

## Simplifying Variable Expressions

### Vocabulary

term, p. 78  
coefficient, p. 78

### BEFORE

You wrote variable expressions.

### Now

You'll simplify variable expressions.

### WHY?

So you can find the weight of a freight train's cargo, as in Ex. 32.

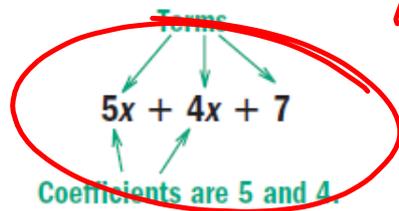
$$\begin{aligned}
 w &= 4400(40\text{rd}) \\
 &= 176,000 + 4400d
 \end{aligned}$$

$$\begin{array}{r}
 100 \\
 10 \\
 \hline
 1000 \checkmark
 \end{array}$$

$$\begin{array}{r}
 110,000 \text{ lbs} \\
 \div 1000 \\
 \hline
 110
 \end{array}$$

**Fitness** You work out each day after school by jogging around a track and swimming laps in a pool. In Example 4, you'll see how to write and simplify a variable expression that describes the number of calories you burn.

The parts of an expression that are added together are called **terms**. In the expression below, the terms are  $5x$ ,  $4x$ , and  $7$ . The **coefficient** of a term with a variable is the number part of the term.



A **constant term**, such as  $7$ , has a number but no variable. **Like terms** are terms that have identical variable parts. In the expression above,  $5x$  and  $4x$  are like terms. Two or more constant terms are also considered like terms.

**Simplifying Expressions** You can use the distributive property to write an expression such as  $7x + 4x$  as a single term:

$$7x + 4x = (7 + 4)x = 11x$$

The like terms  $7x$  and  $4x$  have been *combined*, and the expression  $7x + 4x$  has been *simplified*. A variable expression is simplified if it contains no grouping symbols and all like terms are combined.

## LESSON

**2.3**

Name \_\_\_\_\_ Date \_\_\_\_\_

**Practice A**

For use with pages 78-83

1. Describe and correct the error in the solution.



$$\begin{aligned}4d + 9d - (7 - 6d) &= 4d + 9d - 7 - 6d \\ &= 4d + 9d - 6d - 7 \\ &= 7d - 7\end{aligned}$$

For the given expression, identify the terms, like terms, coefficients, and constant terms. Then simplify the expression.

2.  $6a + 3 + 5 + 4a$

3.  $2 - 3y + 10y - 14$

4.  $7b - b + 8 + 10b$

$6a, 3, -5, 4a$

$6a, 4a$

$3, -5$

like terms

$6, 4$  - coeff.

$3, -5$  → constants

$10a + 2$

5.  $c - 9 + 9c + 15$

6.  $11z + 3z - 4z + 17$

7.  $-8m + 16m - 24 - 32$

$$11z + 3z - 4z + 17$$

Terms  $\Rightarrow 4$

Like terms:  $11z$ ,  $3z$ ,  $-4z$

Coeff:  $-4, 3, 11$

const:  $17$

$$10z + 17$$

Simplify the expression.

8.  $4x + 3(x + 1) + 5$

9.  $7z - 4 + 6(2z - 9)$

10.  $-12 - 5p + 4(6p + p)$

$$4x + 3(x + 1) + 5$$

$$4x + 3x + 3 + 5$$

$$7x + 8$$

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$$-12 - 5p + 4(6p + p)$$

$$-12 - 5p + 24p + 4p$$

$$23p - 12$$

11.  $-(w + 8) - 16w + 7$

12.  $-(j + 9) - 13j + 12$

13.  $-4(2r - 2) + 15r - 18$

$$\begin{aligned} & -(j + 9) - 13j + 12 \\ & -j + 9 - 13j + 12 \\ & -14j + 3 \end{aligned}$$

14.  $-5(x^2 + 3) - 8 - 10x^2$

15.  $2(7 - t) + 14t - 11$

16.  $9(8 - 6v^2) - 12v^2 + 20$

$$\overbrace{-5(x^2 + 3)} + -8 + -10x^2$$

$$-5x^2 + -15 + -8 + -10x^2$$

$$\underline{-15x^2 + -23}$$

17.  $24 - 14f + 2(4f - 10)$

18.  $-19h + 5 + 3(-h - 12)$

19.  $27 - 11k^2 - 7(k^2 - 14)$

$$\begin{aligned} & -19h + 5 + 3(-h - 12) \\ & -19h + 5 + -3h + -36 \\ & \underline{-22h + -31} \end{aligned}$$

20. While training for soccer, you work out each day after school. During your workout, you lift weights and play soccer for a total of 75 minutes. You burn 7 calories per minute when playing soccer and 3 calories per minute when lifting weights.

a. Let  $t$  be the time in minutes you play soccer. Write and simplify an expression in terms of  $t$  for the ~~total calories~~ you burn during your workout.

b. Find the total number of calories burned if you play soccer for 55 minutes.

$$7t + 3(75 - t)$$

$$7t + 225 + 3t$$

$$\underline{4t + 225}$$

$$4 \cdot 55 = 220$$

$$220 + 225$$

$$\underline{445}$$

- 21.** You are purchasing pens and pencils to be sold at the school store. You need a total of 50 boxes of pens and pencils. The pens cost \$3 per box and the pencils cost \$2 per box.
- Let  $p$  be the number of boxes of pens you purchase. Write and simplify an expression in terms of  $p$  for the total cost of the pens and pencils.
  - Find the total cost of the pens and pencils when you purchase 15 boxes of pens.

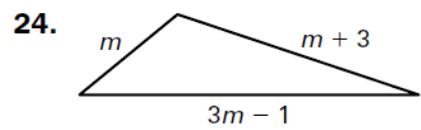
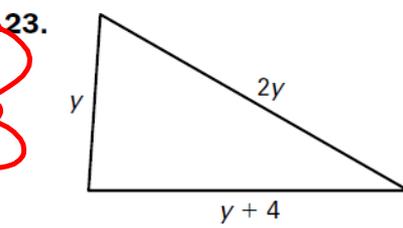
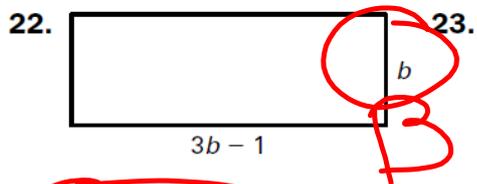
$$3p + 2(50 - p)$$

$$3p + 100 - 2p$$

$$p + 100$$

$$15 + 100 = 115$$

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



$$3B + 1$$

$$2(3B + 1 + B)$$

$$6B + 2 + 2B$$

$$8B + 2$$