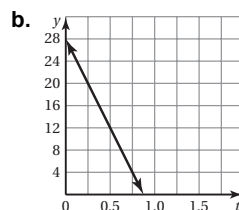
1. $(c^2 + 4)(c - 5)$
2. $(k^2 + 3)(3k + 1)$
3. $(4p^2 + 1)(2p - 7)$
4. $2(3t^2 - 1)(4t - 3)$
5. $(a + b)(b + 8)$
6. $(3x + 4)(y - 6)$
7. $4d(d + 1)(d - 9)$
8. $12n(n - 2)(n + 2)$
9. already factored completely
10. $6w(w + 4)^2$
11. $q = 0, 2, 4$
12. $r = -3, 0, 3$
13. $a = -10, 0, 3$
14. $f = 0, 7$
15. a. length: $x - 10$; width: $y + 8$
b. length: 110; width: 70

Chapter 8

Fair Game Review

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
7. 10
8. 5
9. 7
10. -3
11. -9
12. 14
13. -18
14. 6

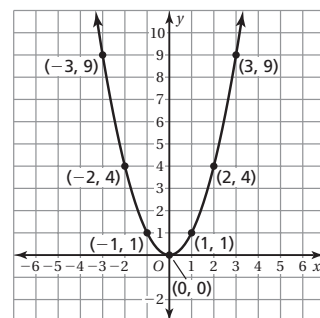
15. a. 23 ft



8.1 Activity

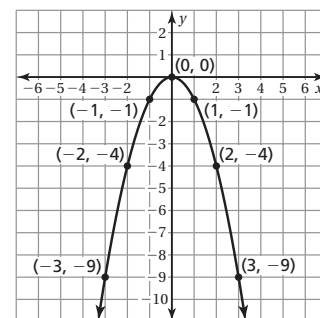
1. a.

x	$y = x^2$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9



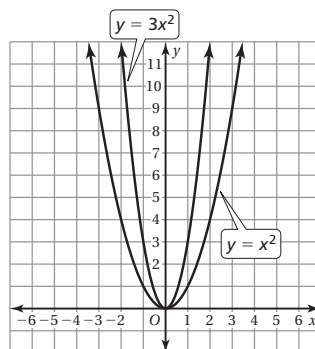
b.

x	$y = -x^2$
-3	-9
-2	-4
-1	-1
0	0
1	-1
2	-4
3	-9

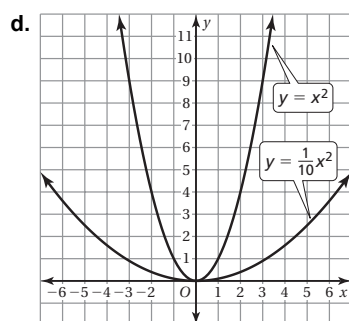
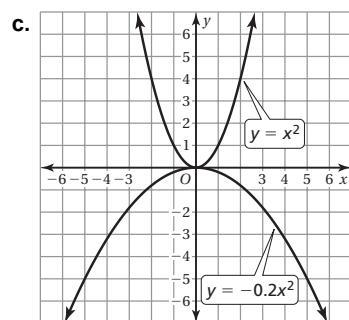
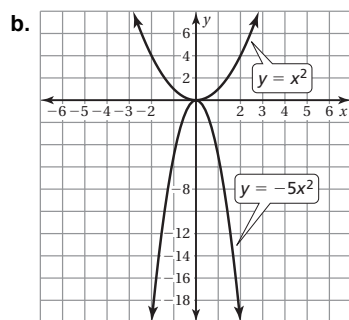


The graphs are a reflection of each other.

2. a.



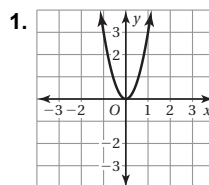
Record and Practice Journal Answer Key



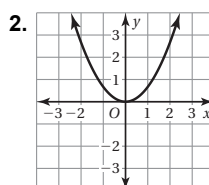
When $0 < a < 1$, the graph of $y = ax^2$ is wider than the graph of $y = x^2$. When $a > 1$, the graph of $y = ax^2$ is narrower than the graph of $y = x^2$. When $-1 < a < 0$, the graph of $y = ax^2$ is wider than and is a reflection in the x -axis the graph of $y = x^2$. When $a < -1$, the graph of $y = ax^2$ is narrower than and is a reflection in the x -axis of the graph of $y = x^2$.

3. The graph of $y = ax^2$ is U-shaped, symmetric about the y -axis, and passes through the origin. It has a domain of all real numbers and a range of either $y \leq 0$ or $y \geq 0$. If $a < 0$, the graph is reflected so that the graph is upside down U-shaped. If $|a| > 1$, the graph is narrower than the graph of $y = x^2$. If $0 < |a| < 1$, the graph is wider than the graph of $y = x^2$.

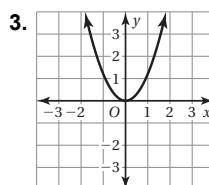
8.1 Practice



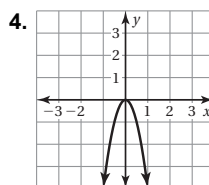
Both graphs open up, have the same vertex, $(0, 0)$, and have the same axis of symmetry, $x = 0$. The graph of $y = 3x^2$ is narrower than the graph of $y = x^2$.



Both graphs open up, have the same vertex, $(0, 0)$, and have the same axis of symmetry, $x = 0$. The graph of $y = \frac{2}{3}x^2$ is wider than the graph of $y = x^2$.

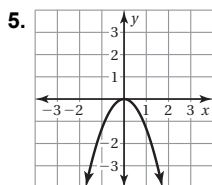


Both graphs open up, have the same vertex, $(0, 0)$, and have the same axis of symmetry, $x = 0$. The graph of $y = \frac{6}{5}x^2$ is wider than the graph of $y = x^2$.



The graphs have the same vertex, $(0, 0)$, and the same axis of symmetry, $x = 0$, but the graph of $y = -4x^2$ opens down. The graph of $y = -4x^2$ is narrower than and is a reflection in the x -axis of the graph of $y = x^2$.

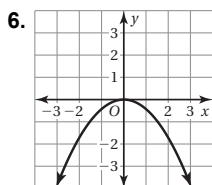
Record and Practice Journal Answer Key



The graphs have the same vertex, $(0, 0)$, and the same axis of symmetry, $x = 0$, but the graph of

$$y = -\frac{4}{3}x^2 \text{ opens down. The graph of}$$

$y = -\frac{4}{3}x^2$ is narrower than and is a reflection in the x -axis of the graph of $y = x^2$.



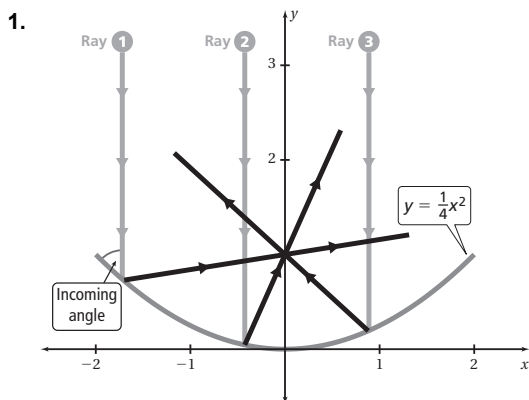
The graphs have the same vertex, $(0, 0)$, and the same axis of symmetry, $x = 0$, but the graph of

$$y = \frac{3}{7}x^2 \text{ opens down. The graph of } y = -\frac{3}{7}x^2$$

is wider than and is a reflection in the x -axis of the graph of $y = x^2$.

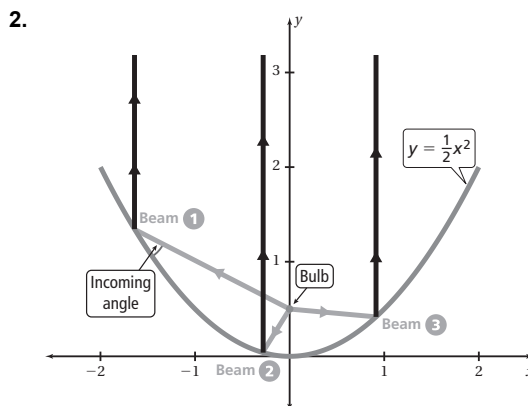
7. Distance: 25 feet; Height: 15 feet

8.2 Activity



The reflected rays all intersect the y -axis at $(0, 1)$.

The receiver for the satellite ray is at $(0, 1)$ because that is where the dish reflects all the incoming signals.

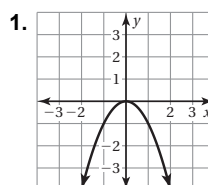


The outgoing rays are all parallel to the y -axis.

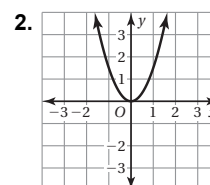
3. Satellite dishes have parabolic shapes so that incoming signals will be reflected to the receiver, located at the parabola's focus. Spotlight reflectors have parabolic shapes so that beams of light emitted from the bulb, located at the focus, will be reflected parallel to the parabola's axis of symmetry.

4. Answer will vary.

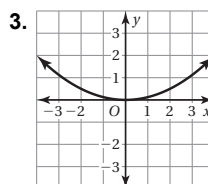
8.2 Practice



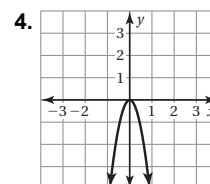
$$\left(0, -\frac{1}{4}\right)$$



$$\left(0, \frac{1}{6}\right)$$



$$(0, 2)$$



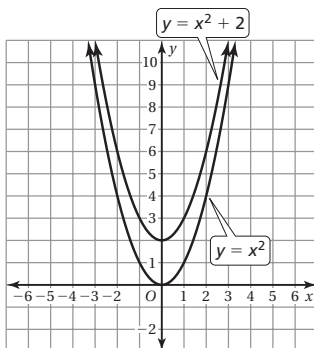
$$\left(0, -\frac{1}{20}\right)$$

5. $y = \frac{1}{12}x^2$ 6. $y = -2.5x^2$ 7. $y = \frac{1}{48}x^2$

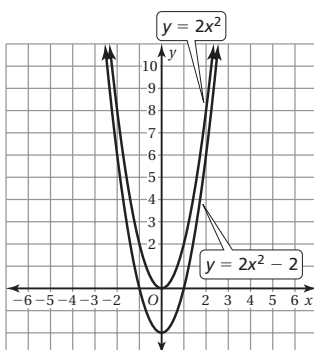
Record and Practice Journal Answer Key

8.3 Activity

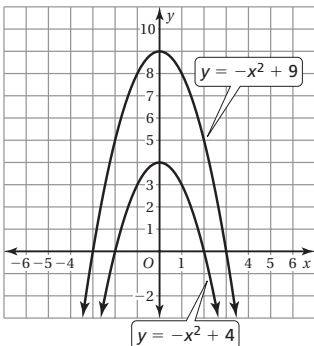
1. a.



