

Chapter 3

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**Chapter
3****Expressions and Equations**

Dear Family,

Algebra is used to describe relationships in general terms. Consider the following statements.

- | | |
|---|--|
| • Game tickets are \$7 each. | The cost of n tickets is $7n$ dollars. |
| • It takes 5 minutes to get shoes and car keys and walk to the car. | For a drive of m minutes, allow $m + 5$ minutes. |
| • Each question on a 20-question test is worth 1 point. | If you miss x questions, your score on the test will be $20 - x$. |

On the left, the rule is stated in words, the way you might remember it. On the right, the rule is stated as a mathematical expression with a variable. The number of tickets, the length of the drive, and the number of questions missed are all variables—that is, they might have many different values. The cost of a ticket, the time to get to the car, and the total number of questions on the test are constants—that is, they remain the same. Ask your student to answer each question, using the information above.

- What is the cost of 3 game tickets?
- You want to arrive at baseball practice at 4:30. The drive is 15 minutes. What time should you get ready to leave?
- You miss 2 questions on the test. What is your score?

(Answers: \$21, 4:10, 18 points)

Rather than remember all possible ticket costs, driving times, or test scores, you remember the rule for finding them. These examples are uses of algebra in daily life.

With your student, find another algebraic rule you could use in daily life. What are the variables? What are the constants? Have your student evaluate your rule for two different values of the variable(s).

Have fun exploring expressions together!

Capítulo
3
Expresiones y ecuaciones

Estimada Familia:

El álgebra se utiliza para describir relaciones en términos generales. Consideren los siguientes enunciados.

- | | |
|--|--|
| • Los boletos para el juego cuestan \$7 cada uno. | n boletos cuestan $7n$ dólares. |
| • Se necesitan 5 minutos para ponerse los zapatos, tomar las llaves del auto y caminar hacia él. | Para un trayecto de m minutos, considere $m + 5$ minutos. |
| • Cada pregunta en una prueba de 20 preguntas vale 1 punto. | Si falla x respuestas, su puntaje en la prueba será $20 - x$. |

A la izquierda, la regla se expresa en palabras, la manera en que podrían recordarla. A la derecha, la regla se indica en una expresión matemática con una variable. El número de boletos, la duración del trayecto y el número de preguntas erróneas son todas variables—es decir, que pueden tener muchos valores diferentes. El costo de un boleto, el tiempo para llegar al auto y el número total de preguntas en la prueba son constantes—es decir, siguen siendo los mismos. Pida a su estudiante que responda cada pregunta utilizando la información anterior.

- ¿Cuánto cuestan 3 boletos para el juego?
- Desean llegar al entrenamiento de béisbol a las 4:30. El trayecto dura 15 minutos. ¿A qué hora deben alistarse para salir?
- Se equivoca en 2 preguntas en la prueba. ¿Cuál es su puntaje?

(Respuestas: \$21, 4:10, 18 puntos). En lugar de recordar todos los gastos posibles de boletos, los tiempos de manejo o los resultados de la prueba, debe recordar la regla para hallarlos. Estos ejemplos son usos del álgebra en la vida diaria.

Con su estudiante, busquen otra regla algebraica que se pueda utilizar en la vida diaria. ¿Cuáles son las variables? ¿Cuáles son las constantes? Haga que su estudiante evalúe la regla para dos valores diferentes de la(s) variable(s).

Activity
3.1**Start Thinking!**

For use before Activity 3.1

Explain to a partner how an expression and an equation are different.

Give an algebraic and numerical example for each.

Activity
3.1**Warm Up**

For use before Activity 3.1

Write the phrase as an expression.

1. 7 increased by a number x
2. negative 14 minus y
3. negative 19 increased by n
4. the product of 14 and y
5. 10 divided by the sum of a number n and 6
6. 6 times the quotient of a number x and 3

Given the problem $6x + 4 - 2x$, your brother says the answer is $8x + 4$. Explain to your brother why his answer is incorrect. Give the correct answer.

Simplify the expression.

1. $10x + 4x$

2. $7y + 12 - 15$

3. $6x - 4x + 16$

4. $3.8y - 4 + 7.2y$

5. $7 + 11x + 8.4 - x$

6. $\frac{4}{7}y + 8 - 2\frac{1}{2} + \frac{3}{7}y$

3.1 Practice A

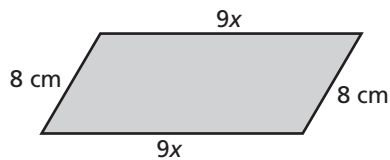
Identify the terms and like terms in the expression.

- $-4y + 7 + 9y - 3$
- $3n^2 - 1.4n + 5n^2 - 6.4$
- $\frac{1}{2}b^3 - b^3 + 2b$

Simplify the expression.

- $-15m + 9m$
- $3.2 - 9x + 7.1 - 3x$
- $19a - 7 - 3a + 12a$
- $\frac{1}{8}h + 7 - \frac{3}{4}h$
- $8k - 2(4 - 3k)$
- $25 - 6x - 12 - 2x$
- $\frac{5}{2}(6x - 7) + \frac{4}{3}(2 + 9x)$
- $\frac{2}{3}y + 5 - 3 - \frac{11}{12}y$

12. Write an expression in simplest form that represents the perimeter of the polygon.



- Each runner is carrying an 8 ounce bottle of water, a 2.1 ounce energy bar, and a 3 ounce energy drink. Write an expression in simplest form that represents the weight carried by y runners. Interpret the expression.
- John weighs 65 kilograms, Sam weighs $22x$ kilograms, and Mark weighs $13x$ kilograms. Write an expression in simplest form for their combined weight.
- Are the expressions $8a^2 - 4b + 7a^2$ and $5(3a^2 - 2b) + 6b$ equivalent? Explain your reasoning.

