

# Answer Key

## Chapter 1.R: Algebraic Expressions, Equations, and Inequalities

### 1.R.1 Exercises

#### Concept Check

- False; Equals 81
- False;  $7^0$  is 1.
- True
- False; 7605 is divisible by 5.
- False; A prime number has exactly 2 factors.
- False; 231 is a composite number.
- False; The LCM of 15 and 25 is 75.
- True

#### Practice

- a. 4 b. 0 c. 1
- 3, 5
- None
- Prime
- $5^3$
- 24
- 15

#### Applications

- a. No. The formula incorrectly shows that each shirt is \$10, and the total cost would be  $\$25 - \$10 \cdot 11 = \$25 - \$110 = -\$85$ .  
b. \$165;  $(\$25 - \$10) \cdot 11$
- 4 team members would work 110 hours each; 8 team members would work 55 hours each.
- 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

#### Writing & Thinking

- If addition is within parentheses (or other grouping symbols), addition would be performed first.

- No, some odd numbers are the product of two or more odd prime factors, for example,  $3 \cdot 3 = 9$ ,  $3 \cdot 5 = 15$ ,  $3 \cdot 7 = 21$ , etc.
- Since the LCM is constructed using the prime factors of each number in the set, by definition, each number will divide the LCM.

### 1.R.2 Exercises

#### Concept Check

- True
- False; The statement  $\frac{1}{3} \cdot \frac{2}{5} = \frac{2}{5} \cdot \frac{1}{3}$  is an example of the commutative property of multiplication.
- False; The reciprocal of 1 is 1.
- False; The reciprocal of 12 is  $\frac{1}{12}$ .

#### Practice

- $\frac{1}{4}$
- $\frac{1}{3}$
- $\frac{8}{9}$
- Undefined

#### Applications

- $\frac{3}{8}$
- 200 years
- No. If a fraction is less than 1 then its product with another number will be less than that other number. So, if the other number is less than 1, the

product will be less than 1. Answers will vary.

- $0 = \frac{0}{1}$  and the reciprocal would be  $\frac{1}{0}$  but division by 0 is undefined. So 0 has no reciprocal.

### 1.R.3 Exercises

#### Concept Check

- True
- False; LCD stands for least common denominator.
- True

#### Practice

- $\frac{17}{21}$
- $\frac{11}{15}$
- $\frac{23}{42}$
- $-\frac{1}{4}$

#### Applications

- 1 ounce

#### Writing & Thinking

- The LCM finds the least common multiple of a set of numbers. The LCD does the same thing for the set of numbers determined by the denominators.

### 1.R.4 Exercises

#### Concept Check

- False; A proportion is a statement that two ratios are equal.
- True

- True

#### Practice

- False
- $B = 7.8$

#### Applications

- 180 minutes or 3 hours

### 1.R.5 Exercises

#### Concept Check

- True
- False; A decimal number that is between 0.01 and 0.10 is between 1% and 10%.
- False; Fractions that have denominators other than 100 can be changed to a percent.

#### Practice

- 20%
- 2%
- 0.07
- 75%
- $1\frac{1}{5}$

#### Applications

- 4%
- 85%

#### Writing & Thinking

- Percent means per centum or per 100. For example, fifty-eight percent means 58 out of 100. Percent can be written as a fraction with 100 in the denominator as in  $\frac{58}{100}$ . The decimal equivalent, 0.58 is read as "fifty-eight hundredths," indicating percent can be written using the hundredths place, another connection.

23. 100% = 1 so anytime there is a mixed number, which has a value greater than 1, the percentage will be greater than 100%. Proper fractions (numerator is smaller than denominator) have a value less than 1 and therefore the percentage will be less than 100%.

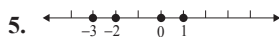
## Chapter 2.R: Equations and Inequalities in One Variable

### 2.R.1 Exercises

#### Concept Check

- True
- True

#### Practice



- 0, 4, 8
- True

#### Applications

- 4500 meters

#### Writing & Thinking

- If  $y$  is a negative number then  $-y$  represents a positive number. For example, if  $y = -2$ , then  $-y = -(-2) = 2$ .

