

Chapter 2: Solving Equations

2.1 Properties and Operations

Objective: Use properties of addition and multiplication.

Commutative and Associative Properties	
<p>Commutative Property of Addition</p> <p>Words In a sum, you can add the numbers in any order.</p> <p>Numbers $4 + (-7) = -7 + 4$</p> <p>Algebra $a + b = b + a$</p>	<p>Commutative Property of Multiplication</p> <p>Words In a product, you can multiply the numbers in any order.</p> <p>Numbers $8(-5) = -5(8)$</p> <p>Algebra $ab = ba$</p>
<p>Associative Property of Addition</p> <p>Words Changing the grouping of the numbers in a sum does not change the sum.</p> <p>Numbers $(9 + 6) + 2 = 9 + (6 + 2)$</p> <p>Algebra $(a + b) + c = a + (b + c)$</p>	<p>Associative Property of Multiplication</p> <p>Words Changing the grouping of the numbers in a product does not change the product.</p> <p>Numbers $(3 \cdot 10) \cdot 4 = 3 \cdot (10 \cdot 4)$</p> <p>Algebra $(a \cdot b) \cdot c = a \cdot (b \cdot c)$</p>

Example 1: Using Properties of Addition

This week, you rode in a car for 42 miles, rode a bike for 5 miles, and rode in a bus for 23 miles. Find the total distance.

$$42 + 5 + 23 = 47 + 23 = \boxed{70 \text{ MILES}}$$

Evaluate the expression when $x = 7$ and $y = 25$.

1. $(2x + y) + 46$

$$\begin{aligned} &(2 \cdot 7 + 25) + 46 \\ &(14 + 25) + 46 \\ &39 + 46 \\ &\boxed{85} \end{aligned}$$

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

$$\begin{aligned} &7 + (2 \cdot 25 + 7) \\ &7 + (50 + 7) \\ &7 + 57 \\ &\boxed{64} \end{aligned}$$

3. $(2y + 3x) + 12$

$$\begin{aligned} &(2 \cdot 25 + 3 \cdot 7) + 12 \\ &(50 + 21) + 12 \\ &71 + 12 \\ &\boxed{83} \end{aligned}$$

Example 2: Using Properties of Multiplication

Evaluate the expression when $x = -8$ and $y = 15$.

1. $4xy$

$$\begin{aligned} &4(-8)(15) \\ &-32(15) \\ &\boxed{-480} \end{aligned}$$

2. $4x^2y$

$$\begin{aligned} &4 \cdot (-8)^2 \cdot 15 \\ &4 \cdot 64 \cdot 15 \\ &\boxed{3,840} \end{aligned}$$

3. $2xy$

$$\begin{aligned} &2(-8)(15) \\ &-16(15) \\ &\boxed{-240} \end{aligned}$$

Example 3: Using Properties to Simplify Expressions

Simplify the expression.

$$1. x + 5 + 2$$

$$\boxed{x + 7}$$

$$2. 3(9y)$$

$$\boxed{27y}$$

$$3. n + 6 + 7$$

$$\boxed{n + 13}$$

$$4. (4r)(-3)$$

$$\boxed{-12r}$$

Identity Properties	
<p>Identity Property of Addition</p> <p>Words The sum of a number and the additive identity, 0, is the number.</p> <p>Numbers $-6 + 0 = -6$</p> <p>Algebra $a + 0 = a$</p>	<p>Identity Property of Multiplication</p> <p>Words The product of a number and the multiplicative identity, 1, is the number.</p> <p>Numbers $4 \cdot 1 = 4$</p> <p>Algebra $a \cdot 1 = a$</p>

Example 4: Identify Properties

$$1. (3 + 2) + 4 = 3 + (2 + 4)$$

ASSOCIATIVE PROPERTY OF ADDITION

$$4. cd = dc$$

COMMUTATIVE PROPERTY OF MULT.

$$2. 0 + b = b$$

IDENTITY PROPERTY OF ADDITION

$$5. (2 \cdot 6) \cdot 3 = 2 \cdot (6 \cdot 3)$$

ASSOCIATIVE PROPERTY OF MULTIPLIC.

$$3. 1(-7) = -7$$

IDENTITY PROPERTY OF MULTIPLICATION

$$6. q + (-r) = -r + q$$

COMMUTATIVE PROPERTY OF ADD.

