

# Section Overview

## Properties of Real Numbers

Lesson 3-1

**Why?** The order of operations and properties of rational numbers are rules for simplifying expressions.

### Order of Operations

1. Perform operations within grouping symbols.
2. Simplify powers.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

### Commutative Property

Addition:  $2 + 3 = 3 + 2$   
 Multiplication:  $2 \cdot 3 = 3 \cdot 2$

### Distributive Property

$4(8 + 2) = (4 \cdot 8) + (4 \cdot 2)$   
 and  
 $4(8 + 2) = (4 \cdot 8) + (4 \cdot 2)$

### Associative Property

Addition:  $(3 + 5) + 4 = 3 + (5 + 4)$   
 Multiplication:  $(3 \cdot 5) \cdot 4 = 3 \cdot (5 \cdot 4)$

## Simplifying Algebraic Expressions

Lesson 3-2

**Why?** Combining like terms helps to simplify algebraic expressions.

Like terms can be grouped together because they have the same variable raised to the same power.

Simplify:  $7(a + b) + 4a + 6 + 5b + 8$   
 $7a + 7b + 4a + 6 + 5b + 8$   
 $7a + 7b + 4a + 6 + 5b + 8$   
 $3a + 2b + 14$

Combine coefficients:

$$\begin{array}{r} 7 + 4 + 3 \\ 7 + 5 + 2 \\ 6 + 8 + 14 \end{array}$$

Identify like terms.

The Distributive Property states that  $a(b + c) = ab + ac$  for all  $a, b,$  and  $c$ .

## Multi-Step Equations

Lesson 3-3

**Why?** Some problems require equations that have more than two steps.

Jack had a \$5 gift certificate for a restaurant. After a 15% tip was added to the bill, the \$5 was deducted. Jack actually paid \$18. What was the original bill before the tip was added?

**Solve**

$$\begin{array}{r} b + 0.15b + 5 = 18 \\ 1.15b + 5 = 18 \\ \quad 5 = 5 \\ 1.15b = 23 \\ 1.15b = 23 \\ \quad 1.15b = 1.15 \\ \quad \quad b = 20 \end{array}$$

**Check**

$$\begin{array}{r} b + 0.15b + 5 = 18 \\ 20 + 0.15(20) + 5 = 18 \\ 20 + 3 + 5 = 18 \\ 28 = 18 \end{array}$$

The original bill was \$20.