### 2.R.2 Exercises

#### Concept Check

- False; The sum of a positive and negative number can be positive, negative, or zero.
- False; The sum of two positive numbers is always positive, zero is neither positive nor negative.

#### Practice

- 6
- 0.5

#### Applications

- $\$45,000 + (-\$8000) + (-\$2000) + \$15,000$ .
  - $\$50,000$ .

#### Writing & Thinking

- $|0| + |0| = 0$

### 2.R.3 Exercises

#### Concept Check

- False; The sum of a number and its additive inverse is zero.
- True

#### Practice

- 11
- 3
- 15

#### Applications

- 18°F (a decrease of 18 degrees Fahrenheit)

#### Writing & Thinking

- Add the opposite of the second number to the first number.

### 2.R.4 Exercises

#### Concept Check

- True.
- False; The product and quotient will be positive.

#### Practice

- 48
- 2

#### Applications

- 12

#### Writing & Thinking

- Negative; The product of every two negative numbers will be positive and this result multiplied by the remaining negative will give a negative answer.

## Chapter 3.R: Equations and Inequalities in Two Variables

### 3.R.1 Exercises

#### Concept Check

- True
  - False; Not all rectangles have four equal sides.
- True
- True
- False; The length of the radius of a circle is half of the length of the diameter.
- True
- B
  - C
  - A
  - E
  - D

#### Practice

- 44 cm
- 45 cm
- 50 in.
- 70 in.<sup>3</sup>
- 81 ft<sup>2</sup>
- 48 in.<sup>2</sup>
- 36 cm<sup>2</sup>
- 35.98 in.
  - 76.93 in.<sup>2</sup>
- 7536 m<sup>2</sup>
- 226.08 m<sup>2</sup>

#### Applications

- 135 square feet
- 63.6 square inches

- \$0.13 per square inch

#### Writing & Thinking

- To find the volume of the ice cream itself, the volume is half the volume of a sphere and the formula used would be  $V = \frac{1}{2} \cdot \frac{4}{3} \pi r^3 = \frac{2}{3} \pi r^3$ . The result is the volume of the ice cream that is exposed. Next find the volume of the cone by using the formula  $V = \frac{1}{3} \pi r^2 h$ . The volume of the ice cream cone will be the sum of these two volumes.

- One diameter is equal to two radii. Thus,  $d = 2r$  and  $C = 2\pi r = \pi d$ .

### 3.R.2 Exercises

#### Concept Check

- True
- True

#### Practice

- 6
- Yes;  $6^2 + 8^2 = 10^2$
- $c = 5$

#### Applications

- 17.0 inches

### 3.R.3 Exercises

#### Concept Check

- False; If the original number is negative, the principal square root will not be the same as the original number.
- False; The radicand is underneath the radical sign.

#### Practice

- 7
- 10
- 0.2

#### Applications

- a. 4 cm  
b. 20 cm

#### Writing & Thinking

- Cubing a negative real number is equivalent to multiplying a negative number by itself 3 times. The product of three negative numbers is negative.

### 3.R.4 Exercises

#### Concept Check

- True
- False; If  $x$  is a real number, then  $\sqrt{x^2} = |x|$

#### Practice

- $9\sqrt{2}$
- $2x^5y\sqrt{6x}$
- $-2x^2\sqrt[3]{x^2}$

#### Applications

- $\sqrt{3} \approx 1.73$  amperes

#### Writing & Thinking

- A cube root has no restrictions as the cube root of a negative number is negative.

