Student Workbook Answers

2.4 Extension Practice

1. 7 **2.** −12 **3.** −24 **4.** 26

5. −2 **6.** 89 **7.** −1 **8.** 15

9. 23 **10.** −13 **11.** −5 **12.** 1

13. −18.6 **14.** 5.15 **15.** −6.5625

16. −5.75 **17.** 56.5 **18.** 8.24

19. −5.875 **20.** −16.578125 **21.** 52.5

22. 87 **23.** −71.5 **24.** 1.75 **25.** 0.25

26. 0.5 **27.** 0.2 **28.** 0.1 **29.** 5

30. 7 **31.** 7 **32.** 8.5 **33.** 1.25

34. −1.5 **35.** 0.4 **36.** 0.6 **37.** 0.2

38. 0.625 **39.** −0.32 **40.** −1 **41.** 2.1

42. 9.625 **43.** 17.5 **44.** 28.5 **45.** 50.4375

46. 61 **47.** 2.75 **48.** 0.125 **49.** 0.84

50. 18.5 **51.** 3.75 **52.** 5.3

53.

Multiplying mixed numbers → Write mixed numbers as improper fractions → Multiply the numerators and the denominators → Simplify

Example
$$-3\frac{1}{2} \cdot 4\frac{1}{5} = -\frac{7}{2} \cdot \frac{21}{5}$$
$$= \frac{-7 \cdot 21}{2 \cdot 5}$$
$$= \frac{-147}{10}$$
$$\text{or, } -14\frac{7}{10}$$

54.

Dividing mixed numbers → Write mixed numbers as improper fractions → Multiply by the reciprocal of the divisor → Multiply the numerators and the denominators → Simplify

Example
$$-6\frac{1}{3} \div 3\frac{1}{4} = -\frac{19}{3} \div \frac{13}{4}$$
$$= -\frac{19}{3} \cdot \frac{4}{13}$$
$$= \frac{-19 \cdot 4}{3 \cdot 13}$$
$$= \frac{-76}{39}$$
$$\text{or, } -1\frac{37}{39}$$

Chapter 3

3.1 Activity

1. a.

	Expression	Value When $x = 0$	Value When $x = 1$
A.	$3x + 2 - x + 4$	6	8
B.	$5(x - 3) + 2$	−13	−8
C.	$x + 3 - (2x + 1)$	2	1
D.	$-4x + 2 - x + 3x$	2	0
E.	$-(1 - x) + 3$	2	3
F.	$2x + x - 3x + 4$	4	4
G.	$4 - 3 + 2(x - 1)$	−1	1
H.	$2(1 - x + 4)$	10	8
I.	$5 - (4 - x + 2x)$	1	0
J.	$5x - (2x + 4 - x)$	−4	0

Student Workbook Answers

	Value When		
	Expression	$x = 0$	$x = 1$
a.	4	4	4
b.	$-x + 1$	1	0
c.	$4x - 4$	-4	0
d.	$2x + 6$	6	8
e.	$5x - 13$	-13	-8
f.	$-2x + 10$	10	8
g.	$x + 2$	2	3
h.	$2x - 1$	-1	1
i.	$-2x + 2$	2	0
j.	$-x + 2$	2	1

A matches d; B matches e; C matches j;
D matches i; E matches g; F matches a;
G matches h; H matches f; I matches b;
J matches c.

b. *Sample answer:* The expressions in the right column have no parentheses and do not have more than one *x*-term or more than one constant term.

To obtain the equivalent expressions, the like terms are combined.

2. *Answer should include, but is not limited to:*
Students should describe the steps they can use to simplify an expression. Then students should use 3 expressions from Activity 1 as examples. Finally, students should write 3 new expressions as exercises.

3. *Sample answer:* You can simplify an algebraic expression by: (1) using the Distributive Property to eliminate parentheses, (2) use the Commutative and Associative Properties of Addition to get the variable terms together and the terms without variables together, (3) combine the variable terms and combine the terms without variables.

Sample answer:
$$
\begin{aligned}
3(x - 2) + 5 - x &= 3x - 6 + 5 - x &&(1)\\
&= 3x - x - 6 + 5 &&(2)\\
&= 2x - 1 &&(3)
\end{aligned}
$$

4. *Sample answer:* It may be easier to evaluate an algebraic expression for a given value when the expression is simplified. For real-life problems, it may be easier to recognize a value, like a total cost, based on the parts of a simplified algebraic expression.