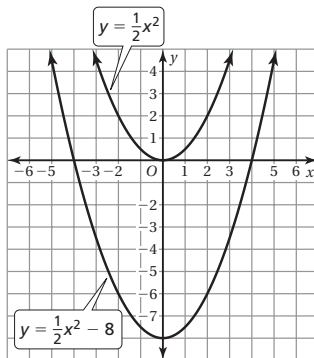
b.



c.

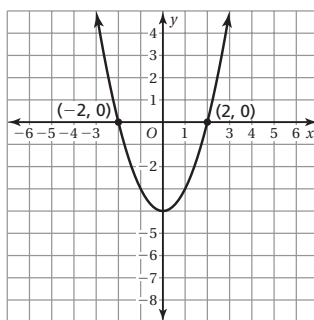


d.



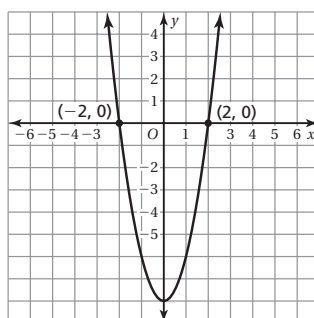
The value of c moves the graph up or down by c units.

2. a.



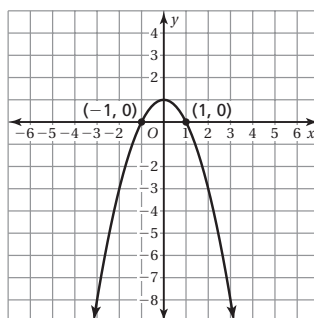
$$x = \pm 2$$

b.



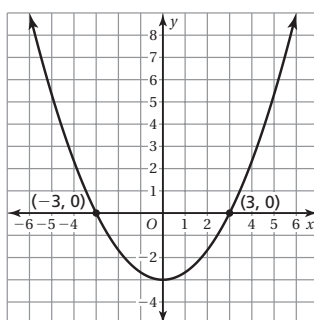
$$x = \pm 2$$

c.



$$x = \pm 1$$

d.



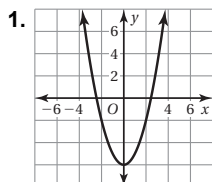
$$x = \pm 3$$

Set y equal to zero and solve for x .

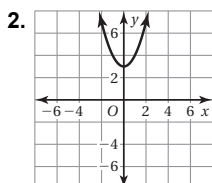
Record and Practice Journal Answer Key

3. The value of c in $y = x^2 + c$ translates the graph of $y = x^2$ up by c unit. ($y = x^2$ will be translated down in c is negative.)

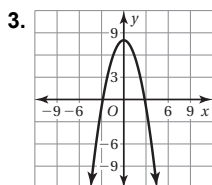
8.3 Practice



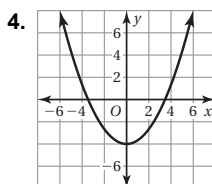
Both graphs open up and have the same axis of symmetry, $x = 0$. The graph of $y = x^2 - 6$ is a translation 6 units down of the graph of $y = x^2$.



Both graphs open up and have the same axis of symmetry, $x = 0$. The graph of $y = x^2 + 3$ is a translation 3 units up of the graph of $y = x^2$.



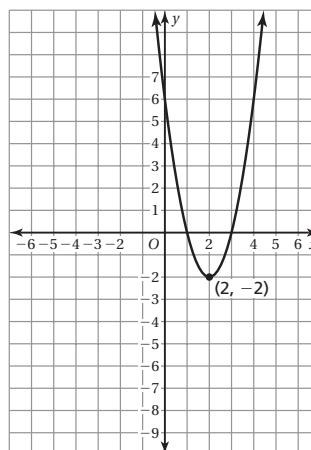
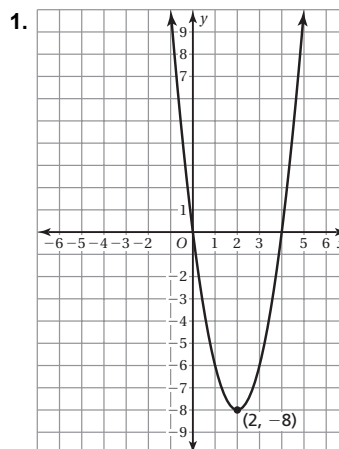
The graphs have the same axis of symmetry, $x = 0$. The graph of $y = -x^2 + 8$ opens down. The graph of $y = -x^2 + 8$ is a translation 8 units up of the graph of $y = x^2$.



Both graphs open up and have the same axis of symmetry, $x = 0$. The graph of $y = \frac{1}{3}x^2 - 4$ is wider than and is a translation 4 units down of $y = x^2$.

5. Shift the graph 8 units up.
6. Shift the graph 4 units down.
7. After 1.25 seconds

8.4 Activity



The vertices of both graphs have the same x -value.

2. $x = 0, 4$

The vertex is horizontally between and vertically below the x -intercepts.

3. $x = 0, -\frac{b}{a}$
 $(0, 0), \left(-\frac{b}{a}, 0\right)$

x	$y = ax^2 + bx$
0	0
$-\frac{b}{a}$	0

Record and Practice Journal Answer Key

4. $-\frac{b}{2a}; -\frac{b}{2a}$

5. You can find the x -coordinate of the vertex by finding the two x -intercepts then finding the point that is half-way between or using the equation,

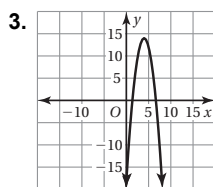
$x = -\frac{b}{2a}$. Substitute that x -value into the original equation to find the y -coordinate of the vertex.

6. $(2, -1)$

8.4 Practice

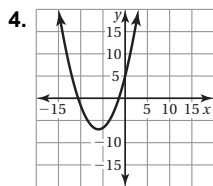
1. a. $x = 1$ b. $(1, -5)$

2. a. $x = -3$ b. $(-3, 12)$



Domain: all real numbers

Range: $y \leq 14$



Domain: all real numbers

Range: $y \geq -9$

5. minimum; $(-15, -46)$ 6. maximum; $(-2, 29)$

7. 16 ft

8.4 Extension

1. The graph of $y = (x - 2)^2$ is a translation 2 units to the right of the graph of $y = x^2$.

2. The graph of $y = (x + 4)^2$ is a translation 4 units to the left of the graph of $y = x^2$.

3. The graph of $y = (x + 7)^2$ is a translation 7 units to the left of the graph of $y = x^2$.

4. The graph of $y = (x - 3.5)^2$ is a translation 3.5 units to the right of the graph of $y = x^2$.

5. The graph of $y = (x + 6)^2 + 3$ is a translation 6 units to the left and 3 units up of the graph of $y = x^2$.

6. The graph of $y = (x - 5)^2 + 1$ is a translation 5 units to the right and 1 unit up of the graph of $y = x^2$.

7. The graph of $y = (x + 2)^2 - 8$ is a translation 2 units to the left and 8 units down of the graph of $y = x^2$.

8. The graph of $y = 2(x - 1)^2 - 4$ is narrower than and is a translation 1 unit to the right and 4 units down of the graph of $y = x^2$.

9. The graph of $y = -3(x - 4)^2 + 2$ opens down, is narrower than, and is a translation 4 units to the right and 2 units up of the graph of $y = x^2$.

10. The graph of $y = \frac{1}{3}(x + 5)^2 - 6$ is wider than and is a translation 5 units to the left and 6 units down of the graph of $y = x^2$.

11. $g(x)$ is a horizontal translation 9 units right of $f(x)$.

12. $g(x)$ is narrower than and is a vertical translation 5 units up of $f(x)$.

13. a. 1 million b. 5 years

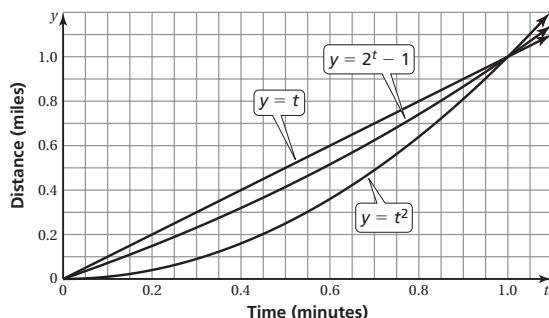
Record and Practice Journal Answer Key

8.5 Activity

1.

t	$y = t$	$y = 2^t - 1$	$y = t^2$
0	0	0	0
0.2	0.2	≈ 0.16	0.04
0.4	0.4	≈ 0.32	0.16
0.6	0.6	≈ 0.52	0.36
0.8	0.8	≈ 0.74	0.64
1.0	1.0	1.0	1.0

The green car has a constant speed because it travels the same distance over each equal time interval. The blue and red cars are both accelerating but the red car is accelerating the most because it makes greater increases in speed as time passes.



2 a.

t	$y = t$	$y = 2^t - 1$	$y = t^2$
1	1	1	1
2	2	3	4
3	3	7	9
4	4	15	16

The green car has a constant speed. The blue and red cars have increasing speed. The red car eventually overtakes the others. After 4 minutes, the red car travels 16 miles, the blue car travels 15 miles, and the green car travels 4 miles.

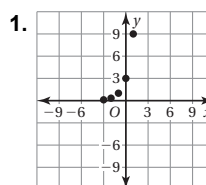
b.

t	$y = t$	$y = 2^t - 1$	$y = t^2$
4	4	15	16
5	5	31	25
6	6	63	36
7	7	127	49
8	8	255	64
9	9	511	81

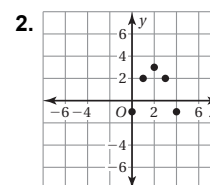
The green car has a constant speed. The blue and red cars have increasing speed. The blue car eventually overtakes the others. After 9 minutes, the blue car travels 511 miles, the red car travels 81 miles, and the green car travels 9 miles.

3. You can compare growth rate of linear, exponential, and quadratic functions using tables or graphs. Exponential growth eventually leaves the other in the dust. Even though quadratic growth is the fastest at first, exponential beats it in the long run.