### 3.R.5 Exercises

#### Concept Check

- True
- True

#### Practice

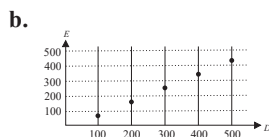
$$5. \left\{ \begin{array}{l} A(-5, 1), B(-3, 3), \\ C(-1, 1), D(1, 2), \\ E(2, -2) \end{array} \right\}$$

- a. (0, -1)  
b. (4, 1)  
c. (2, 0)  
d. (8, 3)

- b, c

#### Applications

11 a.	D	E
	100	85
	200	170
	300	255
	400	340
	500	425



### 3.R.6 Exercises

#### Concept Check

- False; The addition and multiplication principles of equality can be used with decimal or fractional coefficients.
- True

#### Practice

- $x = -3$
- $x = -\frac{27}{10}$

#### Applications

- 14,000 tickets per hour

#### Writing & Thinking

- a. The 4 should have been multiplied by 3 so that the 3 was distributed over the entire left-hand side of the equation; Correct answer is  $x = 15$ .  
b. 3 should be subtracted from each side, not from each term, and  $5x - 3$  doesn't simplify to  $2x$ ; Correct answer is  $x = \frac{8}{5}$ .

### 3.R.7 Exercises

#### Concept Check

- True
- False; It is called a contradiction.

#### Practice

- $x = -5$
- $x = -1$
- Contradiction

#### Applications

- 20 guests

#### Writing & Thinking

- a.  $5x + 1$   
b.  $x = 6$   
c. Answers will vary.

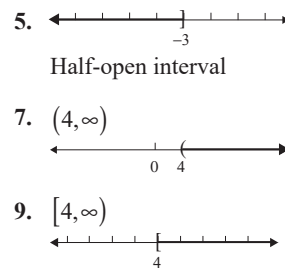
### 3.R.8 Exercises

#### Concept Check

- True

- False; Only one value in the solution set needs to be checked.

#### Practice



#### Applications

- a. The student must score at least 102 points, which is not possible. Thus he cannot earn an A in the course.  
b. The student must score at least 192 points to earn an A in the course.

#### Writing & Thinking

- a. Answers will vary.  
b. Answers will vary.

### 3.R.9 Exercises

#### Concept Check

- False; Radical equations may also have one or no solution.
- False; The process needs to be repeated until all radicals have been eliminated.

#### Practice

- $x = 3$
- $x = 4$

#### Applications

- 12 ft

## Chapter 4.R: Relations, Functions, and Their Graphs

### 4.R.1 Exercises

#### Concept Check

1. True
3. True

#### Practice

$$5. \left\{ (-5, -4), (-4, -2), \right. \\ \left. (-2, -2), (1, -2), (2, 1) \right\};$$

$$D = \{-5, -4, -2, 1, 2\};$$

$$R = \{-4, -2, 1\};$$

Function

7. Not a function;

$$D = (-\infty, \infty);$$

$$R = (-\infty, \infty)$$

9. a. -10 b. 86 c. 86

### 4.R.2 Exercises

#### Concept Check

1. True
3. False; Subtraction is indicated by the phrase "five less than a number."

#### Practice

$$5. x + 6$$

$$7. \frac{x}{2} - 18$$

9. a.  $4n - 6$   
b.  $6 - 4n$

11. The product of a number and negative nine

#### Writing & Thinking

13. The Commutative Property of Addition and Multiplication permits the order of items being added or multiplied to change and still have the same result. This property does not hold true for subtraction or division. Therefore, order is important for subtraction and division problems or the answer will change or be incorrect.

### 4.R.3 Exercises

#### Concept Check

1. True
3. False; Odd integers are integers that are not even.

#### Practice

$$5. x - 5 = 13 - x; 9$$

$$7. n + (n + 1) + (n + 2) = 93; \\ 30, 31, 32$$

#### Applications

9. a. The unknown value is the length of the call in minutes.  
b.  $m = 20$   
c. The collect call lasted 20 minutes.

#### Writing & Thinking

11. a.  $n, n + 2, n + 4, n + 6$   
b.  $n, n + 2, n + 4, n + 6$   
c. Yes; Answers will vary.

### 4.R.4 Exercises

#### Concept Check

1. False; Variables need to be considered as well.
3. True

#### Practice

$$5. 5$$

$$7. 7(2x + 3)$$

$$9. (3 + a)(x + y)$$

#### Applications

11. a. 32 feet  
b.  $16x(3 - x)$   
c. 32 feet  
d. Yes; They are equivalent expressions.