3.1 Practice

1. $-4y, 7, 9y, -3$; $-4y$ and $9y$, 7 and -3

2. $3n^2, -1.4n, 5n^2, -6.4$; $3n^2$ and $5n^2$

3. $\frac{1}{2}b^3, -b^3, 2b$; $\frac{1}{2}b^3$ and $-b^3$

4. $-6m$ **5.** $14k - 8$ **6.** $10.3 - 12x$

7. $13 - 8x$ **8.** $28a - 7$ **9.** $27x - \frac{89}{6}$

10. $-\frac{5}{8}h + 7$ **11.** $-\frac{1}{4}y + 2$ **12.** $18x + 16$

13. $8y + 2.1y + 3y$
The total weight carried by the runners is $8y + 2.1y + 3y = 13.1y$ ounces.

14. $65 + 35x$ kilograms   **15.** yes; $15a^2 - 4b$

3.2 Activity

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

2. a. $(x + 2) + (x + 4) = 2x + 6$
  b. $(x - 5) + (x - 2) = 2x - 7$
  c. $(x + 5) + (2x - 3) = 3x + 2$
  d. $(2x - 8) + (3x + 5) = 5x - 3$

Student Workbook Answers

3. a. $(x + 3) - (x + 1) = 2$

   b. $(x - 4) - (x - 3) = -1$

   c. $(2x + 5) - (x - 1) = x + 6$

   d. $(3x - 7) - (2x + 3) = x - 10$

4. a.

$(2x + 1) + (x - 1) = 3x$

   b.

$(2x - 6) + (3x + 2) = 5x - 4$

   c.

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

   d.

$(4x + 3) - (2x - 1) = 2x + 4$

5. *Sample answer:* Model the algebraic expressions using algebraic tiles.

To add: Combine "like" tiles and remove zero pairs. Write the resulting algebraic expression modeled by the remaining tiles.

To subtract: Remove any "like" tiles from the first expression and the second expression. If tiles remain in the second expression, add zero pairs to the first expression as necessary. Then remove any "like" tiles. Write the resulting algebraic expression modeled by the remaining tiles.

6. $(-x + 3) - (-2x - 2) = x + 5$

3.2 Practice

1. $2p - 10$ **2.** $2n + 3$

3. $2r + 7$ **4.** $8x - 27$

5. $8.2c - 18$ **6.** $28.5q - 2$

7. $6.5y + 13$ **8.** $6x - 3$

9. a. $15t + 2$ **b.** your friend

10. $-2k + 8$ **11.** $-8d - 5$ **12.** $19j - 9$

13. $-12x + 26$ **14.** $5t - 18$ **15.** $4w + 5$

16. a. $4 + 0.5r$ **b.** $7.50

17. $10m + 2$

3.3 Activity

1. a.

red; 3 yellow; 3; So, $x = -1$.

   b. $z = 8$ **c.** $p = 4$ **d.** $t = -10$

2. a. $n = -7$ **b.** $y = -15$

   c. $b = -8$ **d.** $z = -4$

3. a. $-4 = x + 1; x = -5$ **b.** $x - 3 = 3; x = 6$

   c. $x - 5 = -4; x = 1$ **d.** $5 = x - 2; x = 7$

4. a. $x + 57 = 19; -38°F$

   b. *Sample answer:* The melting point of bromine is 19 degrees Fahrenheit. This is 57 degrees Fahrenheit more than the melting point of mercury. So, subtract 57 from 19 to get $19 - 57 = -38$. So, the melting point of mercury is $-38°F$.

The method in part (a) is the algebraic solution because it assigns a variable to the unknown quantity. The method in part (b) is the arithmetic solution because it is a direct numerical solution that does not use any variables.

5. *Sample answer:* Use algebra tiles to model the equation. Then get the variable tile by itself by adding tiles and removing zero pairs.

6. *Sample answer:* To solve an addition equation, subtract to get the variable by itself. To solve a subtraction equation, add to get the variable by itself.

7. The value of x changes or varies, so x can equal both 2 and 3 in two different problems.
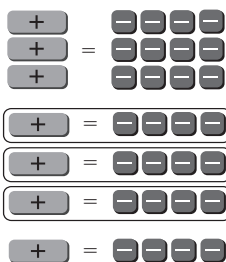
8. *Sample answer:* The weather varies from day to day. The amount of food a person eats in a day varies.