8.5 Practice



exponential



quadratic

3. quadratic

4. linear

5. linear; $y = -5x - 3$

6. exponential; $y = 2(4)^x$

7. a. linear b. \$21

8.5 Extension

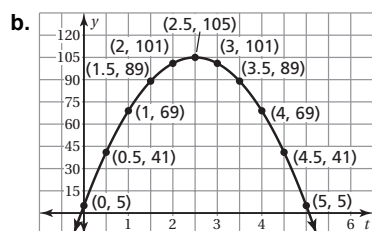
Activity 1

a.

t	0	0.5	1	1.5	2	2.5
$f(t)$	5	41	69	89	101	105

t	3	3.5	4	4.5	5
$f(t)$	101	89	69	41	5

Record and Practice Journal Answer Key



c. The function is increasing when $0 < t < 2.5$.

The function is decreasing when $2.5 < t < 5$.

d.

Time interval	0 to 0.5 sec	0.5 to 1 sec	1 to 1.5 sec	1.5 to 2 sec
Average rate of change (ft/sec)	72	56	40	24

Time interval	2 to 2.5 sec	2.5 to 3 sec	3 to 3.5 sec	3.5 to 4 sec
Average rate of change (ft/sec)	8	-8	-24	-40

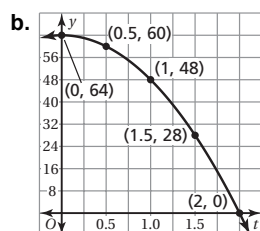
Time interval	4 to 4.5 sec	4.5 to 5 sec
Average rate of change (ft/sec)	-56	-72

Practice

- The rate of change is not constant. It is decreasing.
- decreasing; The graph shows that the curve begins to flatten as x approaches 2.5.
- When the function is increasing, the rate of change is positive. When the function is decreasing, the rate of change is negative.

4. a.

t	0	0.5	1	1.5	2
$f(t)$	64	60	48	28	0



c. decreasing when $0 \leq t \leq 2$

d.

Time interval	0 to 0.5 sec	0.5 to 1 sec	1 to 1.5 sec	1.5 to 2 sec
Average rate of change (ft/sec)	-8	-24	-40	-56

Rates of change are negative and decreasing.

Activity 2

a. yes; When $x = 1$, $y = 4$. So, each website has 4 videos per hour.

b. Linear

Time interval	0 to 1 sec	1 to 2 sec	2 to 3 sec
Average rate of change (videos/h)	4	4	4

Time interval	3 to 4 sec	4 to 5 sec	5 to 6 sec
Average rate of change (videos/h)	4	4	4

Quadratic

Time interval	0 to 1 sec	1 to 2 sec	2 to 3 sec
Average rate of change (videos/h)	4	12	20

Time interval	3 to 4 sec	4 to 5 sec	5 to 6 sec
Average rate of change (videos/h)	28	36	44

Exponential

Time interval	0 to 1 sec	1 to 2 sec	2 to 3 sec
Average rate of change (videos/h)	3	12	48

Time interval	3 to 4 sec	4 to 5 sec	5 to 6 sec
Average rate of change (videos/h)	192	768	3072

c. The average rate of change for the linear function is constant.

Record and Practice Journal Answer Key

- d. The average rate of change for the quadratic function increases by a common difference of 8. So, the values form an arithmetic sequence.
- e. The average rate of change for the exponential function increases by a common ratio of 4. So, the values form a geometric sequence.
- f. the exponential function

Practice

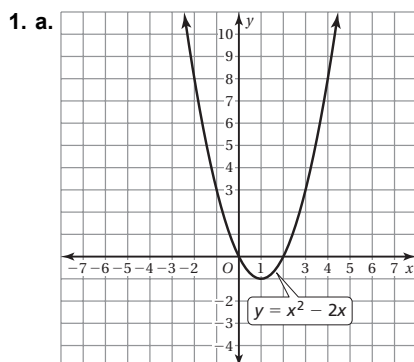
- 5. A quantity increasing exponentially will eventually exceed a quantity increasing linearly or quadratically.
- 6. *Sample answer:* Using any two points on a line will result in the same slope. For quadratic and exponential functions, $f(x)$ may be changing rapidly on some intervals, and slowly on other intervals. The average rate of change helps to balance these changes.

Chapter 9

Fair Game Review

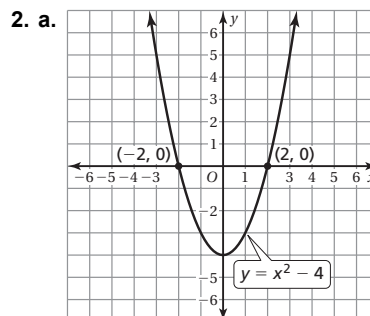
- 1. -6 2. 11 3. $\frac{2}{7}$ 4. ± 1.5
- 5. 3 ft 6. 0.5 m 7. $2\sqrt{5}$ 8. $3\sqrt{7}$
- 9. $6\sqrt{3}$ 10. $12\sqrt{2}$ 11. $5\sqrt{5}$ ft
- 12. $8\sqrt{3}$ m 13. $(y - 3)^2$ 14. $(b + 9)^2$
- 15. $(n + 14)^2$ 16. $(h - 8)^2$
- 17. a. $(x - 25)$ in. b. $4(x - 25)$ in.

9.1 Activity

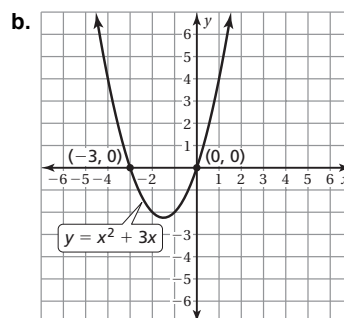


- b. An x -intercept is a point where the graph crosses the x -axis; two; $(0, 0)$, $(2, 0)$

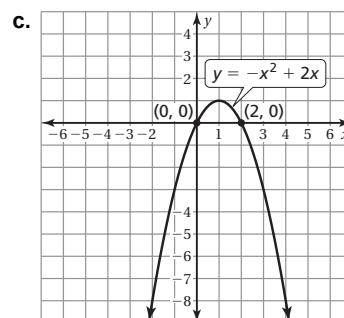
- c. A solution to an equation in x is an x -value that makes the equation true; two; $x = 0$, $x = 2$
- d. Substitute the x -values into the left side of the equation and make sure it equals zero.



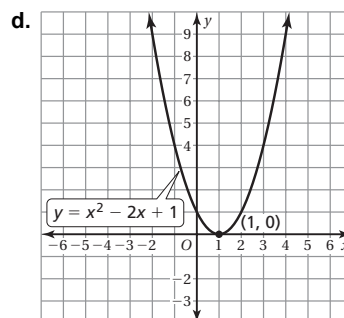
$$x = -2, 2$$



$$x = -3, 0$$



$$x = 0, 2$$

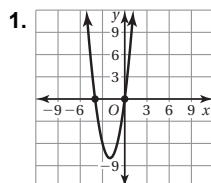


$$x = 1$$

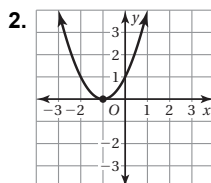
Record and Practice Journal Answer Key

- You can get the equation equal to zero, set it equal to y , graph the resulting equation, and find its x -intercepts.
- Check that the x -values of the x -intercepts satisfy the original equation.

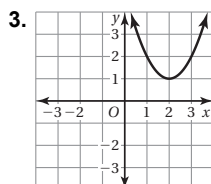
9.1 Practice



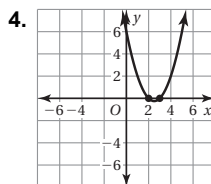
$$x = -4, 0$$



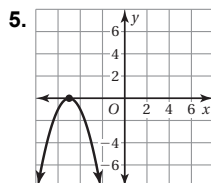
$$x = -1$$



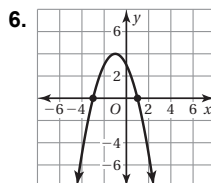
no solution



$$x = 2, 3$$



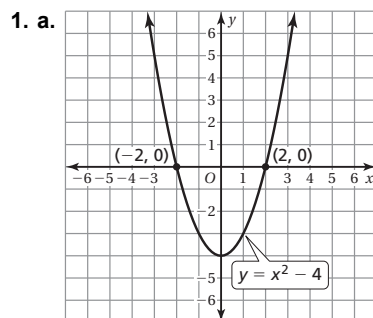
$$x = -5$$



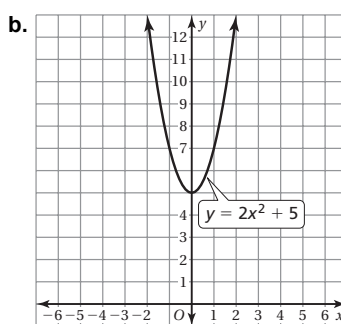
$$x = -3, 1$$

7. 0.59 sec, 2.53 sec

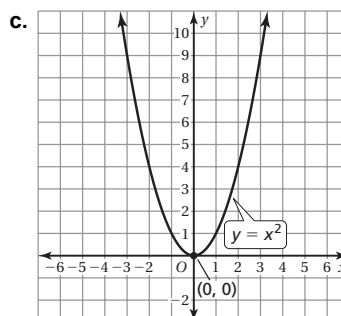
9.2 Activity



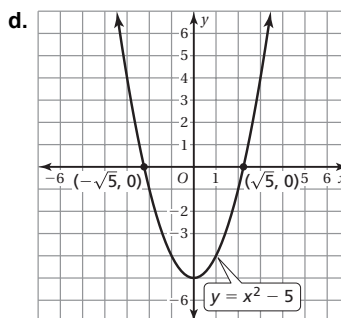
$$x = -2, 2$$



no solution



$$x = 0$$



$$x = \pm\sqrt{5}$$

The number of solutions of $ax^2 + c = 0$ equals the number of x -intercepts of $y = ax^2 + c$.

2. a.

x	$x^2 - 5$
2.21	-0.1159
2.22	-0.0716
2.23	-0.0271
2.24	0.0176
2.25	0.0625
2.26	0.1076

Record and Practice Journal Answer Key

b.

x	$x^2 - 5$
-2.21	-0.1159
-2.22	-0.0716
-2.23	-0.0271
-2.24	0.0176
-2.25	0.0625
-2.26	0.1076

The solutions are about ± 2.235 because the table shows that one is between 2.23 and 2.24 and one is between -2.23 and -2.24.