### 4.R.5 Exercises

#### Concept Check

1. True
3. True

#### Practice

$$5. (x - 9)(x + 3)$$

$$7. (y - 12)(y - 2)$$

#### Applications

$$9. \text{Base} = x + 48; \text{Height} = x$$

#### Writing & Thinking

11. If the sign of the constant term is positive, the signs in the factors will both be positive or both be negative. If the sign of the constant term is negative, the sign in one factor will be positive and the sign in the other factor will be negative.

### 4.R.6 Exercises

#### Concept Check

1. False; The middle term should be the sum of the inner and outer products.
3. False; The first step is to multiply  $a$  and  $c$ .

#### Practice

$$5. (6x + 5)(x + 1)$$

7. Not factorable

$$9. 2(2x - 5)(3x - 2)$$

#### Writing & Thinking

11. This is not an error, but the trinomial is not completely factored. The completely factored form of this trinomial is  $2(x + 2)(x + 3)$ .

### 4.R.7 Exercises

#### Concept Check

1. False; The first step is to check for a common monomial factor.
3. False; It might be factorable by the grouping method.

#### Practice

$$5. (x + 5)^2$$

$$7. (5x + 6)(4x - 9)$$

$$9. (x + 5)(x^2 - 5x + 25)$$

$$11. (x + 12)(x - 3)$$

$$13. 2(2x - 1)(x - 3)$$

### 4.R.8 Exercises

#### Concept Check

1. True
3. True

#### Practice

$$5. x = 2, 9$$

$$7. x = -4, 6$$

#### Applications

$$9. \text{a. } 640 \text{ ft; } 384 \text{ ft}$$

$$\text{b. } 144 \text{ ft; } 400 \text{ ft}$$

$$\text{c. } 7 \text{ seconds;}$$

$$0 = -16(t + 7)(t - 7)$$

**Writing & Thinking**

11. This allows for use of the zero factor property which says that for the product to equal zero one of the factors must equal zero. Answers will vary.

**4.R.9 Exercises**

**Concept Check**

1. False;  $i$ ,  $-i$ , 1, and  $-1$

3. False; The product is  $-1$ .

**Practice**

5.  $-28 - 24i$   
 7.  $0 - \frac{5}{4}i$   
 9.  $0 + i$

**Writing & Thinking**

11. Given a complex number

$$(a + bi) : (a + bi)(a - bi) = a^2 - abi + abi - b^2i^2 = a^2 + b^2$$

which is the sum of squares of real numbers. Thus the product must be a positive real number.

**4.R.10 Exercises**

**Concept Check**

1. True

3. False; Two real solutions

**Practice**

5. 68; Two real solutions  
 7.  $x = -2 \pm 2\sqrt{2}$   
 9.  $x = 1, \frac{4}{3}$

**Writing & Thinking**

11.  $x^4 - 13x^2 + 36 = 0$ ; multiplied  $(x - 2)(x + 2)(x - 3)(x + 3)$

**Chapter 5.R: Working with Functions**

**5.R.1 Exercises**

**Concept Check**

1. True.  
 3. True.

**Practice**

5. a. 36  
 b. 16  
 7.  $-10$   
 9. 129  
 11. 143

**Applications**

13. a.  $-\$42 - \$35 - (3 \cdot \$5)$ .  
 b.  $-\$92$ .

**Writing & Thinking**

15. Smaller; When any positive number is multiplied by a fraction (or decimal) between 0 and 1, the result will be smaller. This is what is happening when a number between 0 and 1 is squared. Answers will vary.

**5.R.2 Exercises**

**Concept Check**

1. True.  
 3. False; In the term “ $12a$ ,” 12 is the coefficient.

**Practice**

5.  $-5$ , 3, and 8 are like terms;  $7x$  and  $9x$  are like terms.  
 7.  $10x$   
 9.  $3y + 4$ ; 13

**Applications**

11.  $\$50,000$

**Writing & Thinking**

13. Like terms have the same variables with the same exponents. For example,  $4a^2bc^3$  and  $-3a^2bc^3$  are like terms. Unlike terms either have different variables or possibly the same variables with different exponents. For example,  $6ab$  and  $-9a^2b$  are unlike terms and  $5xy$  and  $13ax$  are unlike terms.

