

**Study Guide and Intervention**

7AF1.2, 7AF1.3, 7AF1.4

**Variables, Expressions, and Properties**

When finding the value of an expression with more than one operation, perform the operations in the order specified by the order of operations.

**Order of Operations**

1. Perform all operations within grouping symbols first; start with the innermost grouping symbols.
2. Evaluate all powers before other operations.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

**Example 1** Evaluate the expression  $(5 + 7) \div 2 \times 3 - (8 + 1)$ .

$$\begin{aligned} (5 + 7) \div 2 \times 3 - (8 + 1) &= 12 \div 2 \times 3 - (8 + 1) && \text{Add inside the left parentheses.} \\ &= 12 \div 2 \times 3 - 9 && \text{Add inside the remaining parentheses.} \\ &= 6 \times 3 - 9 && \text{Divide.} \\ &= 18 - 9 && \text{Multiply.} \\ &= 9 && \text{Subtract.} \end{aligned}$$

**Example 2** Evaluate the expression  $3x^2 - 4y$  if  $x = 3$  and  $y = 2$ .

$$\begin{aligned} 3x^2 - 4y &= 3(3)^2 - 4(2) && \text{Replace } x \text{ with } 3 \text{ and } y \text{ with } 2. \\ &= 3(9) - 4(2) && \text{Evaluate the power first.} \\ &= 27 - 8 && \text{Do all multiplications.} \\ &= 19 && \text{Subtract.} \end{aligned}$$

**Exercises**

Evaluate each expression.

- |                            |                            |
|----------------------------|----------------------------|
| 1. $4 \times 5 + 8$        | 2. $16 - 12 \div 4$        |
| 3. $14 \div 2 + 3(5)$      | 4. $5 - 6 \times 2 \div 3$ |
| 5. $2 \cdot 3^2 + 10 - 14$ | 6. $2^2 + 32 \div 8 - 5$   |
| 7. $(10 + 5) \div 3$       | 8. $5^2 \cdot (8 - 6)$     |
| 9. $(17 - 5)(6 + 5)$       | 10. $3 + 7(14 - 8 \div 2)$ |
| 11. $5[24 - (6 + 8)]$      | 12. $\frac{14}{3^2 - 2}$   |

Evaluate each expression if  $a = 3$ ,  $b = 5$ , and  $c = 6$ .

- |              |                |                        |
|--------------|----------------|------------------------|
| 13. $a + 3b$ | 14. $4b - 3c$  | 15. $2a - b + 5c$      |
| 16. $(ab)^2$ | 17. $a(b + c)$ | 18. $3(bc - 8) \div a$ |

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**Adding Integers**

To add integers with the same sign, add their absolute values. The sum has the same sign as the integers.

**Example 1** Find  $-3 + (-4)$ .

$$-3 + (-4) = -7 \quad \text{Add } |-3| + |-4|. \text{ Both numbers are negative, so the sum is negative.}$$

To add integers with different signs, subtract their absolute values. The sum has the same sign as the integer with the greater absolute value.

**Example 2** Find  $-16 + 12$ .

$$-16 + 12 = -4 \quad \text{Subtract } |12| \text{ from } |-16|. \text{ The sum is negative because } |-16| > |12|.$$

**Exercises****Add.**

1.  $9 + 16$

2.  $-10 + (-10)$

3.  $18 + (-26)$

4.  $-23 + (-15)$

5.  $-45 + 35$

6.  $39 + (-38)$

7.  $-55 + 81$

8.  $-61 + (-39)$

9.  $-74 + 36$

10.  $5 + (-4) + 8$

11.  $-3 + 10 + (-6)$

12.  $-13 + (-8) + (-12)$

13.  $3 + (-10) + (-16) + 11$

14.  $-17 + 31 + (-14) + 26$

**Evaluate each expression if  $x = 4$  and  $y = -3$ .**

15.  $11 + y$

16.  $x + (-6)$

17.  $y + 2$

18.  $|x + y|$

19.  $|x| + y$

20.  $x + |y|$

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***Multiplying and Dividing Integers***

Use the following rules to determine whether the product or quotient of two integers is positive or negative.