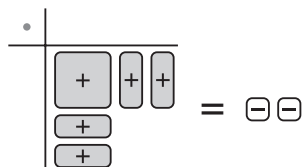
3. a. yes; They have the same solutions.
 b. $x \approx \pm 2.236$. The estimates in Activity 2 are off by about 0.001.
 c. $x = \pm\sqrt{5}$
4. You can graph the equation $y = ax^2 + c$ and count the number of x -intercepts it has. This is the number of solutions of $ax^2 + c = 0$.
5. a. $x = \pm\sqrt{2}$; $x \approx \pm 1.414$
 b. $x = \pm\sqrt{5}$; $x \approx \pm 2.236$
 c. $x = \pm\sqrt{8}$; $x \approx \pm 2.828$

9.2 Practice

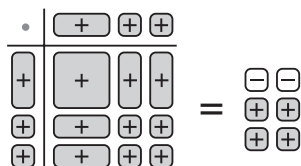
1. $x = \pm 8$ 2. no solution 3. $x = 0$
 4. $x = \pm 5$ 5. no solution 6. $x = 0$
 7. $x = 11$ 8. $x = -\frac{3}{2}$ 9. 9 ft

9.3 Activity

1. Step 1:



Step 2:



Step 3: $x + 2 = \pm\sqrt{2}$
 $x = -2 \pm \sqrt{2}$

2. $x^2 + 6x = -5$
 $x^2 + 6x + 9 = -5 + 9$
 $x = -5, -1$
 $(-5)^2 + 6(-5) = -5$
 $(-1)^2 + 6(-1) = -5$

3. $3x$

The coefficient of x for this group of tiles is half of the coefficient of x in the equation from Activity 2. The number of tiles you add to each side when completing the square is the square of the coefficient of x for this group of tiles.

To complete the square, take *half* of the coefficient of the x -term and *square* it. Add this number to each side of the equation.

4. First, get all the x - and x^2 -terms on the left-hand side and the constant on the right-hand side of the equation. Then, to complete the square, take half of the coefficient of the x -term and square it. Add this number to each side of the equation. Then factor the left-hand side as the square of a binomial and evaluate the addition on the right-hand side of the equation. Finally, take the square root of each side and solve for x .

5. a. $x = 1 \pm \sqrt{2}$
 b. $x = 2 \pm \sqrt{3}$
 c. $x = -3, -1$

9.3 Practice

1. $x^2 + 8x + 16 = (x + 4)^2$
 2. $x^2 - 6x + 9 = (x - 3)^2$
 3. $x^2 - 20x + 100 = (x - 10)^2$

Record and Practice Journal Answer Key

4. $x^2 + 7x + \frac{49}{4} = \left(x + \frac{7}{2}\right)^2$

5. $x = -2, 4$

6. $x = -6 \pm \sqrt{22}$

7. no solution

8. $x = -1, 4$

9. length: 38 m; width: 20 m

9.4 Activity

1. Step 1: Write the equation

Step 2: Multiply the equation by $4a$.

Step 3: Add b^2 to each side.

Step 4: Subtract $4ac$ from each side.

Step 5: Factor $4a^2x^2 + 4abx + b^2$ as $(2ax + b)^2$.

Step 6: Take the square root of each side.

Step 7: Subtract b from each side.

Step 8: Divide each side by $2a$.

2. $x = -\frac{b}{2a} \pm \sqrt{\frac{b^2}{4a^2} - \frac{c}{a}}$

Both this method and the method from Activity 1 solve for x by getting the left-hand side of the equation equal to a perfect square and factoring. The formula for this method looks slightly different but can be simplified to equal the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

In Steps 2 and 3 in Activity 1, $4a$ and b^2 were chosen so that the preceding steps would not be needed to get the quadratic formula.

3. a. The discriminant equals zero.

b. The discriminant is positive and is a perfect square.

c. The discriminant is positive but is not a perfect square.

d. The discriminant is negative.

4. A quadratic equation has two solutions if the discriminant is positive, one solution if the discriminant is zero, and no real solutions if the discriminant is negative.

5. a. $x = -3, 1$ b. $x = 2$ c. no real solution

6. An imaginary number is a number whose square is negative. Quadratic equations have solutions containing imaginary numbers when they have a negative discriminant.

9.4 Practice

1. $x = -6, 3$

2. $x = -4$

3. no solution

4. $x = -\frac{2}{3}, 4$

5. $x = \frac{3}{2}$

6. no solution

7. $x = -3.6, 1.6$

8. $x = -5.9, 0.4$

9. a. 2002, 2008 ($x = 2.3, 8.7$)

b. no; The model is only based on past years and would eventually predict a negative population in the future.

10. 2

11. 0

12. 1

9.4 Extension

1. $x = -2, 9$

2. $x \approx -5.54, 0.541$

3. $x = 1$

4. $x = -3, \frac{1}{4}$

5. $x = -4, 5$

6. $x = \pm 3$

7. $x = -2$

8. no solution

9. $x = 5, 7$

10. $x \approx -1.40, 1.07$

11. no solution

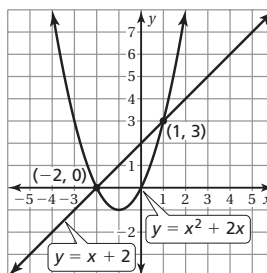
12. $x = -\frac{3}{2}, 6$

13. a. $t \approx 6.05$ sec b. $t = 2, 4$ sec

14. width: 19 yd; length: 13 yd

9.5 Activity

1. a.



b. $(1, 3), (-2, 0)$ c. $(1, 3), (-2, 0)$

Record and Practice Journal Answer Key

2. a. A; $(-2, 0)$, $(1, -3)$

b. C; $(2, 2)$

c. B; no solution

d. D; $(4, 6)$, $(-1, -4)$

3. You can graph both equations and find the points of intersection.

You can substitute the value of y in one equation for y in the other equation, solve for x , and then find the corresponding y -values.

You can eliminate y by subtracting one equation from the other equation, solve for x , and then find the corresponding y -values.

4. Answers will vary.

5. Sample answers:

a. $y = x^2$

$y = -1$

b. $y = x^2$

$y = 0$

c. $y = x^2$

$y = 1$

9.5 Practice

1. $(-3, -10)$, $(1, 2)$

2. $(2, 10)$

3. no solution

4. $(-2, 1)$, $(2, 5)$

5. $(2, 0)$

6. $(-1, 4)$, $(-6, 14)$

7. $\left(\frac{1}{2}, 4\right)$, $(7, -35)$

8. no solution

9. weeks 1 and 3

Chapter 10

Fair Game Review

1. -2

2. 29

3. 8

4. -13

5. 20

6. -48

7. 14

8. 3

9. 16 days since launch

10. $(v - 4)(v - 8)$

11. $(d + 3)(d + 6)$

12. $(k - 7)(k + 9)$

13. $(m + 2)(m - 12)$

14. $(t - 10)(t + 9)$

15. $(f + 9)(f - 3)$

16. $(a + 5)(a + 11)$

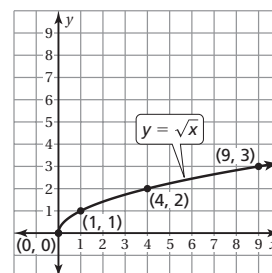
17. $(q - 4)(q - 17)$

18. $(x + 2)$

10.1 Activity

1. a.

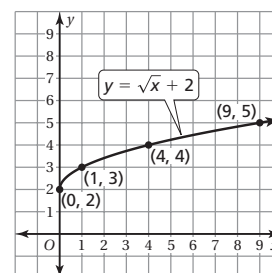
x	y
-1	undef.
0	0.00
1	1.00
4	2.00
9	3.00



Domain: $x \geq 0$

b.

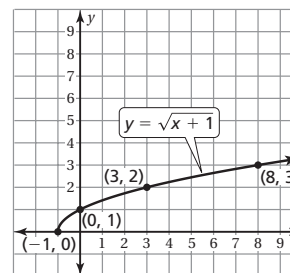
x	y
-1	undef.
0	2.00
1	3.00
4	4.00
9	5.00



Domain: $x \geq 0$

c.

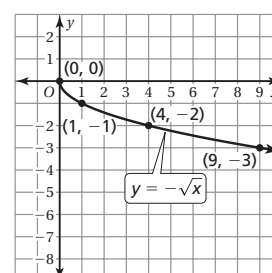
x	y
-2	undef.
-1	0.00
0	1.00
3	2.00
8	3.00



Domain: $x \geq -1$

d.

x	y
-1	undef.
0	0.00
1	-1.00
4	-2.00
9	-3.00



Domain: $x \geq 0$

Record and Practice Journal Answer Key

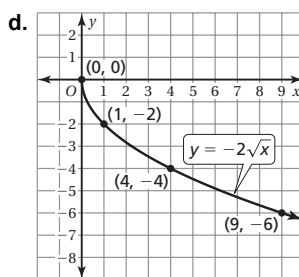
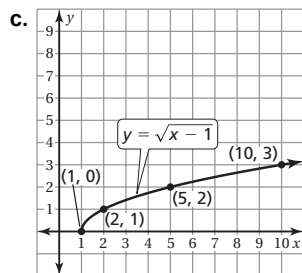
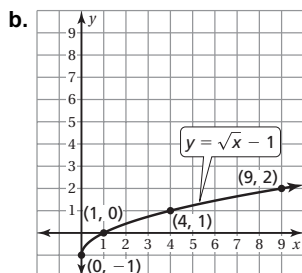
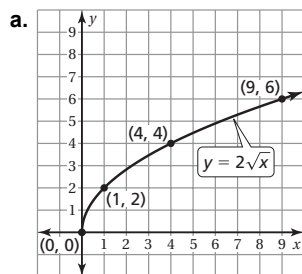
2. a. $f(x) = \sqrt{x+4}$ b. $f(x) = \sqrt{x+4} + 1$

x	$f(x)$
-4	0.00
-3	1.00
-2	1.41
-1	1.73
0	2.00
1	2.24

x	$f(x)$
-4	1.00
-3	2.00
-2	2.41
-1	2.73
0	3.00
1	3.24

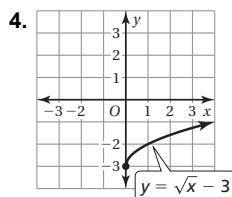
3. $f(x) = \sqrt{x+3}$

4. Making a table of values, plot the ordered pair, and draw a smooth curve through the points.



10.1 Practice

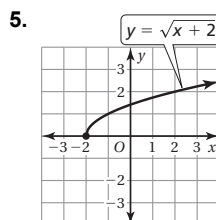
1. $x \geq 0$ 2. $x \geq 5$ 3. $x \leq 1$



Domain: $x \geq 0$

Range: $y \geq -3$

The graph of $y = \sqrt{x} - 3$ is a translation 3 units down of the graph of $y = \sqrt{x}$.

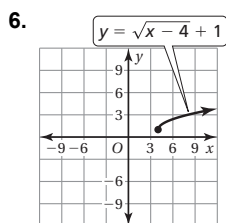


Domain: $x \geq -2$

Range: $y \geq 0$

The graph of $y = \sqrt{x+2}$ is a translation 2 units to the left of the graph of $y = \sqrt{x}$.