3.1 Practice B

Identify the terms and like terms in the expression.

1. $1.3x - 2.7x^2 - 5.4x + 3$

2. $10 - \frac{3}{10}m + 6m^2 + \frac{2}{5}m$

Simplify the expression.

3. $-\frac{15}{4}b + \frac{5}{6}b$

4. $60m - 15(4 - 8m) + 20$

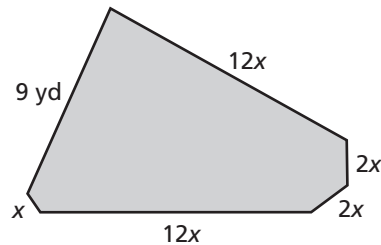
5. $4(5.8 - 9x) + 8.2 + 22x$

6. $9y - 15y + 12 - 6y$

7. $v + 13 - 8(v + 2)$

8. $\frac{5}{3}(5x + 9) + \frac{4}{5}(1 - 9x)$

9. Write an expression in simplest form that represents the perimeter of the polygon.



Draw a diagram that shows how the expression can represent the area of a figure. Then simplify the expression.

10. $8(3x - 1)$

11. $(5 + 2)(x + 3x)$

12. Danielle is x years old. Her sister is 5 years older and her brother is half Danielle's age. Write an expression in simplest form for the sum of their ages.
13. The length of a rectangular field is 30 more than twice its width. Write an expression in simplest form for the perimeter of the field in terms of its width w .
14. You buy x packs of pencils, twice as many packs of erasers, and three times as many rolls of tape. Write an expression in simplest form for the total amount of money you spent.



3.1 Enrichment and Extension

Matching

Simplify the expressions on the left by using the Distributive Property and combining like terms. Then, match it to an equal expression on the right by connecting the two with a line.

- | | |
|--|-----------------------|
| 1. $6x + 2x$ | a. $8x$ |
| 2. $14x - 12 - x - 3$ | b. $\frac{1}{2}x + 1$ |
| 3. $-5x + 14 - x - 2$ | c. $13x - 15$ |
| 4. $-3 - 5x - 3x + 11x + 3$ | d. $2x + 11$ |
| 5. $-2(-5 - x) + x - x + 1$ | e. $2x$ |
| 6. $\frac{1}{2}(12) + 4x - (x - 1)$ | f. $6x^2 + x - 27$ |
| 7. $6(x^2 - 2) + 1 - 16 + x$ | g. $3x$ |
| 8. $4\left(\frac{1}{2}x + 4\right) + 1 - 16 + x$ | h. $3x + 1$ |
| 9. $5(x^2 + x)$ | i. $3x + 7$ |
| 10. $x + \left(1 - \frac{1}{2}x\right)$ | j. $-6x + 12$ |
| 11. $x^3 + x^2 + x + x - x^2 - x^3$ | k. $5x^2 + 5x$ |
| 12. Write an expression containing x -terms and constants. The x -terms should combine to $7x$ and the constants should sum to 13. | |
| 13. Write an expression containing x^2 -terms, x -terms, and constants. The x^2 -terms should combine to $-2x^2$, the x -terms should subtract to $3x$, and the constants should sum to 3. | |



Puzzle Time

How Can You Turn A Pumpkin Into A Squash?

A	B	C	D	E	F
G	H	I	J	K	L

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

$2x + 4$ SMASH
$13x - 2$ THE
$-2x + 6.2$ COME
$2.4x + 2.9$ AND
$21x$ THROW
$-1.5x - 7$ WILL
$7x + 14$ SQUASH

Simplify the expression.

- A. $8x + 13x$
- B. $15x + 10 - 6$
- C. $7x - 4x + 3$
- D. $5.3x - 9 + 7.6x$
- E. $6x - 4x - 2 + 11x$
- F. $\frac{3}{4}x + 11 - 5\frac{1}{2} + \frac{1}{4}x$
- G. $5(x + 8) + 3$
- H. $3.6x - 7 - 5.1x$
- I. $4 + 8x + 2.2 - 10x$
- J. $\frac{5}{6}x - 9 + 3 - \frac{2}{3}x$
- K. $2.4(x + 3) - 4.3$
- L. The length of a rectangle is 7 inches and the width is $(x + 2)$ inches. Write an expression in simplest form that represents the area of a rectangle.

$x + 5\frac{1}{2}$ AIR
$3x + 3$ UP
$5x + 43$ IT
$x - 4\frac{1}{2}$ TOSS
$12.9x - 9$ IN
$\frac{1}{6}x - 6$ DOWN
$15x + 4$ IT

**Activity
3.2****Start Thinking!**

For use before Activity 3.2

Give two examples of *like terms*. Give two examples of *unlike terms*. Explain what the difference is between like terms and unlike terms.

**Activity
3.2****Warm Up**

For use before Activity 3.2

Simplify the expression.

1. $4x + 2 - 3x$

2. $8y - 3 - 10y - 6$

3. $-2x + 3 - 8x$

4. $\frac{1}{2}y + 3y - \frac{2}{5}$

5. $4.8x - 4.6 + 3.9x$

6. $3y - 4.6 + 1.3 + 2.1y$

Lesson
3.2

Start Thinking!

For use before Lesson 3.2

Explain how to simplify $(5x - 4) + (3x - 6)$ using algebra tiles.

Lesson
3.2

Warm Up

For use before Lesson 3.2

Write the sum or difference of two algebraic expressions modeled by the algebra tiles. Then use the algebra tiles to simplify the expression.