Example 5: Use Conversion Factors

Use a conversion factor to perform the indicated conversions.

$$1. 180 \text{ mins to hrs}$$

$$\frac{180 \text{ min}}{1} \cdot \frac{1 \text{ hr}}{60 \text{ min}} = \frac{180}{60} = \boxed{3 \text{ hrs}}$$

$$2. 10,560 \text{ miles to feet}$$

$$\frac{10560 \text{ mi}}{1} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} = \boxed{55,756,800 \text{ ft}}$$

$$3. 64 \text{ oz to lbs.}$$

$$\frac{64 \text{ oz}}{1} \cdot \frac{1 \text{ lb}}{16 \text{ oz}} = \frac{64}{16} = \boxed{4 \text{ lbs}}$$

$$4. 255 \text{ mm to cm}$$

$$\frac{255 \text{ mm}}{1} \cdot \frac{1 \text{ cm}}{10 \text{ mm}} = \frac{255}{10} = \boxed{25.5 \text{ cm}}$$

2.2 The Distributive Property

Objective: Use the distributive property.

EQUIVALENT NUMERICAL EXPRESSIONS are numerical expressions that have the same value.

EQUIVALENT VARIABLE EXPRESSIONS have the same value for all values of the variable(s).

The Distributive Property	
Algebra $a(b + c) = ab + ac$	Numbers $4(6 + 3) = 4(6) + 4(3)$
$(b + c)a = ba + ca$	$(6 + 3)4 = 6(4) + 3(4)$
$a(b - c) = ab - ac$	$5(7 - 2) = 5(7) - 5(2)$
$(b - c)a = ba - ca$	$(7 - 2)5 = 7(5) - 2(5)$

Example 1: Use the Distributive Property

You are buying beads for a craft project. You need gold, silver, and white beads. A bag of each type of bead costs \$3.99. Use the distributive property and mental math to find the total cost of the beads

$$\begin{array}{l}
 3(3.99) \\
 3(4 - 0.01)
 \end{array}
 \qquad
 \begin{array}{l}
 3(4) - 3(0.01) \\
 12 - 0.03
 \end{array}
 \qquad
 \boxed{\$11.97}$$

Use the distributive property to evaluate the expression.

1. $2(9 + 4)$

$$\begin{array}{l}
 2(9) + 2(4) \\
 18 + 8 \\
 \boxed{26}
 \end{array}$$

2. $(12 - 3)3$

$$\begin{array}{l}
 12(3) - 3(3) \\
 36 - 9 \\
 \boxed{27}
 \end{array}$$

3. $(4 - 11)(-4)$

$$\begin{array}{l}
 4(-4) - 11(-4) \\
 -16 + 44 \\
 \boxed{28}
 \end{array}$$

4. $-5(4 - 1)$

$$\begin{array}{l}
 -5(4) - (-5)(1) \\
 -20 + 5 \\
 \boxed{-15}
 \end{array}$$

5. $5(103)$

$$\begin{array}{l}
 5(100 + 3) \\
 5(100) + 5(3) \\
 500 + 15 \\
 \boxed{515}
 \end{array}$$

6. $4(3.8)$

$$\begin{array}{l}
 4(4 - 0.2) \\
 4(4) - 4(0.2) \\
 16 - 0.8 \\
 \boxed{15.2}
 \end{array}$$

7. $3(6.03)$

$$\begin{array}{l}
 3(6 + 0.03) \\
 3(6) + 3(0.03) \\
 18 + 0.09 \\
 \boxed{18.09}
 \end{array}$$

8. $9(205)$

$$\begin{array}{l}
 9(200 + 5) \\
 9(200) + 9(5) \\
 1800 + 45 \\
 \boxed{1845}
 \end{array}$$

Example 2: Writing Equivalent Variable Expressions

Use the distributive property to write an equivalent variable expression.

1. $2(x + 10)$

$$2(x) + 2(10)$$

$$\boxed{2x + 20}$$

2. $(m + 3)(-4)$

$$m(-4) + 3(-4)$$

$$\boxed{-4m - 12}$$

3. $-3(2y - 6)$

$$-3(2y + -6)$$

$$-3(2y) + -3(-6)$$

$$\boxed{-6y + 18}$$

4. $9(x - 2)$

$$9(x) - 9(2)$$

$$\boxed{9x - 18}$$

5. $(x + 7)4$

$$x(4) + 7(4)$$

$$\boxed{4x + 28}$$

6. $-3(4m - 7)$

$$-3(4m + -7)$$

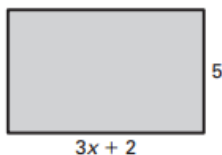
$$-3(4m) + -3(-7)$$

$$\boxed{-12m + 21}$$

Example 3: Finding Areas of Geometric Figures

Find the area of the figure.