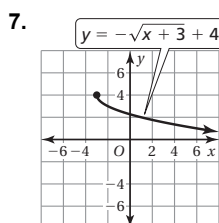
Record and Practice Journal Answer Key



Domain: $x \geq 4$

Range: $y \geq 1$

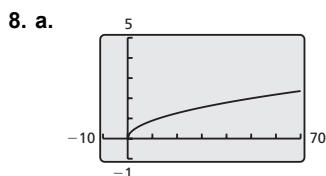
The graph of $y = \sqrt{x-4} + 1$ is a translation 4 units to the right and 1 unit up of the graph of $y = \sqrt{x}$.



Domain: $x \geq -3$

Range: $y \leq 4$

The graph of $y = -\sqrt{x+3} + 4$ is a reflection in the x -axis, a translation 3 units to the left and 4 units up of the graph of $y = \sqrt{x}$.



Domain: $S > 0$

b. $S \approx 50.3 \text{ cm}^2$

10.1 Extension

1. $\frac{\sqrt{26}}{26}$ 2. $\frac{\sqrt{15}}{3}$ 3. $\frac{\sqrt{210}}{6}$ 4. $\frac{2\sqrt{22}}{11}$

5. $\frac{2\sqrt{3}}{3}$ 6. $2\sqrt{7}$ 7. $\frac{3\sqrt{2}}{2}$

8. $\frac{60 - 3\sqrt{30}}{10}$ 9. $4 + 2\sqrt{2}$

10. $\frac{4 - \sqrt{6}}{10}$ 11. $-2\sqrt{5} - 2$

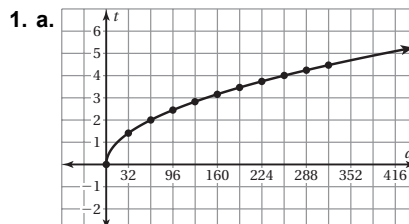
12. $10 - 5\sqrt{3}$

13. $6\sqrt{2} - 3\sqrt{5}$

14. $\frac{-2\sqrt{3} - \sqrt{6}}{3}$

15. $\frac{\sqrt{78}}{3} \text{ km}$

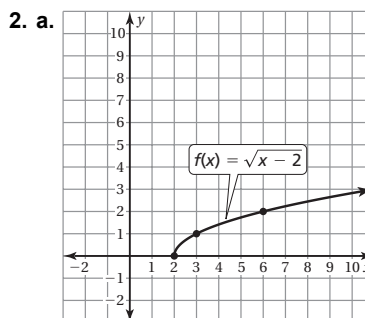
10.2 Activity



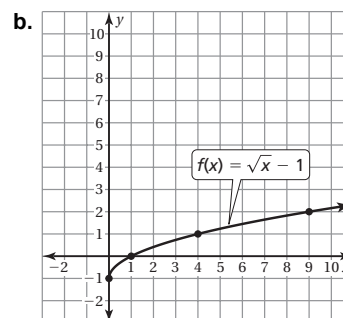
b. 3.9 sec

c. $t = \sqrt{\frac{240}{16}} \approx 3.87$. The estimate was reasonably close.

d. $d = 400 \text{ ft}$; Substitute 5 into $t = \sqrt{\frac{d}{16}}$ for t and solve for d .



$x = 6; f(6) = 2$



$x = 9; f(9) = 2$

3. a. $d = 1 \text{ ft}$ b. $d = 4 \text{ ft}$ c. $d = 9 \text{ ft}$

Record and Practice Journal Answer Key

4. You can solve an equation that contains a square root by first solving for the square root itself, then squaring both sides of the equation, then solving for the variable.

a. $x = 1$ b. $x = 9$ c. $x = 5$ d. $x = \frac{9}{4}$

10.2 Practice

1. $x = 25$ 2. $x = 64$ 3. $x = 5$
 4. $x = 15$ 5. $x = 3$ 6. $x = 6$
 7. $x = 4, 8$ 8. $x = 9$ 9. 150 ft

10.3 Activity

1. e. $c^2 = a^2 + b^2$
 2. a. $c = 10$ b. $c = 13$
 c. $c = \frac{5}{12}$ d. $c = 0.5$
 3. a. $a = 9$ b. $b = 3.2$
 4. The sum of the squares of the lengths of the two shorter sides is equal to the square of the length of the hypotenuse.

10.3 Practice

1. $c = 17$ 2. $b = \sqrt{80} \approx 8.94$
 3. $a = \sqrt{13} \approx 3.61$ 4. $b = 3.6$
 5. $a = 5$ 6. $c = \frac{5}{6}$ 7. 37 in.

10.4 Activity

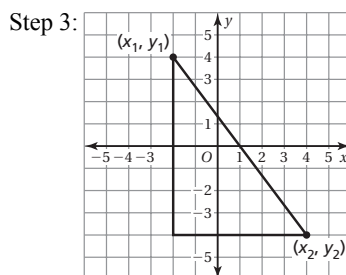
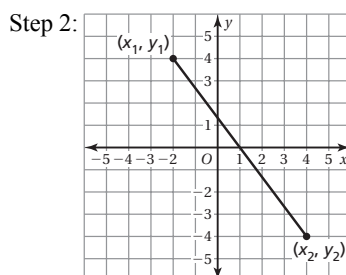
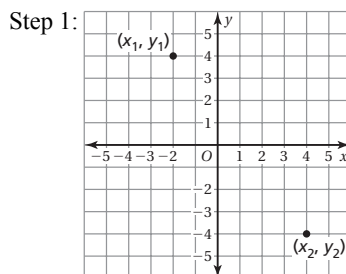
1. a. $a^2 = b^2$, then $a = b$; false; counterexample: $a = -2, b = 2$
 b. If two nonvertical lines are parallel, then they have the same slope; true
 c. If a sequence is arithmetic, then it has a common difference; true
 d. If $a + b$ is a rational number, then a and b are rational numbers; false; counterexample: $a = \sqrt{2}, b = -\sqrt{2}$.

The converse of a true statement can be true or false.

2. a. true; You could use the Pythagorean Theorem and the properties of congruent triangles to support the statement as shown in part (b).

b. $a^2 + b^2 = x^2$; $c = x$; $\triangle DEF \cong \triangle JKL$;
 $\angle E = 90^\circ$; $\triangle DEF$ is a right triangle.

3. Sample answer:



Step 4: $|x_2 - x_1|$

Step 5: $|y_2 - y_1|$

Step 6: $(x_2 - x_1)^2 + (y_2 - y_1)^2 = c^2$

Step 7: $c = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

The length of the hypotenuse is the distance between the two points.

4. You can use the Pythagorean Theorem to show that a triangle is a right triangle and to find the distance between two points in a plane.

Record and Practice Journal Answer Key

5. The converse of the Pythagorean Theorem can help solve real-life problems where two lines intersect and it needs to be determined whether they form a right angle.

10.4 Practice

1. no
2. yes
3. yes
4. no
5. $5\sqrt{2}$
6. 10
7. $\sqrt{13}$
8. $\sqrt{137}$
9. yes

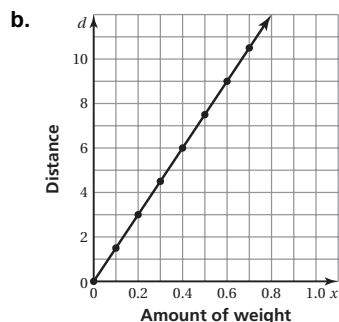
Chapter 11

Fair Game Review

1. $\frac{7}{3}$
2. $\frac{1}{8}$
3. $-\frac{7}{10}$
4. $\frac{9}{4}$
5. $\frac{1}{8}$
6. $\frac{5}{12}$
7. $\frac{3}{5}$
8. 10
9. $\frac{13}{8}$ mi
10. 6 servings
11. $d = 4$
12. $m = 15$
13. $a = 27$
14. $k = 3.2$
15. $x = 11.4$
16. $c = 12.75$
17. \$212.50

11.1 Activity

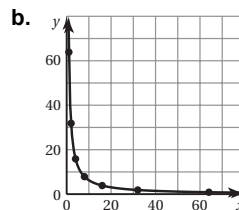
1. a. The heavier the weight, the greater the distance stretched. They are said to vary directly because the magnitudes of both distance and weight vary in the same direction and stay in constant proportion.



linear

- c. $d = 15x$
- d. Hooke's Law states that the distance a spring stretches from equilibrium is a constant multiple of the amount of weight applied to it.

2. a. The greater the length of x , the smaller the length of y . They are said to vary inversely because the magnitudes of x and y vary in the opposite direction and the magnitude of x stays in constant proportion to the inverse of the magnitude of y .



nonlinear

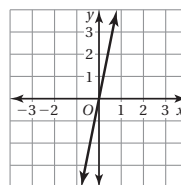
c. $y = \frac{64}{x}$

3. When two variables vary directly, one is a constant multiple of the other. When two variables vary inversely, one is a constant multiple of the inverse of the other.
4. Holding all other variables constant, flapping rate and length of a bird's wings vary inversely because for birds with longer wings, each flap of the wings creates more lift, so fewer flaps are needed.

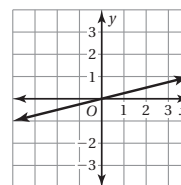
11.1 Practice

1. direct variation; The ratio $\frac{x}{y}$ is constant.
2. inverse variation; The equation is of the form $y = \frac{k}{x}$.

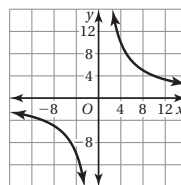
3. $y = 5x$



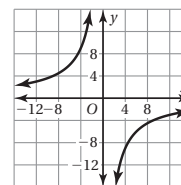
4. $y = \frac{1}{4}x$



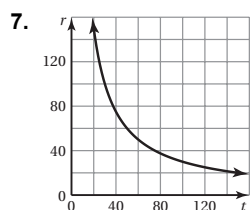
5. $y = \frac{40}{x}$



6. $y = \frac{36}{x}$



Record and Practice Journal Answer Key



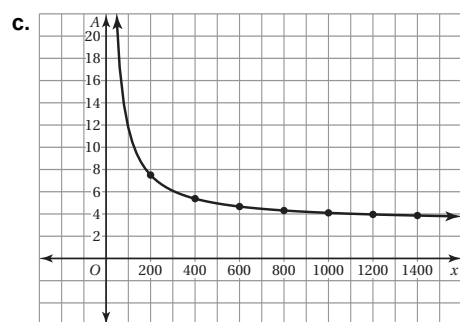
The time t (in hours) is determined by the flying speed r (in miles per hour).