1. $(\text{+} \text{-} \text{-} \text{-} \text{-}) + (\text{+} \text{+} \text{+})$

2. $(\text{+} \text{+} \text{-} \text{-} \text{-}) + (\text{+} \text{-} \text{-} \text{-})$

3. $(\text{+} \text{+} \text{+}) - (\text{+} \text{+} \text{+} \text{+} \text{+})$

4. $(\text{+} \text{+} \text{-} \text{-} \text{-} \text{-}) - (\text{+} \text{+} \text{+})$

3.2 Practice A**Find the sum.**

1. $(p - 3) + (p - 7)$

2. $(3n - 1) + (4 - n)$

3. $(-3r + 8) + (5r - 1)$

4. $6(x - 3) + (2x - 9)$

5. $(3c + 2) + 4(1.3c - 5)$

6. $10(2.1q - 2) + (7.5q + 18)$

7. $(-6y - 2) + 5(3 + 2.5y)$

8. $\frac{1}{2}(6x - 10) + \frac{1}{3}(6 + 9x)$

9. After a week of rain, tadpoles appeared in your pond. After t minutes, you have $(7t + 5)$ tadpoles and your friend has $(8t - 3)$ tadpoles.

a. Write an expression that represents the number of tadpoles you and your friend caught together.

b. Who has more tadpoles after 9 minutes?

Find the difference.

10. $(k + 3) - (3k - 5)$

11. $(-6d + 2) - (7 + 2d)$

12. $(10j - 7) - (-9j + 2)$

13. $(3x + 8) - 6(2.5x - 3)$

14. $(7 - 3t) - 5(-1.6t + 5)$

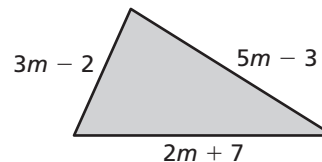
15. $\frac{1}{2}(12w + 8) - \frac{1}{5}(10w - 5)$

16. The admission to a local fair is \$10 for each adult and \$6 for each child. Each ride costs \$1.50 for an adult and \$1 for a child.

a. Write an expression that represents how much more an adult will spend at the fair.

b. An adult and a child each go on 7 rides. How much more did the adult spend?

17. Write an expression that represents the perimeter of the triangle.



3.2 Practice B**Find the sum.**

1. $(5 - t) + (3t + 2)$

2. $(7k + 9) + (4k - 3)$

3. $2(-5y + 6) + (2y - 8)$

4. $4(2.5g - 4) + 3(1.2g - 2)$

5. $5(-0.3s - 2) + 2(5 - 3.4s)$

6. $\frac{1}{3}(6p - 3) + \frac{1}{7}(7p + 14)$

7. $\frac{1}{5}(-15w - 20) + \frac{1}{2}(3 - 4w)$

8. $\frac{1}{8}(16k - 24) + \frac{1}{5}(2 + 10k)$

9. You are selling tickets to a play. You have sold $(3t + 2)$ tickets for \$5 each and $(2t + 5)$ tickets for \$7 each.

a. Write an expression that represents the total number of tickets sold so far.

b. Write an expression that represents the total amount of money received for the tickets that have been sold.

c. When $t = 3$, what is the total amount of money received?

Find the difference.

10. $(8 - u) - (5u + 1)$

11. $(2x + 7) - 6(5x - 8)$

12. $(3h + 4) - 6(5 - 1.4h)$

13. $(12 + 7.2b) - 3(0.9b - 4)$

14. $\frac{1}{4}(16j - 12) - \frac{1}{9}(18j + 45)$

15. $\frac{2}{3}(12n + 6) - \frac{1}{5}(10n - 2)$

16. You are collecting pairs of socks and toothbrushes for a local charity. After d days, you have collected $(4d + 5)$ pairs of socks and $(3d + 7)$ toothbrushes.

a. Write an expression that represents the total number of items that have been collected.

b. How many more pairs of socks than toothbrushes have been collected on day 7?

3.2 Enrichment and Extension

Using the Distributive Property

When working with algebraic expressions and the Distributive Property, the exponents of the variables are added.

Example: Simplify $x(x + 6)$.

Distribute x to each term inside the parentheses. (Remember that x can be rewritten as $1 \cdot x^1$.) Then, multiply the coefficients.

$x(x + 6) = (1x \cdot 1x) + (1x \cdot 6)$	Distribute x to each term.
$= (1x^1 \cdot 1x^1) + (1x^1 \cdot 6)$	Rewrite to show exponents.
$= 1x^{1+1} + 6$	Multiply coefficients and add exponents.
$= x^2 + 6x$	Simplify.

Simplify the expression.

- | | |
|---|--|
| 1. $x^2(x + 1)$ | 2. $-x(2x - 8)$ |
| 3. $x(x^4 - 4)$ | 4. $x(3x - 1)$ |
| 5. $3x(x - 1)$ | 6. $2x(x - 1)$ |
| 7. $4x(-4x - 3)$ | 8. $n(n - 4)$ |
| 9. $-b(3b + 9)$ | 10. $2w(-4w - 14)$ |
| 11. $2x(4x - 9) - 3x(4x - 2)$ | 12. $3k(-5k + 21) + 2(2.5k + 9)$ |
| 13. $4(1 + 1.8h) + h(2.2h + 5)$ | 14. $\frac{1}{2}m(10 + 6m) - \frac{1}{5}m(10m + 10)$ |
| 15. $\frac{1}{3}(6z - 6) - \frac{1}{4}z(4z + 16)$ | 16. $3d^6(24d^3 + 6) + 24d^9$ |

3.2 Puzzle Time

What Did The Candle Say To The Match?

Write the letter of each answer in the box containing the exercise number.

Find the sum.