1.



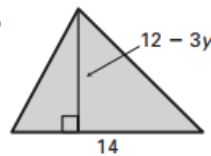
$$A = bh$$

$$A = (3x + 2)5$$

$$A = 3x(5) + 2(5)$$

$$\boxed{A = 15x + 10 \text{ UNITS}^2}$$

2.



$$A = \frac{1}{2}bh$$

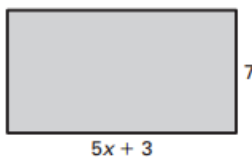
$$A = \frac{1}{2}(14)(12 - 3y)$$

$$A = 7(12 - 3y)$$

$$A = 7(12) - 7(3y)$$

$$\boxed{A = 84 - 21y \text{ UN}^2}$$

3.



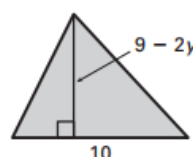
$$A = bh$$

$$A = (5x + 3)7$$

$$A = 5x(7) + 3(7)$$

$$\boxed{A = 35x + 21 \text{ UN}^2}$$

4.



$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}(10)(9 - 2y)$$

$$A = 5(9 - 2y)$$

$$A = 5(9) - 5(2y)$$

$$\boxed{A = 45 - 10y \text{ UN}^2}$$

2.3 Simplifying Variable Expressions

Objective: Simplify variable expressions.

The parts of an expression that are added together are called TERMS.

The COEFFICIENT OF A TERM with a variable is the number part of the term.

A CONSTANT TERM has a number but no variable.

LIKE TERMS are terms that have identical variable parts.

Example 1: Identify Parts of an Equation

Identify the terms, like terms, coefficients, and constant terms of the expressions.

1. $5 - 2x - 3 + x$

terms: $5, -2x, -3, x$

like terms: $5 \& -3; -2x \& x$

coefficients: $-2 \& 1$

constant terms: $5 \& -3$

2. $4y - 6 + 3y$

terms: $4y, -6, 3y$

like terms: $4y \& 3y$

coefficients: $4 \& 3$

constant terms: -6

3. $9 + w - 5 - 8w$

terms: $9, w, -5, -8w$

like terms: $9 \& -5; w \& -8w$

coefficients: $1 \& -8$

constant terms: $9 \& -5$

simplified expression: $4 - 7w$

2. $3a - 2 + 5a + 9$

terms: $3a, -2, 5a, 9$

like terms: $3a \& 5a$

coefficients: $3 \& 5$

constant terms: $-2 \& 9$

simplified expression: $8a + 7$

Example 2: Simplifying an Expression

Simplify the expression.

1. $5m + 8 - 3m - 7$

$$(5m - 3m) + (8 - 7)$$

$$2m + 1$$

2. $4y - 6 + 3y$

$$(4y + 3y) - 6$$

$$7y - 6$$

$$3. \quad 9 + w - 5 - 8w$$

$$(9 - 5) + (w - 8w)$$

$$4 - 7w$$

$$4. \quad -6a^2 - 2 - 4a^2 - 10$$

$$(-6a^2 - 4a^2) + (-2 - 10)$$

$$-10a^2 - 12$$

Example 3: Simplifying an Expression with Parentheses

Simplify the expression.

$$1. \quad 3(x + 2) - x + 9$$

$$3(x) + 3(2) - x + 9$$

$$3x + 6 - x + 9$$

$$2x + 15$$

$$2. \quad 2k - 5(k + 4)$$

$$2k + -5(k) + -5(4)$$

$$2k - 5k - 20$$

$$-3k - 20$$

$$3. \quad 5a - (5a - 7)$$

$$5a + -1(5a) + -1(-7)$$

$$5a - 5a + 7$$

$$7$$

$$4. \quad 4(x - 1) - 2x - 7$$

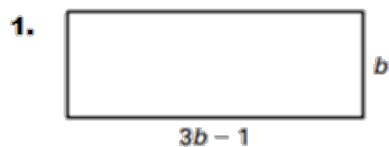
$$4(x) - 4(1) - 2x - 7$$

$$4x - 4 - 2x - 7$$

$$2x - 11$$

Example 4: Simplifying a Geometry Expression

Write and simplify an expression for the perimeter of the triangle or rectangle.