11.2 Activity

1. a. $A = \frac{850 + 3.25x}{x}$

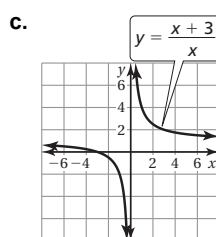
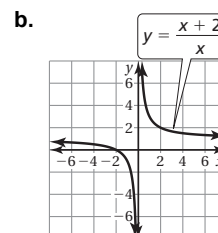
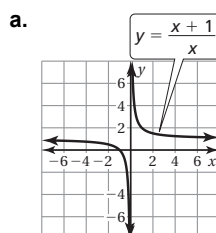
b.

x	A
100	11.75
200	7.50
400	5.38
600	4.67
800	4.31
1000	4.10
1200	3.96
1400	3.86



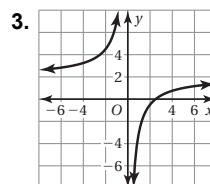
2. a. \$853.25; It occurs if only one calendar is printed. The graph reaches higher values when $x < 1$, but those values are not meaningful.
- b. \$3.25; Although the average cost never is exactly \$3.25, it approaches \$3.25 as the number of calendars sold gets infinitely large; horizontal asymptote.
3. a. \$14,000
- b. \$8600; The cost of printing 1400 calendars is \$5400 and profit is the difference of revenue and cost.

4. The graph of a rational function is undefined and approaches positive or negative infinity at points where the denominator of the function is equal to zero. The graph can also approach but not reach a y -value as x approaches positive or negative infinity.



11.2 Practice

1. $x = 8$
2. $x = -3$

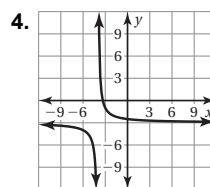


Horizontal asymptote: $y = 2$

Vertical asymptote: $x = 0$

Domain: All real numbers except 0

Range: All real number except 2



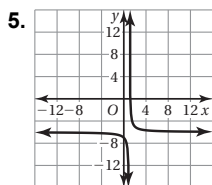
Horizontal asymptote: $y = -3$

Vertical asymptote: $x = -4$

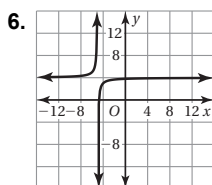
Domain: All real numbers except -4

Range: All real number except -3

Record and Practice Journal Answer Key



The graph of $y = \frac{1}{x-1} - 6$ is translation 6 units down and 1 unit right of the graph of $y = \frac{1}{x}$.



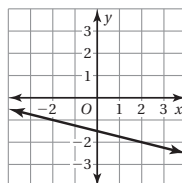
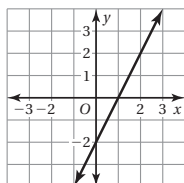
The graph of $y = \frac{-1}{x+5} + 4$ is a translation 4 units up and 5 units left and a reflection in the x -axis of the graph of $y = \frac{1}{x}$.

7. 38 players

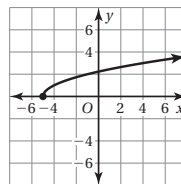
11.2 Extension

- $(-1, -2), (2, -1), (5, 0), (8, 1), (11, 2)$
- $(8, -3), (0, -1), (-1, 0), (0, 1), (8, 3)$
- $(3, 1), (5, 3), (6, 4), (7, 6), (10, 6)$
- $(2, -4), (3, -2), (4, 0), (5, 2), (6, 4)$
- $(-1, -3), (0, -2), (-1, -1), (-4, 0), (-3, 1)$
- $(12, -8), (8, -4), (4, -4), (6, 0), (4, 8)$

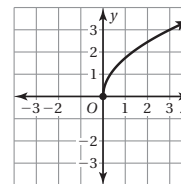
7. $f^{-1}(x) = 2x - 2$ 8. $f^{-1}(x) = -\frac{1}{4}x - \frac{3}{2}$



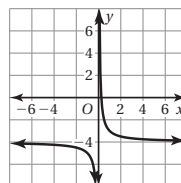
9. $f^{-1}(x) = \sqrt{x+5}$



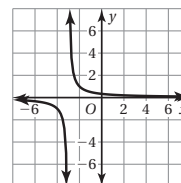
10. $f^{-1}(x) = \sqrt{3x}$



11. $f^{-1}(x) = \frac{1}{x} - 4$



12. $f^{-1}(x) = \frac{1}{x+3}$



13. 8

11.3 Activity

1. a. C b. E c. D d. A e. B

2. no; $y = \frac{x^2 + x}{x}$ is undefined at $x = 0$ so its graph has a hole at $x = 0$, but $y = x + 1$ is defined everywhere and has no holes.

- $\frac{x+2}{x}$; The original expression and the simplified expression both have one excluded value, $x = 0$.
- $\frac{x}{x+2}$; The original expression has excluded values $x = 0$ and $x = -2$, but the simplified expression's only excluded value is $x = -2$.
- x ; The original expression has excluded value $x = 0$, but the simplified expression has no excluded values.
- $x + 2$; The original expression has excluded value $x = -2$, but the simplified expression has no excluded values.
- $\frac{1}{x+2}$; The original expression has excluded values $x = -2$ and $x = 2$, but the simplified expression's only excluded value is $x = -2$.
- $\frac{1}{x^2 + 1}$; The expression doesn't simplify and has no excluded values.

Record and Practice Journal Answer Key

4. Factor the numerator and denominator and divide out any common factors; Excluded values are values that make the denominator zero

a. $x + 1$; excluded value: $x = 0$

b. $x + 1$; excluded value: $x = -2$

c. $\frac{1}{x-3}$; excluded values: $x = \pm 3$

11.3 Practice

1. $4y$; $y = 0$ 2. $\frac{3}{2t^2}$; $t = 0$

3. Expression is in simplest form; $d = 1$

4. $\frac{3b}{4a}$; $a = 0$, $b = 0$ 5. $\frac{m}{5}$; $m = 0$, 9

6. Expression is in simplest form; $h = 3$

7. $\frac{-6x}{x+1}$; $x = -1$, 4

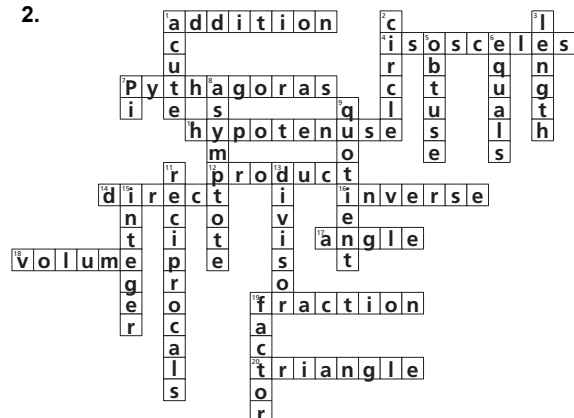
8. $\frac{p-9}{2p(p-3)}$; $p = -3$, -2 , 0

9. $h = \frac{(x+4)(2x+4)}{(x+1)+(x+3)} = x+4$

11.4 Activity

1. a. B, 4 b. D, 3 c. A, 1 d. C, 2
e. H, 6 f. E, 7 g. F, 8 h. G, 5
i. K, 10 j. J, 9 k. L, 12 l. I, 11

2.



3. The product of two rational expressions equals the product of the numerators of the expressions divided by the product of the denominators of the expressions. To divide rational expressions, multiply the dividend by the reciprocal of the divisor.

$$\text{a. } \frac{x+3}{x} \cdot \frac{1}{x+3} = \frac{(x+3) \cdot 1}{x \cdot (x+3)} = \frac{1}{x}$$

$$\text{b. } \frac{x+3}{x} \div \frac{1}{x} = \frac{x+3}{x} \cdot x = \frac{(x+3) \cdot x}{x} = x+3$$

11.4 Practice

1. $\frac{4(k-5)}{7k^2}$ 2. $12w$ 3. $\frac{b^2}{3b+9}$

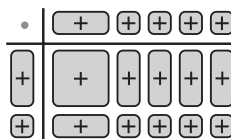
4. $\frac{(n-2)^2}{n+7}$ 5. $\frac{3}{g}$ 6. $\frac{y-2}{-5y^2}$

7. $\frac{a-8}{3a^3}$ 8. $\frac{r}{3r+24}$

9. a. $\frac{x+3}{x+1}$ b. $\frac{7}{5}$

11.5 Activity

1. Steps 1 and 2:



Step 3: $x + 4$

$$\text{a. } (x^2 + 6x + 9) \div (x + 3) = x + 3$$

$$\text{b. } (x^2 + x - 12) \div (x - 3) = x + 4$$

$$\text{2. a. } (2x^2 + 7x + 3) \div (x + 3) = 2x + 1$$

$$(2x^2 + 7x + 3) \div (2x + 1) = x + 3$$

$$\text{b. } (2x^2 - 8x + 6) \div (2x - 6) = x - 1$$

$$(2x^2 - 8x + 6) \div (x - 3) = 2x - 2$$

$$\text{c. } (x^2 - x - 6) \div (x - 3) = x + 2$$

$$(x^2 - x - 6) \div (x + 2) = x - 3$$

$$\text{d. } (x^2 + 6x + 8) \div (x + 4) = x + 2$$

$$(x^2 + 6x + 8) \div (x + 2) = x + 4$$

Record and Practice Journal Answer Key

3. a. $3x + 1$ b. $2x + 1$

4. You can divide one polynomial by another polynomial by factoring the dividend into two polynomials where one is the divisor, and then concluding that the other factor is the quotient. For example,

a. $3x^2 + 20x - 7 = (x + 7)(3x - 1)$
 $(3x^2 + 20x - 7) \div (x + 7) = 3x - 1$

b. $4x^2 - 4x - 3 = (2x - 3)(2x + 1)$
 $(4x^2 - 4x - 3) \div (2x - 3) = 2x + 1$

If the divisor is not a factor of the dividend, you can use long division to divide the polynomials.

11.5 Practice

1. $b + 9$

2. $n - 6$

3. $4w - 3 + \frac{6}{w + 3}$

4. $5c + 3 - \frac{7}{c - 1}$

5. $2x - 3$

6. $3h - 6 + \frac{50}{2h + 9}$

7. $r - 8 + \frac{52}{r + 8}$

8. $4y + 8 + \frac{32}{3y - 4}$

9. $x + 2$

11.6 Activity

1. a. $t \bullet \frac{1}{40}$ b. $t \bullet \frac{1}{60}$ c. $\frac{5t}{120}$

d. 24 h; In 24 hours, the portion of the lawn both of you working together will have mowed is $\frac{5(24)}{120} = 1$.