1. $(x + 10) + (x - 14)$
2. $(9 - 2x) + (6x + 4)$
3. $(3x - 7) + (-4x - 8)$
4. $(2x - 7) + 5(x - 3)$
5. $6(-2.3x - 5) + (4x + 11)$
6. $(8 - 2x) + 3(4.5x + 9)$
7. $\frac{1}{2}(8 - 4x) + \frac{1}{3}(9x - 6)$
8. $-\frac{3}{4}(3x + 7) + \frac{1}{4}(12x + 20)$

Find the difference.

9. $(-3x + 8) - (x + 10)$
10. $(5x + 4) - (1 - 2x)$
11. $(3 - 4x) - 3(2.4x - 7)$
12. $(4x - 8) - 4(-6.5x + 5)$
13. $\frac{1}{9}(-9x + 18) - \frac{1}{5}(10 + 15x)$
14. $\frac{4}{7}(4x + 3) - \frac{1}{7}(9x + 5)$
15. $\frac{1}{2}(-4x + 8) - \frac{1}{4}(8x - 12)$
16. Your class project involves recycling aluminum cans. After x weeks, your class has $(13x + 50)$ aluminum cans. The class goal is to collect $(80x + 120)$ aluminum cans. How many more aluminum cans does your class need to collect?

Answers

- U. $-4x - 2$
- P. $30x - 28$
- T. $-9.8x - 19$
- E. $x + 2$
- I. $2x - 4$
- L. $67x + 70$
- H. $-11.2x + 24$
- Y. $7x - 22$
- I. $4x + 13$
- U. $\frac{3}{4}x - \frac{1}{4}$
- G. $x + 1$
- L. $-4x + 7$
- Y. $11.5x + 35$
- F. $-4x$
- M. $7x + 3$
- O. $-x - 15$

6	3	9		16	2	14	11	5		8	12		10	4		15	1	13	7
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Extension
3.2

Start Thinking!

For use before Extension 3.2

Your friend says the greatest common factor of 15 and 30 is 5. Is your friend correct? Explain your reasoning

Extension
3.2

Warm Up

For use before Extension 3.2

Find the GCF.

1. 2, 10

2. 3, 24

3. 9, 27

4. 14, 49

5. 24, 42

6. 50, 90

Extension
3.2 Practice**Factor the expression using the GCF.**

- | | | |
|----------------|---------------|----------------|
| 1. $8 - 22$ | 2. $25 + 30$ | 3. $6y + 3$ |
| 4. $2t - 10$ | 5. $16p - 8$ | 6. $21s + 15$ |
| 7. $32v + 24w$ | 8. $9b + 24c$ | 9. $12y - 42z$ |

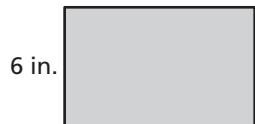
Factor out the coefficient of the variable.

- | | | |
|----------------------------------|----------------------------------|-----------------------------------|
| 10. $\frac{1}{2}m + \frac{1}{2}$ | 11. $\frac{2}{3}j - \frac{2}{9}$ | 12. $1.2k + 2.4$ |
| 13. $1.5a - 4.5$ | 14. $3f + 5$ | 15. $\frac{3}{10}x - \frac{3}{5}$ |

16. Factor $-\frac{1}{3}$ out of $-\frac{1}{3}x - 12$.

17. Factor $-\frac{1}{6}$ out of $-\frac{1}{3}x + \frac{5}{6}y$.

18. The area of the rectangle is
- $(18x - 12)$
- square inches. Write an expression that represents the length of the rectangle (in inches).



19. A concession stand sells hamburgers. The revenue from the hamburgers is $(30x + 45)$ dollars.
- The price of a hamburger is \$5. Write an expression that represents the number of hamburgers sold.
 - The revenue from drinks is $(63x + 84)$ dollars. The price of a drink is \$3. Write an expression that represents the number of drinks sold.
 - Write and simplify an expression that represents how many more drinks were sold.

Activity
3.3**Start Thinking!**

For use before Activity 3.3

You have 7 less points than your cousin. Your brother has 8 more points than your sister.

Write an expression to model each situation. Use p as your variable. Can each expression be written in more than one way? Explain.

Activity
3.3**Warm Up**

For use before Activity 3.3

Add.

1. $65 + (-23)$ 2. $-12 + (-34)$ 3. $-35 + 42$

Subtract.

4. $-15 - 24$ 5. $29 - 35$ 6. $52 - (-13)$

Lesson
3.3

Start Thinking!

For use before Lesson 3.3

Discuss with a partner, using an example, how inverse operations are used to solve equations.

Lesson
3.3

Warm Up

For use before Lesson 3.3

Solve the equation. Check your solution.

1. $x + 5 = 10$

2. $y - 2 = 16$

3. $n - 13 = 65$

4. $18 = p + 3$

5. $34 = t - 23$

6. $z + 14 = 21$

3.3 Practice A

Solve the equation. Check your solution.

1. $x + 3 = 10$

2. $b - 6 = -14$

3. $5 = n + 9$

4. $y - 2.1 = 7.5$

5. $-6.4 = x + 4.3$

6. $k - \frac{1}{3} = \frac{5}{6}$

7. $10.5 + p = -8.32$

8. $3\frac{3}{4} = r + \frac{1}{8}$

9. $m + 1.06 = 5$

10. $-\frac{7}{12} = 1\frac{5}{6} + d$

11. $t - \frac{2}{7} = \frac{1}{2}$

12. $-10.2 + c = -8.14$

Write the word sentence as an equation. Then solve.

13. 5 more than a number y is -2 .

14. The sum of 8 and a number h is 12.

15. -13 is 4 less than a number n .