$$P = 2b + 2h$$

$$P = 2(3b - 1) + 2(b)$$

$$P = 2(3b) - 2(1) + 2b$$

$$P = 6b - 2 + 2b$$

$$P = 8b - 2 \text{ units}$$



$$P = S_1 + S_2 + S_3$$

$$P = y + 2y + y + 4$$

$$P = 4y + 4 \text{ units}$$

2.4 Variables and Equations

Objective: Solve equations with variables.

An **EQUATION** is a mathematical sentence formed by placing an equal sign, =, between two expressions.

SOLUTION is a number that produces a true statement when it is substituted for the variable.

Finding all solutions to an equation is called **SOLVING**.

Example 1: Writing Verbal Sentences as Equations

1. The sum of x and 4 is 8.

$$\underline{x + 4 = 8}$$

2. The difference of 7 and y is 13.

$$\underline{7 - y = 13}$$

3. The product of -2 and p is 24.

$$\underline{-2p = 24}$$

4. The quotient of n and 3 is 5.

$$\underline{n \div 3 = 5}$$

Example 2: Checking Possible Solutions

1. Tell whether 7 or 8 is a solution of $x - 3 = 5$.

A. SUBSTITUTE 7 FOR x

$$7 - 3 = 5$$

$$4 \neq 5$$

B. SUBSTITUTE 8 FOR x

$$8 - 3 = 5$$

$$5 = 5 \checkmark$$

$x = 8$ IS A SOLUTION

2. Tell whether 8 or 10 is a solution of $x - 4 = 6$.

A. SUBSTITUTE 8 FOR x

$$8 - 4 = 6$$

$$4 \neq 6$$

B. SUBSTITUTE 10 FOR x

$$10 - 4 = 6$$

$$6 = 6 \checkmark$$

$x = 10$ IS A SOLUTION

3. Tell whether the given value is a solution of the equation.

a. $-3m + 8 = 17$; $m = -3$

$$-3(-3) + 8 = 17$$

$$9 + 8 = 17$$

$$17 = 17 \checkmark$$

$m = -3$ IS A SOLUTION

b. $5x - 7 = 13$; $x = -4$

$$5(-4) - 7 = 13$$

$$-20 - 7 = 13$$

$$-27 \neq 13$$

$x = -4$ IS NOT A SOLUTION

c. $\frac{y}{2} + 1 = 7$; $y = 6$

$$\frac{6}{2} + 1 = 7$$

$$3 + 1 = 7$$

$$4 \neq 7$$

$y = 6$ IS NOT A SOLUTION

d. $\frac{k}{3} - 3 = -36$; $k = -99$

$$\frac{-99}{3} - 3 = -36$$

$$-33 - 3 = -36$$

$$-36 = -36 \checkmark$$

$k = -99$ IS A SOLUTION

Example 3: Solving Equations Using Mental Math

Solve the equation using mental math. Check your answer.

1. $x + 4 = 7$

WHAT NUMBER
PLUS 4 EQUALS
7?

$$\boxed{x=3}$$

2. $12 - n = 5$

12 MINUS WHAT
NUMBER EQUALS
5?

$$\boxed{n=7}$$

3. $18 = 3t$

18 EQUALS 3
TIMES WHAT
NUMBER?

$$\boxed{t=6}$$

4. $x - 8 = 10$

WHAT NUMBER
MINUS 8 EQUALS
10?

$$\boxed{x=18}$$

5. $24 = 4m$

24 EQUALS 4
TIMES WHAT
NUMBER?

$$\boxed{m=6}$$

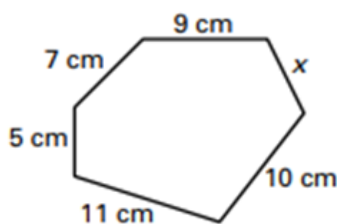
6. $\frac{c}{3} = 9$

WHAT NUMBER
DIVIDED BY 3
EQUALS 9?

$$\boxed{c=27}$$

Example 4: Finding the Side Length of Geometric Figures

The perimeter of the figure is 48 centimeters.



a. Write and simplify an equation that you can use to find x.

$$\text{Perimeter} = x + 10 + 11 + 5 + 7 + 9$$

b. Solve your equation. What is the value of x?

$$48 = x + 10 + 11 + 5 + 7 + 9$$

$$48 = x + 42$$

$$\begin{array}{r} -42 \\ \hline 6 = x \end{array}$$

2.5 Solving Equations Using Addition or Subtraction

Objective: Solve equations using addition or subtraction.