Student Workbook Answers

3.3 Practice

1. 7   **2.** -8 **3.** -4 **4.** 9.6

5. -10.7 **6.** $1\dfrac{1}{6}$ **7.** -18.82 **8.** $3\dfrac{5}{8}$

9. 3.94   **10.** $-2\dfrac{5}{12}$ **11.** $\dfrac{11}{14}$ **12.** 2.06

13. $y + 5 = -2; -7$ **14.** $8 + h = 12; 4$

15. $-13 = n - 4; -9$ **16.** $b + 2 = 9; \$7$

17. $325 = t - 75; 400°F$

18. $c - 29\dfrac{3}{4} = -10\dfrac{1}{4}; 19\dfrac{1}{2}$ in.

19. $76.50 = f - 31.41; \$107.91$

20. $5.2 + 8 + x = 25; 11.8$ ft

21. -4

3.4 Activity

1. a.

3; red; 3; $x = -4$

b. $k = -4$ **c.** $t = -5$

d. $m = -4$ **e.** $h = -4$

2. a. $8 = 4x, x = 2$ **b.** $6x = -12, x = -2$

   c. $-10 = 2x, x = -5$ **d.** $3x = -18, x = -6$

3. a. $32x = 400$; 12.5 sec; Divide the distance by the

    rate to get $\dfrac{400}{32} = 12.5$.

   b. $\dfrac{x}{3.6} = -96; -345.6°F$; Multiply the melting

    point of radon by 3.6 to get $-96 \bullet 3.6 = -345.6$.

c. $\dfrac{3}{4}x = -6; -\$8$ million; Multiply this year's

profit by the reciprocal of $\dfrac{3}{4}$ to get

$$-6 \bullet \dfrac{4}{3} = -8.$$

Sample answer: The method that uses the equation is the algebraic solution because it assigns a variable to the unknown quantity. The other method is the arithmetic solution because it is a direct numerical solution that does not use any variables.

4. *Sample answer:* Multiplication can be used to solve an equation that uses division and division can be used to solve an equation that uses multiplication. The equation $x \div (-3) = -6$ uses division, so multiply each side by -3 to obtain $x = 18$. The equation $2x = -10$ uses multiplication, so divide each side by 2 to obtain $x = -5$.

3.4 Practice

1. 6   **2.** -5 **3.** -99 **4.** -160

5. 1.4   **6.** -5.6 **7.** -15 **8.** $4\dfrac{2}{3}$

9. -14.28 **10.** $-3\dfrac{1}{3}$ **11.** 3   **12.** -16

13. $\dfrac{1}{2}x = -\dfrac{5}{12}; -\dfrac{5}{6}$ **14.** $\dfrac{n}{0.2} = -2.6; -0.52$

15. $7.50h = 123.75; 16.5$ hours

16. $\dfrac{m}{4.5} = 70; 315$ miles

17. $\dfrac{3}{8}w = \dfrac{1}{2}; 1\dfrac{1}{3}$ in.   **18.** $\dfrac{s}{3} = 21; 63$ students

19. $26.46 = 4s; 6.615$ in.

20. *Sample answer:* $7n = 2$

21. *Sample answer:* $\dfrac{y}{2} = -10$

Student Workbook Answers

3.5 Activity

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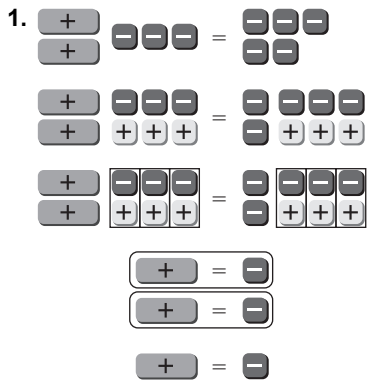
3; 3; 3; 2; 2; $x = -1$

2.

$2x - 3 = -5$	Write the equation.
$2x - 3 + 3 = -5 + 3$	Add 3 to each side.
$2x = -2$	Simplify.
$\dfrac{2x}{2} = \dfrac{-2}{2}$	Divide each side by 2.
$x = -1$	Simplify.

So, $x = -1$.

a. adding 3 to each side

b. They are the same.

3. a. $2x + 2 = -6$; $x = -4$

b. $-13 = 3x - 4$; $x = -3$

4. a. 25 points **b.** $38.92

5. Add enough 1 or -1 tiles to each side to remove the zero pairs and leave only variable tiles on one side. Form as many equal groups of 1 or -1 tiles as there are variable tiles. One of these groups shows the value of the variable.

6. Subtract 1 from each side.

7. $x = 25$; The steps are the same.