2. a. $\frac{10,000}{x}$ b. $\frac{6000}{2x}$ c. $\frac{13,000}{x}$ d. 6.5 min

3. Rewrite (if needed) both expressions so they have a common denominator, then add or subtract the numerators over the common denominator.

a. $\frac{x}{5} + \frac{x}{10} = \frac{2x}{10} + \frac{x}{10} = \frac{3x}{10}$

b. $\frac{3}{x} + \frac{4}{x} = \frac{7}{x}$

c. $\frac{9}{x} + \frac{2}{3x} = \frac{27}{3x} + \frac{2}{3x} = \frac{29}{3x}$

d. $\frac{x}{2} - \frac{x}{4} = \frac{2x}{4} - \frac{x}{4} = \frac{x}{4}$

e. $\frac{x + 1}{3} - \frac{1}{3} = \frac{x}{3}$

f. $\frac{1}{x} - \frac{1}{x^2} = \frac{x}{x^2} - \frac{1}{x^2} = \frac{x - 1}{x^2}$

11.6 Practice

1. $\frac{9}{5g}$

2. $\frac{5}{2v + 3}$

3. $\frac{4m - 1}{2m - 1}$

4. $\frac{y - 3}{y - 2}$

5. $\frac{11a - 1}{12a}$

6. $\frac{5k + 8}{k - 5}$

7. $\frac{x + 3}{3}$

8. $\frac{3d - 11}{d^2 + 2d - 15}$

9. $t = \frac{120}{r} \text{ h}$

11.7 Activity

1. a. $\frac{707}{799}$

b. $\frac{707 + x}{799 + x}$

c.

Additional Saves, x	Save Percentage
0	0.885
20	0.888
40	0.890
60	0.893
80	0.895
100	0.898
120	0.900
140	0.902

d. 121; $\frac{707 + x}{799 + x} = 0.900$
 $x = 121$

Record and Practice Journal Answer Key

2. a. $\frac{8}{47}$

b. $\frac{8+x}{47+x}$

c.

Additional Hits, x	Batting Average
0	0.170
1	0.188
2	0.204
3	0.220
4	0.235
5	0.250
6	0.264
7	0.278

d. 5; $\frac{8+x}{47+x} = 0.250$
 $x = 5$

3. Use the Cross Products Property.

a. $\frac{x-6}{6} = \frac{2}{3}$
 $3(x-6) = 2(6)$
 $x = 10$

b. $\frac{x+56}{6} = \frac{1}{2}$
 $2(x+56) = 6(1)$
 $x = -53$

c. $\frac{x}{4} + \frac{x}{2} = \frac{2x}{3}$
 $\frac{3x}{4} = \frac{2x}{3}$
 $3(3x) = 4(2x)$
 $x = 0$

11.7 Practice

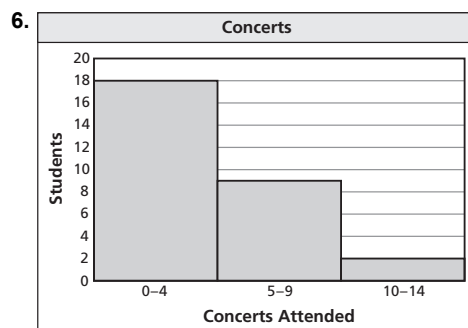
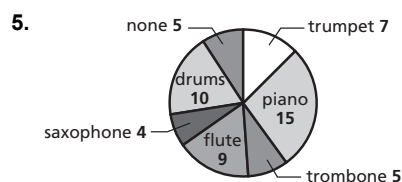
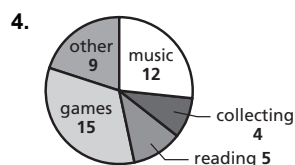
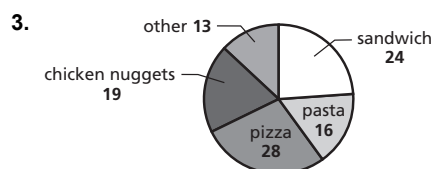
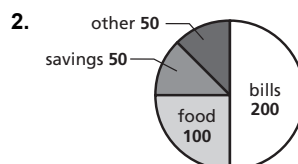
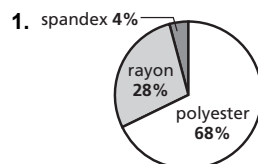
1. $h = 6$ 2. $q = -4$ 3. $m = -5, 3$

4. $c = \pm \frac{3}{2}$ 5. $z = 9$ 6. $k = -2$

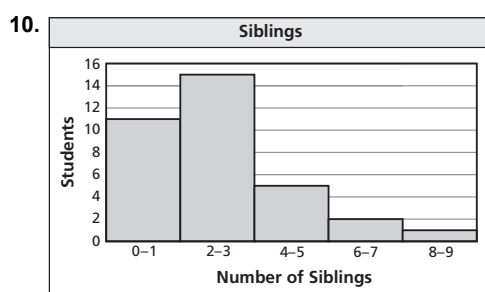
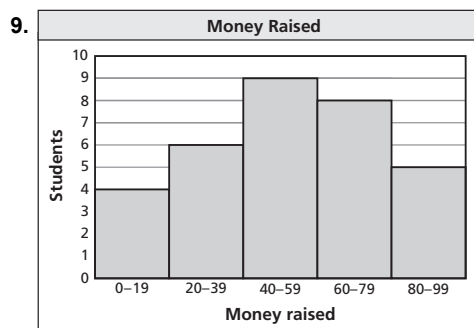
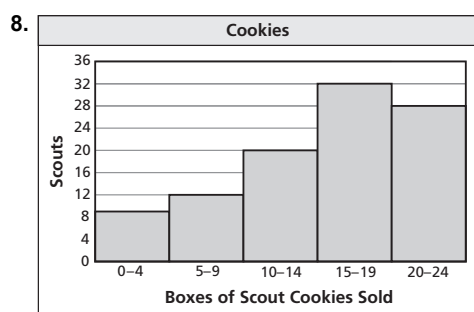
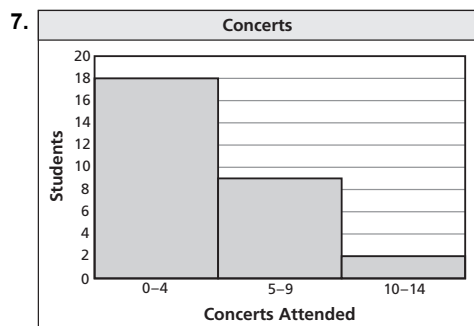
7. $d = -1$ 8. $t = 8$ 9. 6 boys

Chapter 12

Fair Game Review



Record and Practice Journal Answer Key



12.1 Activity

1. a.

Stack	1	2	3	4	5	6	7	8	9
Coins	5	4	3	6	2	5	8	7	5

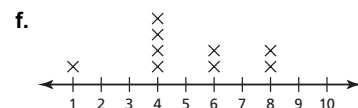
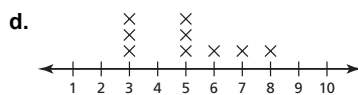
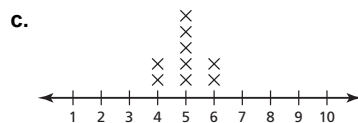
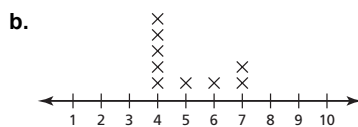
b. mean: 5; median: 5; mode: 5

c. The mean cannot be changed because you will still have 45 coins in 9 stacks. Both the median and mode can be changed. The median is the middle value when the values are ordered. So, the median could be lower or higher. The mode is the most frequently occurring value. So, you could move stacks so that a number other than 5 appears most often.

d. yes; yes; *Sample answer:* To have a median of 6, you can put the coins in stacks containing 1, 2, 3, 4, 6, 6, 7, 8, and 8 coins. To have a median of 8, you can put the coins in stacks containing 1, 1, 1, 2, 8, 8, 8, 8, and 8 coins.



3. A fair distribution requires every person to have the mean number of coins.



The distributions in parts (b) and (c) seem the most fair because all of the values are near the mean of 5. The distribution in part (e) seems the least fair because a person has either 1 coin or 10 coins.

4. In order to distribute an amount evenly to a group of people, you would need to give everyone the mean amount.

Record and Practice Journal Answer Key

5. *Answer should include, but is not limited to:* Make sure the possible distributions produce the mean or median given in the article.

12.1 Practice

- mean: 3.53; median: 3.67; mode: none
- mean: 4.25; median: 4; mode: 4
- $x = 29$
- $x = 32$
- a. 70 b. mean
- c. mean with outlier: 94.6; mean without outlier: 100.75; median with outlier: 98; median without outlier: 101.5

12.2 Activity

- a. The weights are very dispersed from the mean weight. They are spread out over the entire range and not clustered in any one area.
- b. yes; Although the weights range from 180 to 340 pounds, weights for specific positions are clustered inside ranges of 50 pounds or less, not including the Other players category. Yes, in most sports, there is some correlation between position and weight (for example, forwards usually weigh more than guards in basketball), but the correlation is the most distinctive in football and it is hardly noticeable in sports like soccer and baseball.
- a. The weights are not very dispersed from the mean. Every player's weight is within about 50 pounds of the mean and more players have weights closer to the mean.
- b. The dispersion of weights of an NFL football team is much greater than that of a Major League Baseball team.
- c. no; Each position shown is spread out over a similar range of weights.
- Plot the data in a histogram and observe how spread out the data is about the mean; yes; Point guards and shooting guards have significantly lower weights than forwards, power forwards, small forwards, and centers.

12.2 Practice

- Varsity: $\bar{x} = 128$; range = 27; JV: $\bar{x} = 152$; range = 38; The varsity times have a lower mean and are less spread out than the JV times.

- Tests: $\bar{x} = 84$; range = 14; Quizzes: $\bar{x} = 83.5$; range = 43; The test and quiz scores have approximately the same mean but the quiz scores are much more dispersed.

- $\bar{x} = 6$; standard deviation ≈ 2.74

- $\bar{x} = 11$; standard deviation ≈ 3.04

- $\bar{x} = 34$; standard deviation ≈ 1.83

- $\bar{x} = 126$; standard deviation ≈ 12.11

- a. Forest A: $\bar{x} = 147.5$; range = 22; standard deviation = 7. Forest B: $\bar{x} = 160$; range = 25; standard deviation ≈ 8.15 ;
The average weight of a deer in Forest B is 12.5 pounds higher than the average weight of a deer in Forest A. The weights of deer in Forest B are slightly more spread out than the weights of deer in Forest A
- b. Forest B; The average weight per deer is higher in Forest B so a hunter would be more likely to get a bigger deer.

12.3 Activity

- a.