Inverse **OPERATIONS** are two operations that undo each other, such as addition and subtraction.

Subtraction Property of Equality

Words Subtracting the same number from each side of an equation produces an equivalent equation.

Numbers If $x + 3 = 5$, then $x + 3 - 3 = 5 - 3$, or $x = 2$.

Algebra If $x + a = b$, then $x + a - a = b - a$, or $x = b - a$.

Example 1: Solving an Equation Using Subtraction

Solve the equation. Show your work. Check your answer.

1. $x + 5 = -2$

$$\begin{array}{r} x + 5 = -2 \\ -5 \quad -5 \\ \hline x = -7 \end{array}$$

$-7 + 5 = -2$
 $-2 = -2 \checkmark$

2. $x + 6 = 19$

$$\begin{array}{r} x + 6 = 19 \\ -6 \quad -6 \\ \hline x = 13 \end{array}$$

$13 + 6 = 19$
 $19 = 19 \checkmark$

3. $-5 = y + 12$

$$\begin{array}{r} -5 = y + 12 \\ -12 \quad -12 \\ \hline -17 = y \end{array}$$

$-5 = -17 + 12$
 $-5 = -5 \checkmark$

4. $7 + k = 42$

$$\begin{array}{r} 7 + k = 42 \\ -7 \quad -7 \\ \hline k = 35 \end{array}$$

$7 + 35 = 42$
 $42 = 42 \checkmark$

5. $j + 13 = -2$

$$\begin{array}{r} j + 13 = -2 \\ -13 \quad -13 \\ \hline j = -15 \end{array}$$

$-15 + 13 = -2$
 $-2 = -2 \checkmark$

6. $-1 = x + 5$

$$\begin{array}{r} -1 = x + 5 \\ -5 \quad -5 \\ \hline -6 = x \end{array}$$

$-1 = -6 + 5$
 $-1 = -1 \checkmark$

Addition Property of Equality

Words Adding the same number to each side of an equation produces an equivalent equation.

Numbers If $x - 3 = 5$, then $x - 3 + 3 = 5 + 3$, or $x = 8$.

Algebra If $x - a = b$, then $x - a + a = b + a$, or $x = b + a$.

Example 2: Solving Equations Using Addition

Solve the equation. Show your work. Check your answer.

1. $12 = y - 7$

$$\begin{array}{r} 12 = y - 7 \\ +7 \quad +7 \\ \hline 19 = y \end{array}$$

$12 = 19 - 7$
 $12 = 12 \checkmark$

2. $m - 3 = -11$

$$\begin{array}{r} m - 3 = -11 \\ +3 \quad +3 \\ \hline m = 8 \end{array}$$

$8 - 3 = -11$
 $-11 = -11 \checkmark$

3. $a - 5 = 5$

$$\begin{array}{r} a - 5 = 5 \\ +5 \quad +5 \\ \hline a = 10 \end{array}$$

$10 - 5 = 5$
 $5 = 5 \checkmark$

4. $f - 11 = 2$

$$\begin{array}{r} f - 11 = 2 \\ +11 \quad +11 \\ \hline f = 13 \end{array}$$

$13 - 11 = 2$
 $2 = 2 \checkmark$

5. $y - 12 = -8$

$$\begin{array}{r} y - 12 = -8 \\ +12 \quad +12 \\ \hline y = 4 \end{array}$$

$4 - 12 = -8$
 $-8 = -8 \checkmark$

6. $-7 = z - 5$

$$\begin{array}{r} -7 = z - 5 \\ +5 \quad +5 \\ \hline -2 = z \end{array}$$

$-7 = -2 - 5$
 $-7 = -7 \checkmark$

Check It Out!

Solve the equation. Show your work. Check your answer.