3.5 Practice

1. 4   **2.** -2.4 **3.** 3.5   **4.** 4.4

5. -3 **6.** 7.6   **7.** -1.05 **8.** -1.5

9. 17.35   **10.** -1 **11.** $-\dfrac{1}{2}$ **12.** -4

13. $2.5r + 4 = 21.50$; 7 rides

14. $45 + 1.99m = 68.88$; 12 movies

15. $16 + 2w = 24$; 4 feet

16. 9   **17.** $-\dfrac{1}{3}$ **18.** -6

19. 32 students

20. a. 10 cans   **b.** $x = 10$; same answer

3.6 Activity

1. a. 5, 6; The numbers are greater than 4; no; The phrase *more than 4* implies that the number cannot be equal to 4; *Sample answer:* 7, 8, 9, 10

b. $-1, -2, -3, -4, -5$; The numbers are less than 0; no; The phrase *less than 0* implies that the number cannot be equal to 0; *Sample answer:* $-6, -7, -8, -9$

c. 5, 6, 7, 8; The numbers are greater than or equal to 5; yes; The phrase *at least 5* implies that the number can be equal to 5; *Sample answer:* 9, 10, 11, 12

d. $-3, -4, -5, -6, -7$; The numbers are less than or equal to -3; yes; The phrase *no more than 3* implies that the number can be equal to -3; *Sample answer:* $-8, -9, -10, -11$

2. a. 9, 6, 4, 2   **b.** 8, 5, 3, -2

c. $0, 1, -6, -10$ **d.** $-7, -10$

3. a. $x \geq -2$; All numbers greater than or equal to -2.

b. < 1; All numbers less than 1

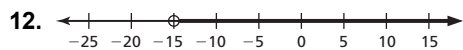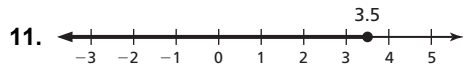**c.** $x \leq 4$; All numbers less than or equal to 4.

4. Start with the number given in the inequality. If the number is a solution, plot a closed circle on the number line. If the number is not a solution, plot an open circle on the number line. Then shade the numbers that are solutions of the inequality.

5. The statement "no more than 5" means less than *or equal to* 5. On a number line, a closed circle at 5 and an arrow pointing to the left can represent $x \leq 5$, whereas an *open* circle at 5 and an arrow pointing to the left can represent $x < 5$.
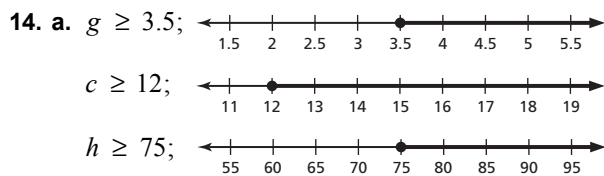
Student Workbook Answers

3.6 Practice

1. $x > -4$; all values of x greater than -4

2. $x \le 11$; all values of x less than or equal to 11

3. $x \ge 15$

4. $r + 3.7 < 1.2$

5. $\dfrac{h}{2} > -5$

6. $a - 8.2 \le 12$

7. no   **8.** no   **9.** yes   **10.** no

11.

12.

13. $a \ge 16$

14. a. $g \ge 3.5$;

$c \ge 12$;

$h \ge 75$;

b. no; Your cousin only has 65 hours of community service and needs at least 10 more hours to meet that requirement.

c. yes; Your friend has a GPA that is greater than the minimum, a number of college preparatory academic course credits that is equal to the minimum, and a number of community service hours that is greater than the minimum.
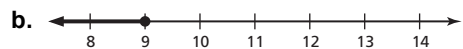
3.7 Activity

1. a. $x + 3 < 18$; your friend's current age; Your friend's age in 3 years will be $x + 3$, at which point your friend still won't be old enough to vote (< 18).

b.
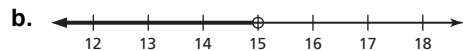
Sample answer: Graphed ages that are more than 3 years away from 18

2. a. $x + 4 \le 13$; x represents how much the manatee grows; Because a baby manatee is 4 feet long and can grow to a maximum length of 13 feet, the sum of 4 and x (how much it grows) must not exceed 13.

b.

Sample answer: Graphed total growth amounts that are 13 or less when added to 4.

**3.** For Activity 1: $x + 3 = 18$; $x = 15$; $x < 15$;

The graphs are the same.

For Activity 2: $x + 4 = 13$; $x = 9$; $x \le 9$;

The graphs are the same.