**5.R.3 Exercises**

**Concept Check**

1. False; The distributive property can be used when multiplying any types of polynomials.  
 3. True

**Practice**

5.  $-4x^8 + 8x^7 - 12x^4$   
 7.  $y^3 + 2y^2 + y + 12$

**Applications**

9.  $V = 10x^2 + 220x + 1200$  cubic inches

**5.R.4 Exercises**

**Concept Check**

1. True  
 3. False; Missing powers should be filled in with zeros.

**Practice**

5.  $y^2 - 2y + 3$   
 7.  $x - 6 + \frac{4}{x + 4}$   
 9.  $x^3 + 2x + 5 + \frac{17}{x - 3}$

**Applications**

11. a.  $x^2 - 4x - 5$  square inches  
 b.  $x^2 - 3x - 10$  square inches

**5.R.5 Exercises**

**Concept Check**

1. True  
 3. False; A rational expression cannot have a zero denominator.

**Practice**

5.  $\frac{3x}{4y}$ ;  $x \neq 0, y \neq 0$   
 7.  $\frac{x - 3}{y - 2}$ ;  $y \neq -2, 2$   
 9.  $\frac{1}{x - 3}$ ;  $x \neq 0, 3$

**Applications**

11. a.  $p(x) = \frac{15x + 200}{x}$   
 b.  $\$35$   
 c.  $x \neq 0$   
 d. The variable cannot be negative because you cannot have a negative quantity of people. There would also be a maximum number depending on the size of the room.

**Writing & Thinking**

13. a. A rational expression is an algebraic expression that can be written in the form  $\frac{P}{Q}$  where  $P$  and  $Q$  are polynomials and  $Q \neq 0$ .  
 b.  $\frac{x - 1}{(x + 2)(x - 3)}$ ; Answers will vary.

c.  $\frac{1}{x+5}$ ;  
Answers will vary.

7.  $\frac{x}{12}$

Applications

9. a.  $\frac{x^2 - 3x - 10}{x + 3}$   
 b.  $\frac{x^2 + 5x + 6}{x - 5}$   
 c.  $(x + 2)^2 = x^2 + 4x + 4$

5.R.6 Exercises

Concept Check

1. False; The reciprocal is  $\frac{x+3}{x}$ .  
 3. False; the restriction is 0.

Practice

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

3. True

Practice

5.  $\frac{4}{5xy}$   
 7.  $\frac{11}{2(1+4x)}$   
 9.  $\frac{-5}{x+1}$

Applications

11. a.  $\frac{4r + r^2}{4}$

b. 0.0609

c. 0.0609

d. Yes; They are calculated from different forms of the same expression.

e. 0.0009

f. Answers will vary. It is larger because the interest is compounded along with the principal.

5.R.7 Exercises

Concept Check

1. True

Chapter 7.R: Exponential and Logarithmic Functions

7.R.1 Exercises

Concept Check

1. False; If there is no exponent written, the exponent is assumed to be 1.  
 3. True

Practice

5.  $y^{11}$   
 7.  $\frac{1}{x}$   
 9.  $-18x^5y^7$

Applications

11.  $2^8$  GB

7.R.2 Exercises

Concept Check

1. True  
 3. False; The rules for exponents can be applied in any order, resulting in the same answer.

Practice

5. 64  
 7.  $-\frac{2y^6}{27x^{15}}$   
 9.  $\frac{y^8}{16x^8}$

7.R.3 Exercises

Concept Check

1. True  
 3. True

Practice

5.  $\sqrt[3]{8}$   
 7.  $\frac{1}{10}$   
 9.  $a^{\frac{1}{4}}$

Applications

11. 576 ft<sup>2</sup>

Writing & Thinking

13. No;

$$\sqrt[5]{a} \cdot \sqrt{a} = a^{\frac{7}{10}}, \sqrt[5]{a^2} = a^{\frac{2}{5}},$$