In Exercises 16–20, write an equation. Then solve.

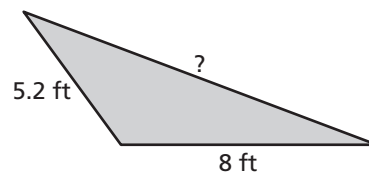
16. You earn \$9 per hour babysitting. This is \$2 more than what you earned per hour last year. What did you earn per hour last year?

17. Your mother asked you to turn the oven down to 325°F . This is 75°F less than it was. What was the original temperature?

18. The difference between the heights of your chair and your desk is $-10\frac{1}{4}$ inches. The height of your desk is $29\frac{3}{4}$ inches. What is the height of your chair?

19. Your Two-Day-Pass to a theme park is \$76.50. This is \$31.41 less than your uncle's Two-Day-Pass. What is the price of your uncle's pass?

20. The perimeter of a triangle is 25 feet. What is the length of the unknown side?



21. Find the value of $3x + 2$ when $7 + x = 5$.

3.3 Practice B**Solve the equation. Check your solution.**

1. $x + 12 = 100$

2. $g - 16 = -52$

3. $-4.5 = m + 1.9$

4. $j - 12.1 = 7.53$

5. $y + 4.003 = -3.14$

6. $z - 4\frac{1}{3} = 2\frac{2}{3}$

7. $90.8 + q = -18.24$

8. $10\frac{2}{3} = r + 12\frac{1}{6}$

9. $b + 4.006 = 9$

10. $-7\frac{5}{8} = 1\frac{5}{6} + d$

11. $f - \frac{2}{15} = 6\frac{3}{5}$

12. $-10.216 + c = -12.014$

Write the word sentence as an equation. Then solve.13. 27 is 12 more than a number x .14. The difference of a number p and -9 is 12.15. 35 less than a number m is -72 .**In Exercises 16–18, write an equation. Then solve.**

16. You swim the 50-meter freestyle in 28.12 seconds. This is 0.14 second less than your previous fastest time. What was your previous fastest time?

17. The perimeter of a rectangular backyard is $32\frac{1}{2}$ meters. The two shorter sides are each $7\frac{3}{8}$ meters long. What is the length of the two longer sides?*(Hint: The sum of the shorter side and the longer side is equal to half of the perimeter.)*18. The temperature of dry ice is -109.3°F , which is 183.6°F less than the outside temperature. What is the outside temperature?

19. Your cell phone bill in August was \$61.43, which was \$21.75 more than your bill in July. Your cell phone bill in July was \$13.62 less than your bill in June. What was your cell phone bill in June?

Find the values of x .

20. $|x| - 10.5 = 4.3$

21. $|x + 2| - 7 = 5$

3.3 Enrichment and Extension

You Be the Teacher

In Exercises 1 and 2, use the student solutions below.

Courtney $ x = 7$ $x = 7$

Karen $ x = 7$ $x = 7$ or $x = -7$

1. Did both students get a correct solution?
2. Is one student's answer more complete? If so, which one? Explain.
3. A student asks you how to solve $|x + 8| = 12$. Describe your explanation and any math steps you would show.
4. Describe Mario's solution. Did he get the correct answers? Explain.

Mario $ x - 5 = 9$ $x - 5 = 9$ or $x - 5 = -9$ $x = 14$ or $x = -4$

5. Kelly looks at Mario's solutions and does not understand why -4 is a solution. She thought absolute value could not be negative. Explain Kelly's error.
6. Pat says the solutions of $|x| + 7 = 2$ are $x = 5$ and $x = -5$. What mistake did Pat make? Explain.
7. A student asks you if every absolute value equation has two solutions. How would you respond? Explain.
8. Give an example of an absolute value equation with (a) one solution, (b) two solutions, and (c) no solutions.

3.3 Puzzle Time

What Did The Digital Clock Say To Its Mother?

Circle the letter of each correct answer in the boxes below. The circled letters will spell out the answer to the riddle.

Solve the equation.

- | | |
|---------------------------------------|--|
| 1. $x + 8 = 21$ | 2. $3 = a - 12$ |
| 3. $y - 7 = -4$ | 4. $g + 11 = -13$ |
| 5. $z - 1.75 = 3.82$ | 6. $4.9 = h - 2.6$ |
| 7. $8.7 + b = 14.5$ | 8. $-10.3 = w - 5.8$ |
| 9. $\frac{3}{5} = c + \frac{1}{4}$ | 10. $r + 3\frac{1}{2} = -4\frac{2}{3}$ |
| 11. $5\frac{3}{4} = d - 2\frac{1}{8}$ | 12. $-7\frac{1}{3} = p - \frac{4}{9}$ |
13. The second book in your favorite series has 9 more chapters than the first book in the series. The second book has 38 chapters. How many chapters does the first book have?
14. Emily has a Springer Spaniel that weighs 48.5 pounds. She also has a Cocker Spaniel that weighs 24.8 pounds less than the Springer Spaniel. How many pounds does the Cocker Spaniel weigh?

L	M	O	O	I	K	E	T	M	S	O	R	D	M	A	E
23.7	4.7	3	$-8\frac{1}{6}$	$2\frac{3}{7}$	5.8	$-5\frac{2}{5}$	7.2	13	-42	-4.5	$1\frac{1}{9}$	-8.9	$-6\frac{8}{9}$	12	8
H	N	E	R	O	S	H	T	U	A	N	Y	D	M	E	S
52	7.5	$4\frac{3}{8}$	$12\frac{1}{3}$	-24	$-1\frac{2}{5}$	29	-3.9	17	5.57	$\frac{7}{20}$	$-\frac{1}{6}$	15	33	65.5	$7\frac{7}{8}$

Activity
3.4**Start Thinking!**

For use before Activity 3.4

Explain how buying a number of items at a store is like solving a math problem.