- The product of two integers with different signs is negative.
- The product of two integers with the same sign is positive.
- The quotient of two integers with different signs is negative.
- The quotient of two integers with the same sign is positive.

**Example 1** Find  $7(-4)$ . $7(-4) = -28$  The factors have different signs. The product is negative.**Example 2** Find  $-5(-6)$ . $-5(-6) = 30$  The factors have the same sign. The product is positive.**Example 3** Find  $15 \div (-3)$ . $15 \div (-3) = -5$  The dividend and divisor have different signs. The quotient is negative.**Example 4** Find  $-54 \div (-6)$ . $-54 \div (-6) = 9$  The dividend and divisor have the same sign. The quotient is positive.**Exercises****Multiply or divide.**

1.  $8(-8)$

2.  $-3(-7)$

3.  $-9(4)$

4.  $12(8)$

5.  $33 \div (-3)$

6.  $-25 \div 5$

7.  $48 \div 4$

8.  $-63 \div (-7)$

9.  $(-4)^2$

10.  $\frac{-75}{15}$

11.  $-6(3)(-5)$

12.  $\frac{-143}{-13}$

**Evaluate each expression if  $a = -1$ ,  $b = 4$ , and  $c = -7$ .**

13.  $3c + b$

14.  $a(b + c)$

15.  $c^2 - 5b$

16.  $\frac{a - 6}{c}$

# Study Guide and Intervention

7AFI.1, 7AFI.3, 7AFI.4

## Simplifying Algebraic Expressions

The **Distributive Property** can be used to simplify algebraic expressions.

**Examples** Use the **Distributive Property** to rewrite each expression.

**1**  $3(a + 5)$

$$\begin{aligned} 3(a + 5) &= 3(a) + 3(5) && \text{Distributive Property} \\ &= 3a + 15 && \text{Simplify.} \end{aligned}$$

**2**  $-2(d - 3)$

$$\begin{aligned} -2(d - 3) &= -2[d + (-3)] && \text{Rewrite } d - 3 \text{ as } \\ & && d + (-3). \\ &= -2(d) + (-2)(-3) && \text{Distributive Property} \\ &= -2(d) + 6 && \text{Simplify.} \end{aligned}$$

When a plus sign separates an algebraic expression into parts, each part is called a **term**. In terms that contain a variable, the numerical part of the term is called the **coefficient** of the variable. A term without a variable is called a **constant**. **Like terms** contain the same variables, such as  $3x$  and  $2x$ .

**Example 3** Identify the terms, like terms, coefficients, and constants in the expression  $7x - 5 + x - 3x$ .

$$\begin{aligned} 7x - 5 + x - 3x &= 7x + (-5) + x + (-3x) && \text{Definition of subtraction} \\ &= 7x + (-5) + 1x + (-3x) && \text{Identity Property; } x = 1x \end{aligned}$$

The terms are  $7x$ ,  $-5$ ,  $x$ , and  $-3x$ . The like terms are  $7x$ ,  $x$ , and  $-3x$ . The coefficients are 7, 1, and  $-3$ . The constant is  $-5$ .

An algebraic expression is in **simplest form** if it has no like terms and no parentheses.

**Example 4** Simplify the expression  $-2m + 5 + 6m - 3$ .

$-2m$  and  $6m$  are like terms. 5 and  $-3$  are also like terms.

$$\begin{aligned} -2m + 5 + 6m - 3 &= -2m + 5 + 6m + (-3) && \text{Definition of subtraction} \\ &= -2m + 6m + 5 + (-3) && \text{Commutative Property} \\ &= (-2 + 6)m + 5 + (-3) && \text{Distributive Property} \\ &= 4m + 2 && \text{Simplify.} \end{aligned}$$

### Exercises

Use the **Distributive Property** to rewrite each expression.

1.  $2(c + 6)$

2.  $-4(w + 6)$

3.  $(b - 4)(-3)$

4. Identify the terms, like terms, coefficients, and constants in the expression  $4m - 2 + 3m + 5$ .

Simplify each expression.

5.  $3d + 6d$

6.  $2 + 5s - 4$

7.  $2z + 3 + 9z - 8$