1. $m + 9 = 12$

$$\begin{array}{r} -9 \quad -9 \\ \hline \end{array}$$

$m = 3$

2. $k - 2 = -15$

$$\begin{array}{r} +2 \quad +2 \\ \hline \end{array}$$

$k = -13$

3. $3 + a = 5$

$$\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$$

$a = 2$

$3 + 9 = 12$
 $12 = 12 \checkmark$

$-13 - 2 = -15$
 $-15 = -15 \checkmark$

$3 + 2 = 5$
 $5 = 5 \checkmark$

4. $b - 10 = 2$

$$\begin{array}{r} +10 \quad +10 \\ \hline \end{array}$$

$b = 12$

5. $x + 12 = -2$

$$\begin{array}{r} -12 \quad -12 \\ \hline \end{array}$$

$x = -14$

6. $7 = x - 4$

$$\begin{array}{r} +4 \quad +4 \\ \hline \end{array}$$

$11 = x$

$12 - 10 = 2$
 $2 = 2 \checkmark$

$-14 + 12 = -2$
 $-2 = -2 \checkmark$

$7 = 11 - 4$
 $7 = 7 \checkmark$

7. $n + 3 + 8 = 20$

$$\begin{array}{r} n + 11 = 20 \\ -11 \quad -11 \\ \hline \end{array}$$

$n = 9$

8. $x - 1 - 7 = -16$

$$\begin{array}{r} x - 8 = -16 \\ +8 \quad +8 \\ \hline \end{array}$$

$x = -8$

$9 + 3 + 8 = 20$
 $20 = 20 \checkmark$

$-8 - 1 - 7 = -16$
 $-16 = -16 \checkmark$

Example 3: Solving Story Problems

You spend \$12.75 at the movie theater. You purchase a ticket, a container of popcorn of \$3.25, and a bottle of water for \$2. How much does the movie ticket cost?

TOTAL COST = TICKET + POPCORN + WATER

$\$12.75 = x + \$3.25 + \$2$

$$\begin{array}{r} 12.75 = x + 5.25 \\ -5.25 \quad -5.25 \\ \hline 7.5 = x \end{array}$$

TICKET = \$7.50

2.6 Solving Equations Using Multiplication or Division

Objective: Solve equations using multiplication or division.

Division Property of Equality

Words Dividing each side of an equation by the same nonzero number produces an equivalent equation.

Numbers If $3x = 12$, then $\frac{3x}{3} = \frac{12}{3}$, or $x = 4$.

Algebra If $ax = b$ and $a \neq 0$, then $\frac{ax}{a} = \frac{b}{a}$, or $x = \frac{b}{a}$.

Example 1: Solving Equations Using Division

Solve the equation. Show your work. Check your answer.

$$1. \quad \frac{-7x}{-7} = \frac{42}{-7}$$

$$x = -6$$

$$\begin{aligned} -7(-6) &= 42 \\ 42 &= 42 \checkmark \end{aligned}$$

$$2. \quad \frac{5x}{5} = \frac{45}{5}$$

$$x = 9$$

$$\begin{aligned} 5(9) &= 45 \\ 45 &= 45 \checkmark \end{aligned}$$

$$3. \quad \frac{-56}{-8} = \frac{-8y}{-8}$$

$$7 = y$$

$$\begin{aligned} -56 &= -8(7) \\ -56 &= -56 \checkmark \end{aligned}$$

Multiplication Property of Equality

Words Multiplying each side of an equation by the same nonzero number produces an equivalent equation.

Numbers If $\frac{x}{3} = 12$, then $3 \cdot \frac{x}{3} = 3 \cdot 12$, or $x = 36$.

Algebra If $\frac{x}{a} = b$ and $a \neq 0$, then $a \cdot \frac{x}{a} = a \cdot b$, or $x = ab$.

Example 2: Solving Equations Using Multiplication

Solve the equation. Show your work. Check your answer.

$$1. \quad 11 \cdot 5 = \frac{w}{11} \cdot 11$$

$$55 = w$$

$$\begin{aligned} 5 &= \frac{55}{11} \\ 5 &= 5 \checkmark \end{aligned}$$

$$2. \quad 4 \cdot \frac{m}{4} = 11 \cdot 4$$

$$m = 44$$

$$\begin{aligned} \frac{44}{4} &= 11 \\ 11 &= 11 \checkmark \end{aligned}$$

$$3. \quad 6 \cdot -9 = \frac{c}{6} \cdot 6$$

$$-54 = c$$

$$\begin{aligned} -9 &= \frac{-54}{6} \\ -9 &= -9 \checkmark \end{aligned}$$

Check It Out!