4. a. $6 + x > 10$; Assuming x is not the longest side, the sum of the two shortest side lengths $(6 + x)$ must be greater than $(>)$ the longest side length (10), or else the shorter sides are not long enough to meet and form a triangle.

b. $x - 6 < 10$; Assuming x is not the longest side, the difference of the longest side length and one of the shorter side lengths $(x - 6)$ must be less than $(<)$ the other side length (10), or else the longest side is too long for the shorter sides to meet and form a triangle.

c.
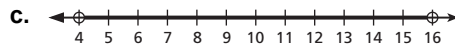
5. *Sample answer:* Replace the inequality symbol with an equal sign, solve the equation, and then replace the equal sign with the original inequality symbol.

6. *Sample answer:* In order to vote in elections in the United States, a citizen must be at least 18 years old. A man was able to vote in the election 4 years ago.
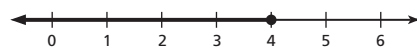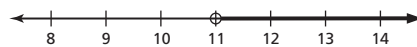
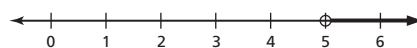$x - 4 \ge 18$;

3.7 Practice

1. $n \ge 11$;

2. $v \le 4$;

3. $p < 1$;

4. $x > 11$;

5. $k > 5$;

Student Workbook Answers

6. $m \geq 1$;

7. $h \leq 20$;

8. $b < 2$;
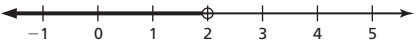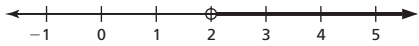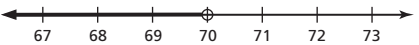

9. $w \leq 100$;

10. $a \geq 9$;

11. $r > 2$;

12. $y < 70$;

13–16. Choice of variables may vary.

13. $d + 6 \leq 10$; $d \leq 4$ **14.** $x - 4 > 3$; $x > 7$

15. $0.6 \geq n - 2.4$; $n \leq 3$

16. $z + 14 \geq 18$; $z \geq 4$

17. The inequality sign should not change;
   $7 > g$ or $g < 7$.

18. Five should be subtracted from both sides of the equation.

$$\begin{aligned} x + 5 &\geq\ \ 11 \\ -5\ \ \ &\ \ -5 \\ \hline x &\geq\ \ \ 6 \end{aligned}$$

19. Let d be the amount you can spend on the cold drink: $d + 6.75 \leq 10$; $d \leq 3.25$; You can spend up to \$3.25.

20. Let n be the number of days for your books to arrive; $n + 9 \geq 28$; $n \geq 19$; at least 19 days.

21. Let p be the number of people who can attend the play; $p + 185 \leq 480$; $p \leq 295$; at most 295 people.

Chapter 4

4.1 Activity

1.

Your running rate in a 100-meter dash	meters per second	$\dfrac{8\text{ m}}{\text{sec}}$; $\dfrac{80\text{ m}}{\text{sec}}$
The fertilization rate for an apple orchard	pounds per acre	$\dfrac{150\text{ lb}}{\text{acre}}$; $\dfrac{1\text{ lb}}{\text{acre}}$
The average pay rate for a professional athlete	dollars per year	$\dfrac{\$3,000,000}{\text{yr}}$; $\dfrac{\$3000}{\text{yr}}$
The average rainfall rate in a rain forest	inches per year	$\dfrac{100\text{ in.}}{\text{yr}}$; $\dfrac{5\text{ in.}}{\text{yr}}$

2. a. *Sample answer:* ingredients in a drink mixture;

$$\frac{1}{2} \div 4 = \frac{1}{2} \bullet \frac{1}{4} = \frac{1}{8}\ \text{cup per fluid ounce}$$

b. *Sample answer:* speed of a bug;

$$2 \div \frac{3}{4} = 2 \bullet \frac{4}{3} = \frac{8}{3},\ \text{or}\ 2\frac{2}{3}\ \text{inches per second}$$

c. *Sample answer:* ingredients in a recipe;

$$\frac{3}{8} \div \frac{3}{5} = \frac{3}{8} \bullet \frac{5}{3} = \frac{5}{8}\ \text{cup of sugar for every cup}$$
of flour

d. *Sample answer:* draining an aquarium;

$$\frac{5}{6} \div \frac{2}{3} = \frac{5}{6} \bullet \frac{3}{2} = \frac{5}{4},\ \text{or}\ 1\frac{1}{4}\ \text{gallons per second}$$

3. a. $\dfrac{18\text{ mi}}{4\text{ sec}}$

b.

Time (seconds)	4	8	12	16	20
Distance (miles)	18	36	54	72	90