Activity
3.4**Warm Up**

For use before Activity 3.4

Multiply.

1. $(-21)(8)$

2. $(-18) \cdot (-12)$

3. $5 \cdot (-13)$

Divide.

4. $\frac{-96}{3}$

5. $\frac{108}{-12}$

6. $\frac{-128}{-8}$

With a partner, write and solve a real-life word problem using the equation $13x = 39$.

Then rewrite the word problem using division.

Solve the equation. Check your solution.

1. $4x = 24$

2. $2x = 56$

3. $-7x = 77$

4. $\frac{x}{5} = 12$

5. $\frac{x}{7} = 9$

6. $\frac{x}{-8} = 6$

3.4 Practice A

Solve the equation. Check your solution.

1. $4b = 24$

2. $-7n = 35$

3. $\frac{y}{-3} = 33$

4. $\frac{p}{5} = -32$

5. $-3t = -4.2$

6. $1.5q = -8.4$

7. $\frac{1}{5}d = -3$

8. $14 = 3y$

9. $\frac{g}{2.1} = -6.8$

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

11. $\frac{k}{-9} = -\frac{1}{3}$

12. $\frac{5}{8}j = -10$

Write the word sentence as an equation. Then solve.

13. A number multiplied by $\frac{1}{2}$ is $-\frac{5}{12}$.

14. The quotient of a number and 0.2 is -2.6 .

In Exercises 15–19, write an equation. Then solve.

15. You earn \$7.50 per hour at a fast food restaurant. You earned \$123.75 last week. How many hours did you work last week?

16. Your family took a road trip on Saturday. You were in the car for 4.5 hours and averaged 70 miles per hour. How many miles did you travel?

17. The area of a rectangle is $\frac{1}{2}$ square inch. The length of the rectangle is $\frac{3}{8}$ inch. What is the width of the rectangle?

18. You are in a room with other students and are asked to get in groups of 3. When finished, there are 21 groups of 3. How many students are in the room?

19. The perimeter of a square is 26.46 inches. What is the side length of the square?

20. Write a multiplication equation that has a solution of $\frac{2}{7}$.

21. Write a division equation that has a solution of -20 .

3.4 Practice B

Solve the equation. Check your solution.

1. $16t = 60$

2. $-14p = -21$

3. $\frac{q}{5} = -7.35$

4. $\frac{d}{1.2} = -3.3$

5. $-\frac{8}{15}k = -4$

6. $-7.24q = 17.014$

7. $\frac{1}{8}d = -\frac{3}{5}$

8. $1.5 = 3.3y$

9. $\frac{g}{0.003} = -2.8$

10. $-\frac{10}{21}c = -\frac{15}{28}$

11. $\frac{k}{-9} = -1$

12. $18 = -\frac{6}{11}h$

In Exercises 13 and 14, write an equation. Then solve.

13. You order an entree for \$12.00. You pay \$0.78 in taxes. What is the tax rate?
14. If a project is handed in late, you receive $\frac{8}{9}$ of your earned points. You received 72 points on your late project. How many points did you lose?
15. Write a multiplication equation that has a solution of -14.8 .
16. Write a division equation that has a solution of $-\frac{9}{14}$.
17. There are 92 students in a room. They are separated into 18 groups. How many students are in each group? How many students are not in a group?
18. A bus token costs \$1.75.
- You spend \$15.75 on tokens. Write and solve an equation to find how many tokens you purchase.
 - If you purchase 10 tokens, you get 2 free tokens. Write and solve an equation to find the approximate reduced price of each token.
 - You also receive free tokens if you purchase 20 tokens. The reduced price for each token is \$1.40. Write and solve an equation to find how many free tokens you receive.
19. Solve $\frac{1}{3}|z| = 2$.

3.4

Enrichment and Extension

Equations with No Solution

For some equations, there is no value that could be substituted for the variable to make the equation true. In this case, the equation has no solution.

Example: Solve $4|x| = -12$.

$$4|x| = -12 \quad \text{Rewrite the equation.}$$

$$|x| = -3 \quad \text{Divide both sides by 4.}$$

Because absolute value is always nonnegative, no number has an absolute value of -3 . So, this equation has *no solution*.

Without solving the equation, tell whether it has *one solution*, *two solutions*, or *no solution*. If the equation has one solution, tell whether the solution is *positive* or *negative*. Explain your reasoning.

- | | | | |
|---------------------------|---|--------------------------------------|--------------------|
| 1. $-5x = -16$ | 2. $\frac{n}{-5} = -12$ | 3. $\frac{g}{7} = -8$ | 4. $-12t = 100$ |
| 5. $-8 v = -16$ | 6. $\frac{ k }{-9} = 6$ | 7. $\left \frac{x}{-5}\right = -15$ | 8. $ -6p = 42$ |
| 9. $ 2.7u = 10.8$ | 10. $\left 1\frac{1}{2}b\right = -13\frac{4}{5}$ | 11. $3h = 8 $ | 12. $ -9 y = -12$ |
| 13. $\frac{ b }{-3} = -7$ | 14. $\left \frac{a}{-9}\right = -2.5$ | | |

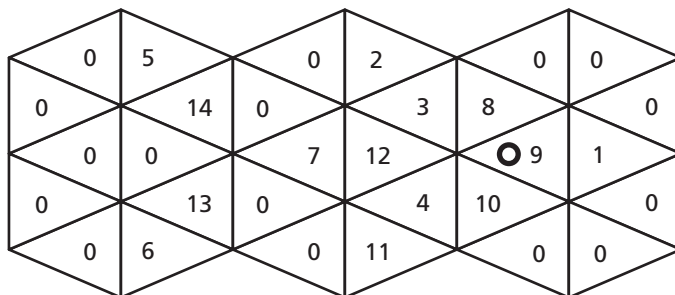
For each exercise number, use your answers and the key below to color the cell. Do not color the cells that have a zero in them.