$$a^{\frac{7}{10}} \neq a^{\frac{2}{5}}$$

7.R.4 Exercises

Concept Check

1. True  
 3. True

Practice

5.  $\log_7 49 = 2$   
 7.  $x = -3$   
 9.  $x = 3.7$

Writing & Thinking

11. The two functions are symmetric about the  $x$ -axis.

Chapter 8.R: Conic Sections

8.R.1 Exercises

Concept Check

1. False; The product will be a binomial.  
 3. True

Practice

5.  $x^2 - 14x + 49$ ;  
Perfect square trinomial  
 7.  $x^2 + 8x + 16$ ;  
Perfect square trinomial  
 9.  $9x^2 - 12x + 4$ ;  
Perfect square trinomial

Applications

11. a.  $A(x) = 400 - 4x^2$   
 b.  $P(x) = 4(20 - 2x) + 8x = 80$

Writing & Thinking

13.  $(x+5)^2 = x^2 + 2(5x) + 5^2$ .  
Answers will vary.

8.R.2 Exercises

Concept Check

1. True  
 3. False; The sum of two squares is not factorable.

Practice

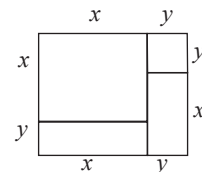
5.  $(y - 8)^2$

- 7.  $2(x-8)(x+8)$
- 9.  $(3x-y)(3x+y)$

**Writing & Thinking**

11. a.  $xy + xy + x^2 + y^2$   
 $= x^2 + 2xy + y^2$   
 $= (x + y)^2$

b.  $(x + y)(x + y)$   
 $= (x + y)^2$



## Chapter 9.R: Systems of Equations and Inequalities

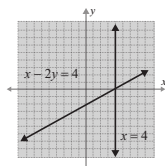
### 9.R.1 Exercises

**Concept Check**

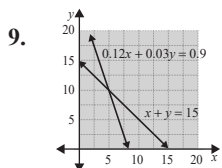
- 1. False; The solution must be checked in all equations.
- 3. True

**Practice**

- 5. a, c
- 7. (4, 0)



**Applications**



5 gallons of 12%; 10 gallons of 3%

**Writing & Thinking**

11. The solution to a consistent system of linear equations is a single point, which is easily written as an ordered pair.

### 9.R.2 Exercises

**Concept Check**

- 1. True
- 3. True

**Practice**

- 5. (2, 4)
- 7. No solution

**Applications**

- 9. 15 m × 10 m

**Writing & Thinking**

11. Answers will vary.

### 9.R.3 Exercises

**Concept Check**

- 1. False; The solution always needs to be checked in both original equations.
- 3. False; Both methods give exact solutions.

**Practice**

- 5. No solution
- 7. (x, 2x - 4)

**Applications**

- 9. 1200 adults; 3300 children

**Writing & Thinking**

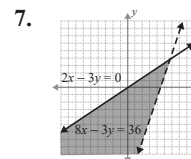
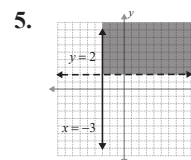
11. Answers will vary.

### 9.R.4 Exercises

**Concept Check**

- 1. False; When boundary lines are parallel, the solution is either the strip between the boundary lines, a half-plane, or there is no solution.
- 3. True

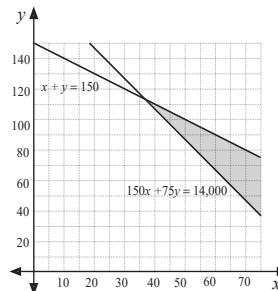
**Practice**



**Applications**

9. a.  $\begin{cases} 150x + 75y \geq 14,000 \\ x + y \leq 150 \end{cases}$

b.



- c. Answers will vary.
- d. No.  $150 \cdot \$75 = \$11,250$