Solve the equation. Show your work. Check your answer.

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

$$x = -1$$

$$3(-1) = -3 \\ -3 = -3 \checkmark$$

$$4. 5 \cdot 8 = \frac{n}{5} \cdot 5$$

$$40 = n$$

$$8 = \frac{40}{5} \\ 8 = 8 \checkmark$$

$$2. \frac{8a}{8} = \frac{32}{8}$$

$$a = 4$$

$$8(4) = 32 \\ 32 = 32 \checkmark$$

$$5. \frac{-3}{1} \cdot \frac{1}{3} x = 4 \cdot \frac{-3}{1}$$

$$x = -12$$

$$-\frac{1}{3}(-12) = 4 \\ 4 = 4 \checkmark$$

$$3. \frac{2}{1} \cdot \frac{1}{2} x = 3 \cdot \frac{2}{1}$$

$$x = 6$$

$$\frac{1}{2}(6) = 3 \\ 3 = 3 \checkmark$$

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

$$x = -10$$

$$-\frac{10}{-2} = 5 \\ 5 = 5 \checkmark$$

Example 3: Solving Story Problems

1. Sixty-four people show up for a volleyball tournament. Write and solve an equation to find how many 4-person teams can be formed.

$$\text{TOTAL PEOPLE} = 4 * \text{TEAMS}$$

$$\frac{64}{4} = \frac{4t}{4}$$

$$16 = t$$

16 people per 4-person team

2. A high-speed rail service connects London, England, Paris, France, and Brussels, Belgium. One of the high-speed trains travels about 233 miles from London to Brussels at a speed of about 87 miles per hour. How long does the trip take?

$$\text{RATE} = \frac{\text{DISTANCE}}{\text{TIME}}$$

$$t \cdot 87 = \frac{233}{t} \cdot t$$

$$\frac{87t}{87} = \frac{233}{87}$$

$$t = 2.7 \text{ hours}$$

2.7 Decimal Operations and Equations with Decimals

Objective: Solve equations with decimals.

Example 1: Adding and Subtracting Decimals

Find the sum.

1. $-1.7 + (-3.4)$

-5.1

2. $-2.8 + (-5.9)$

-8.7

3. $2.1 + (-1.1)$

1.0

Find the difference.

1. $-21.29 - (-34.62)$

$-21.29 + 34.62$

13.33

2. $7.12 - (-3.46)$

$7.12 + 3.46$

10.58

3. $-4.3 - (1.2)$

$-4.3 + -1.2$

-5.5

Example 2: Multiplying and Dividing Decimals

Find the product or quotient.

1. $-0.4(13.7)$

-5.48

2. $-2.5(-6.75)$

16.875

3. $18.05 \div (-1.9)$

-9.5

4. $7.093 \div (-3.46)$

-2.05

Example 3: Solve Equations using Addition or Subtraction

Solve the equation.

$$1. \quad x + 6.3 = 4.8$$
$$\quad \underline{-6.3} \quad \underline{-6.3}$$
$$\boxed{x = -1.5}$$

$$2. \quad y - 5.74 = -3.51$$
$$\quad \underline{+5.74} \quad \underline{+5.74}$$
$$\boxed{y = 2.23}$$

$$3. \quad x + 5.6 = 9.4$$
$$\quad \underline{-5.6} \quad \underline{-5.6}$$
$$\boxed{x = 3.8}$$

$$4. \quad -3.5 = y + 1.27$$
$$\quad \underline{-1.27} \quad \underline{-1.27}$$
$$\boxed{-4.77 = y}$$

Example 3: Solve Equations using Multiplication or Division

Solve the equation.

$$1. \quad \frac{0.8m}{0.8} = \frac{4.8}{0.8}$$
$$\boxed{m = 6}$$

$$2. \quad 2.5 \cdot \frac{n}{5} = -2.15 \cdot 5$$
$$\boxed{n = -10.75}$$

$$3. \quad \frac{6x}{6} = \frac{-43.2}{6}$$
$$\boxed{x = -7.2}$$

$$4. \quad -3.1 \cdot \frac{y}{-3.1} = -8.4 \cdot -3.1$$
$$\boxed{y = 26.04}$$