One Positive Solution = Orange

One Negative Solution = Blue

Two Solutions = Green

No Solution = Green



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3.4 Puzzle Time

Did You Hear About...

A	B	C	D	E	F
G	H	I	J	K	L
M					

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

-12 PLANET
-60 MOON
-14 GOOD
4 THE
-1.7 EARTH
-56 REALLY
9 ATMOSPHERE
$-13\frac{1}{2}$ THAT
$\frac{3}{11}$ ORBIT

Solve the equation.

A. $6x = 24$

B. $-7a = 35$

C. $-3g = -33$

D. $\frac{c}{4} = -8$

E. $\frac{z}{-12} = 5$

F. $\frac{2}{3}h = -9$

G. $\frac{4}{5} = 2b$

H. $32 = -\frac{4}{7}y$

I. $-1.8m = 25.2$

J. $\frac{p}{3.7} = 5.1$

K. $20.3 = -2.9c$

L. $-12.6w = -16.38$

M. Tyler has \$11.25. How many ride tickets can he buy for himself and his friends if the ride tickets cost \$1.25 each?

8.3 EAT
11 ON
-5 RESTAURANT
-7 BUT
-32 THE
1.3 NO
18.87 FOOD
$-1\frac{3}{5}$ BAD
$-\frac{2}{5}$ HAS

**Activity
3.5****Start Thinking!**

For use before Activity 3.5

In Sections 3.3 and 3.4, you learned how to solve one-step problems. Without using your notes, give an example and then describe to a partner how to solve each of the four types of one-step problems.

**Activity
3.5****Warm Up**

For use before Activity 3.5

Solve the equation. Check your solution.

1. $-9x = -108$

2. $x - 3 = -12$

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

4. $12x = 144$

5. $x - 3.6 = 5.44$

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

Lesson
3.5

Start Thinking!

For use before Lesson 3.5

Explain to a partner how to solve the equation

$$3x - 4 = 11.$$

Lesson
3.5

Warm Up

For use before Lesson 3.5

Solve the equation. Check your solution.

1. $3x - 10 = 14$

2. $5x + 24 = -36$

3. $17 = 3x + 2$

4. $-9x + 17 = 71$

5. $4x + 13.2 = 2.6$

6. $-3x - 3.4 = 12.2$

3.5

Practice A

Solve the equation. Check your solution.

1. $3k - 2 = 10$

2. $5p + 2 = -10$

3. $-4x + 3 = -11$

4. $12 = 2d + 3.2$

5. $-1 - 5h = 14$

6. $1.25r - 7 = 2.5$

7. $-4k + 3.6 = 7.8$

8. $6 + 2n = 3$

9. $4y - 16.3 = 53.1$

10. $\frac{1}{2}b + \frac{9}{4} = \frac{7}{4}$

11. $\frac{5}{6} + 3j = -\frac{2}{3}$

12. $-\frac{9}{10}p - 3 = \frac{3}{5}$

In Exercises 13–15, write an equation. Then solve.

13. It costs \$4 to enter the fair. Each ride costs \$2.50. You have \$21.50. How many rides can you go on?

14. The cable company charges a monthly fee of \$45. Each movie rental is \$1.99. You owe \$68.88. How many movies did you rent?

15. The perimeter of the rectangle is 24 feet. What is the width of the rectangle?



Solve the equation. Check your solution.

16. $7c - 2c = 45$

17. $3(k - 5) = -16$

18. $-2(m + 1) = 10$

19. The senior class has 412 students. They are assigned to different homerooms. There are 28 students in the smallest homeroom and the remaining 12 homerooms have the same number of students. How many students are in each of the remaining 12 homerooms?

20. You purchased paint for the rooms in your house. You have 1.5 cans of paint left. You painted 4 rooms and each room required 2 cans of paint. You spilled $\frac{1}{2}$ of a can of paint. How many cans of paint did you purchase?

a. Solve the problem by working backwards.

b. Solve the equation $\frac{x - 2}{4} = 2$. How does the answer compare to part (a)?

3.5 Practice B**Solve the equation. Check your solution.**

- | | | |
|--------------------------------------|--|---|
| 1. $5k - 8 = 7$ | 2. $6b + 9 = -15$ | 3. $-3.2w - 2 = -4.5$ |
| 4. $13 - 2n = 27$ | 5. $25 = 4.5z + 12$ | 6. $5.25s - 2.01 = -8.94$ |
| 7. $84 = 51 - 14p$ | 8. $81 + 7t = 81$ | 9. $16 + 2.4c = 22.5$ |
| 10. $4h + \frac{1}{3} = \frac{3}{4}$ | 11. $\frac{1}{7}f - 5\frac{1}{2} = \frac{9}{14}$ | 12. $-\frac{1}{2}u + \frac{3}{5} = \frac{1}{6}$ |

In Exercises 13 and 14, write an equation. Then solve.

13. You purchased \$132.49 worth of wheels and bearings for your skateboards. The shop charges \$15 per board to install them. The total cost is \$192.49. How many skateboards will be repaired?
14. A music download service charges a flat fee each month and \$0.99 per download. The total cost for downloading 27 songs this month is \$42.72. How much is the flat fee?

Solve the equation. Check your solution.