0 1 3 3 3 3 5 6 8 8 9 10 10 12 13 13 14 16 18 19 23 24 32 45

- b.

0 1 3 3 3 3 5 6 8 8 9 10 10 12 13 13 14 16 18 19 23 24 32 45

Least value First quartile Median Third quartile Greatest value

least value: 0

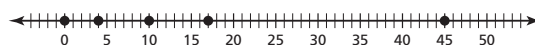
first quartile: 4

median: 10

third quartile: 17

greatest value: 45

- c.



- d. The box-and-whisker plot shows the median and range of the data set. It also shows that most of the data is concentrated between 4 and 17.

- Answer should include, but is not limited to:*

Students should follow the steps in Activity 1 to draw their box-and-whisker plot.

- a. Upper plot shows higher scores.

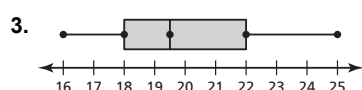
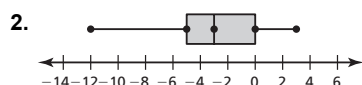
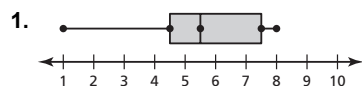
- b. Spring; Fall

Record and Practice Journal Answer Key

4. You can describe how the data is distributed, the median, and the range where most people fall into.

5. *Sample answer:* Teachers; if they know when scores are lower, they can determine the reason and address it.

12.3 Practice



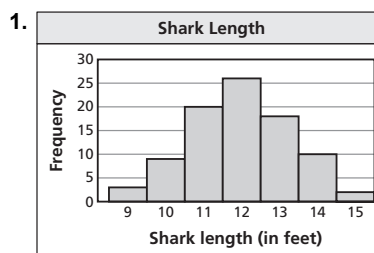
Sample answer: The right whisker is longer than the left. So, the data are more spread out above the third quartile than below the first quartile.

4. 62 pages

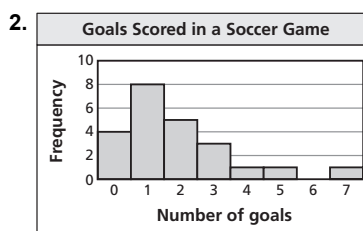
12.4 Activity

1. a. 78.3%; This includes chest sizes from 38 to 42 inches.
b. 96.9%; This includes chest sizes from 36 to 44 inches.
c. 99.9%; This includes chest sizes from 34 to 46 inches.
2. a. Adult Female Heights; This means there is less variation among female heights.
b. 75%
3. You can determine whether the distribution is symmetric or skewed to one side. You can also get some indication of where the data is centered and how spread out it is.
4. a. A symmetric distribution has a mean equal to its median and is not skewed to either side.
b. The histogram representing a symmetric distribution is often shaped like a bell.
c. *Sample answer:* Physical measurements (height, weight) of humans and animals are often distributed symmetrically. In certain financial models, growth rates are assumed to have symmetric distributions.

12.4 Practice



The distribution is approximately symmetric.

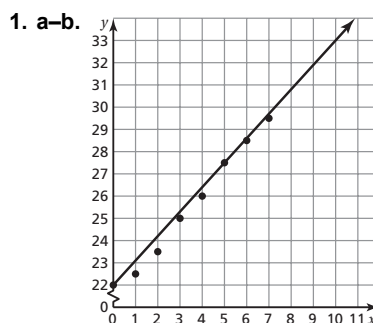


The distribution is skewed right.

3. Median and five-number summary because the distribution is skewed.

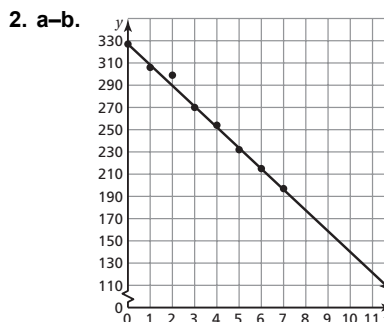
4. Mean and standard deviation because the distribution is symmetric.

12.5 Activity



c. *Sample answer:* $y = 1.1x + 22$

d. *Sample answer:* 35.2 in.



Record and Practice Journal Answer Key

c. Sample answer: $y = -19.5x + 327$

d. Sample answer: 132,000 bats

3. You can plot data you know and then draw a line that best approximates the points. Then, you can write an equation and use it to predict an event.

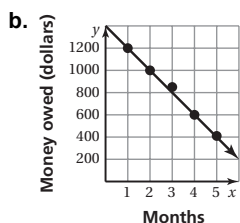
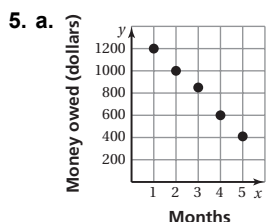
4. Answer should include, but is not limited to: Make sure that data can be described by a line.

12.5 Practice

1. positive 2. no relationship

3. negative

4. a. 17 people b. positive

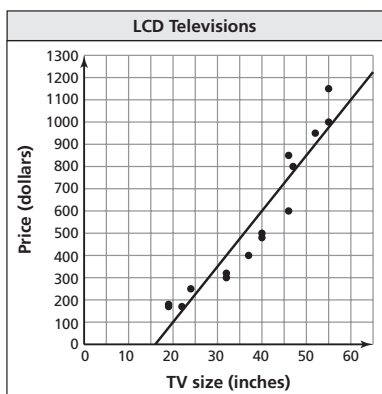


c. Sample answer: $y = -200x + 1400$

d. Sample answer: \$200

12.6 Activity

1. a–b.



As the size of the television increases, the price increases.

c. $d = 25x - 400$

d. Answers will vary.

2. Answers will vary.

3. c. Answers will vary.

TV Size (in.), x	26	42	50	60
Price Using Line of Fit from Activity 2	250	650	850	1100
Price Using Line of Best Fit: $y = 24.9x - 400$	247.4	645.8	845	1094
Difference Between the Prices	2.6	4.2	5	6

The predicted prices are only off by a few dollars, but the error in prediction increases as the TV size increases.

5. linear regression

12.6 Practice

1. yes; The points are randomly dispersed about the horizontal axis.

2. no; The points form a U-shaped pattern.

3. $y = -1.35x - 2.1$; -0.958 ; This implies strong negative correlation between x and y .

4. $y = -0.38x + 5.7$; 0.356 ; This implies very weak positive correlation between x and y .

5. yes; no; An increase in IQ does not cause an increase in income.

6. yes; yes; A higher grade in algebra causes a higher GPA.

12.7 Activity

1. a. Bottom row: 20, 18, 14, 5, 8

Right column: 12, 16, 14, 11, 12

b. no; The cell where the black and gold row meets the XL column T-shirts has a 0.

c. Bottom row: 25, 30, 35, 30, 25

Right column: 29, 29, 29, 29, 29

d. For every category of shirt, order the number of shirts sold last year minus the number remaining. Also order a couple extra of the shirts that were all sold. For example, order $6 - 1 = 5$ large blue and white shirts and $1 - 4 = -3$ small red and white shirts.

Record and Practice Journal Answer Key

2. a.

		Gender		
		Boys	Girls	Total
Hours	0 hours per week	160	160	320
	1–7 hours per week	130	140	270
	8+ hours per week	90	140	230
	Total	380	440	820

- b. There are fewer boys working part-time jobs than girls. The number of students working 0 hours per week is greater than the number of students working 1–7 hours per week, which is greater than the number of students working 8+ hours per week.
- c. no; The data doesn't support or oppose the claim because the data isn't about students dropping out or working full-time jobs.

3. To read a two-way table, note that each entry represents the number of data values that fit both the criteria for the row and column the entry is in. The entries in the Total row and column represent the number of data values that fit the one criterion in that column or row.

To make a two-way table for a data set, use one variable that describes the data for the rows for the table and another variable for the columns. Put the number of data points that fit both row and column criteria in each slot in the table. On the bottom and right edges of the table, sum up each column and row.

4. Answers will vary.

12.7 Practice

1. a. 8 students

b.

		Flu Shot		Total
		Yes	No	
Flu	Yes	8	13	21
	No	27	32	59
	Total	35	45	80

21 students got the flu. 59 students did not get the flu. 35 students got a flu shot. 45 students did not get a flu shot. 80 students were surveyed.

2. a.

		Grade			Total
		6	7	8	
The student	Eats breakfast at home	28	15	9	52
	Eats breakfast at school	12	15	21	48
	Total	40	30	30	100

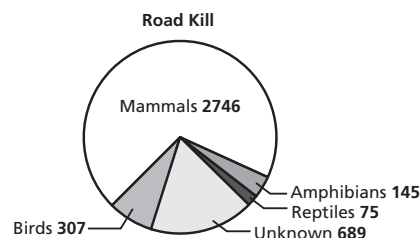
b.

		Grade		
		6	7	8
The student	Eats breakfast at home	70%	50%	30%
	Eats breakfast at school	30%	50%	70%

$\frac{9}{30} = 0.3$
So, 30% of the grade 8 students in the survey eat breakfast at home.

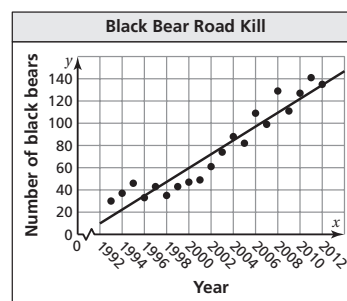
12.8 Activity

1. a. Sample answer:



The circle graph shows the kinds of animals as parts of a whole.

- b. Sample answer:



The scatter plot shows the relationship over time.

Record and Practice Journal Answer Key

c. *Sample answer:*

Raccoon Road Kill Weights

Stem	Leaf
9	4 5
10	
11	0
12	4 9
13	4 6 9
14	0 5 8 8
15	2 7
16	8
17	0 2 3 5
18	5 5 6 7
19	0 1 4
20	4
21	3 5 5 5
22	
23	
24	
25	4

Key: 9 | 4 = 9.4 pounds

The stem-and-leaf plot shows how the raccoon weights are distributed.

- d. *Sample answer:* Reduce the speed limit on some roads.
2. *Answer should include, but is not limited to:* Make sure the graphical displays are appropriate.
3. *Sample answer:* You can display data using different plots and graphs so that it makes it easy for people to interpret and make conclusions from the data.

12.8 Practice

1. *Sample answer:* line graph: shows how data changes over time
2. *Sample answer:* circle graph: shows the data as part of a whole
3. The y-axis has a break making the data look as if it changed rapidly and by large amounts.
4. Because the rain icon is larger than the sun icon, it makes it look as if there were equal amounts of sunny and rainy days when there were not.
5. *Sample answer:* stem-and-leaf plot; can easily read each data value