15. $-5x - 2x + 3x = 9$ 16. $-5(m + 4) = 27$ 17. $-12(a - 2) = -50$
18. The perimeter of a triangle is 60 feet. One leg is 12 feet long. Of the two unknown sides, one of them is twice as long as the other. Find the lengths of the two unknown sides.
19. Sally picks seashells by the seashore. She lost 17 of them on her way home. She planned to fill 5 jars with the same amount of seashells in each. How many seashells did Sally pick?
- a. You do not have enough information to solve this problem. The number of seashells in each jar is the same as the number portion of her street address, which is a 2-digit number. The first digit is 5. The last digit is 9 less than 3 times the first digit. How many seashells did Sally plan to put in each jar?
- b. By working backwards, determine how many seashells Sally picked.
- c. The 5 jars that Sally chose would not each hold that many seashells. In her search for a 6th jar, she discovered a few seashells in her pocket. What are possible values for the number of seashells in each of the 6 jars and the number of seashells discovered in her pocket, such that there are no seashells left over?

3.5 Enrichment and Extension**Solving Equations with Fractions**

1. If you multiply each term by this number, the equation $\frac{3x}{2} - \frac{4}{5} = 5\frac{1}{5}$ will contain no fractions. What number could this be?
2. Are there other numbers you can multiply by to rewrite the equation in Exercise 1 without fractions? Explain.
3. What number do you think is best to use as the multiplier? Explain.
4. Why can you multiply each term and not change the solution of the equation?
5. Describe to someone how to rewrite an equation with fractions so that there are no fractions left in it.
6. Solve each equation by rewriting it without fractions first.

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

b. $\frac{x}{4} - \frac{1}{2} = 3\frac{1}{4}$

c. $2\frac{1}{3} - \frac{x}{4} = \frac{5}{6}$

d. $-\frac{2}{7} + \frac{x}{2} = \frac{9}{14}$

e. $6\frac{7}{9} = \frac{2}{3} - 5x$

f. $\frac{x + 10}{6} = \frac{2}{3}$

3.5 Puzzle Time

What Did One Bowling Ball Say To The Other Bowling Ball?

Write the letter of each answer in the box containing the exercise number.

Solve the equation.

- | | |
|--|--------------------------------------|
| 1. $2c - 5 = 9$ | 2. $3m + 7 = -8$ |
| 3. $-7x - 3 = 12$ | 4. $15 = 4a + 3$ |
| 5. $5y - 6 = -20$ | 6. $9f + 3.6 = 10.8$ |
| 7. $-4p - 5.7 = 11.1$ | 8. $-20.3 = 6w + 3.1$ |
| 9. $2 + 5.3k = 18.43$ | 10. $7.8b - 2.14 = -42.7$ |
| 11. $\frac{1}{4}z - \frac{2}{7} = \frac{5}{7}$ | 12. $3 - \frac{r}{8} = -\frac{9}{2}$ |
| 13. $-\frac{1}{3} + 5e = -\frac{3}{4}$ | 14. $14d - 2d = -84$ |
| 15. $-5g - 13g = 54$ | 16. $-3(t - 8) = 32$ |
17. Kayla's age is 3 less than twice her brother's age. Kayla is 13 years old. How old is her brother?
18. Mario spent \$23.85 at the bookstore on one book and some magazines. The book cost \$12.60 and the magazines cost \$2.25 each. How many magazines did Mario buy?
19. Ethan planted a tree that is 37.5 inches tall. If the tree grows 3 inches each year, how long will it take for the tree to reach a height of 54 inches?

Answers	
T. -5.2	N. 3
S. 5	M. 8
E. $-2\frac{4}{5}$	O. 3.1
L. $-2\frac{1}{7}$	T. 7
N. -7	O. $-\frac{1}{12}$
M. -5	I. 4
P. $-2\frac{2}{3}$	A. 0.8
O. -3.9	D. -3
L. 60	R. 5.5
O. -4.2	

15	7	4	10		18	1	13	16		17	5		11	2		8	14		6		19	9	12	3
----	---	---	----	--	----	---	----	----	--	----	---	--	----	---	--	---	----	--	---	--	----	---	----	---

**Chapter
3****Technology Connection**

For use after Section 3.5

Solving Multi-Step Equations

You may find it helpful to use a calculator to solve multi-step equations with large numbers or decimals.

EXAMPLE 1 Solve $19.39 + 4.8x = 34.51$.**SOLUTION****Step 1** Enter 34.51 $\boxed{-}$ 19.39 to undo addition.**Step 2** Most calculators will store the answer, 15.12, so that you don't need to write it down. Just enter $\boxed{\div}$ 4.8 to undo the multiplication.**ANSWER** 3.15

You can use this method to solve equations that require more steps.

EXAMPLE 2 Solve $\frac{x}{1.2} + 1.8 = 9 - 1.45$.**SOLUTION****Step 1** Enter 9 $\boxed{-}$ 1.45 to simplify the right side of the equation.**Step 2** Enter $\boxed{-}$ 1.8 to undo addition.**Step 3** Enter $\boxed{\times}$ 1.2 to undo division.**ANSWER** 6.9**Use a calculator to solve the equation.**

1. $106y + 317 = 5299$

2. $0.93x - 0.904 = 0.2864$

3. $325.85 = 0.14m - 40.67$

4. $\frac{x}{52} - 73 = 36$

5. $\frac{w}{27} + 372 = 431$

6. $203 = \frac{m}{67} + 189$

7. $212x - 5216 = 9310 + 2646$

8. $4.838 - 1.202 = 1.85z - 3.209$

9. $41 + \frac{a}{109} = 22.3 + 21.5$

10. $0.65 + 9.85 = \frac{c}{0.65} + 2.6$