Alg 1     1.4

Use the distributive property to evaluate expressions
Use the distributive property to simplify expressions

term     part of alg expr.
like terms
coefficient     $2x + 5 + 7x$

$-5x + 5$

**Example 3** Algebraic Expressions

Rewrite each expression using the Distributive Property. Then simplify.

a. $7(3w - 5)$

$7 \cdot 3w + {}^-3 \cdot 5$

$7 \cdot 3w + {}^-35$

$21w + {}^-35$

**3A** $(8 + 4n)2$    $16 + 8n = 8n + 16$

**3C.** $(2 - 5q)(-3)$

$-6 - -15q$

$-6 + 15q$

$11$

**3B** $-6(r + 3g - t) = -6r + {}^-18g - 6t$

**3D.** $-4(-8 + {}^-3m)$    $-6r + {}^-18g + 6t$

$-4 \cdot {}^-3m$    $-6 \cdot {}^-t = {}^+6t$

$-4 \cdot {}^-8 - {}^-12$

$32 + 12m$

$32 - -12m$

$32 - {}^-12m$

**Like terms** are terms that contain the same variables, with corresponding variables having the same power.

$$5x^2 + 2x - 4$$

three terms

$$6a^2 + a^2 + 2a$$

like terms | unlike terms

$$5x^2 + 2x + \overline{4}$$

$$7a^2 + 2a$$

**Simplify each expression. If not possible, write *simplified*.**

**4A.** $6n + {}^-4n$ → $2n$

**4B.** $\underline{b^2} + 13\underline{b} + 13$  Simp.

**4C.** $4y^3 + 2y + {}^-8y + 5$

$$4y^3 - 6y + 5$$

**4D.** $7a + 4 - 6a^2 + {}^-2a$

$$5a + 4 - 6a^2$$
$$-6a^2 + 5a + 4$$

**Example 5** Write and Simplify Expressions

Use the expression *twice the difference of 3x and y increased by five times the sum of x and 2y.*

**a.** Write an algebraic expression for the verbal expression.

| Words | twice the difference of 3x and y | increased by | five times the sum of x and 2y |
|---|---|---|---|

$$2 \cdot (3x + ^-y) + 5 \cdot (x + 2y)$$

$$6x + ^-2y + 5x + 10y = 11x + 8y$$

**GuidedPractice**

**i.** Use the expression *5 times the difference of q squared and r plus 8 times the sum of 3q and 2r.*

$$5 \cdot (q^2 + ^-r) + 8 \cdot (3q + 2r)$$

**A.** Write an algebraic expression for the verbal expression.

**B.** Simplify the expression, and indicate the properties used.

$$5q^2 + ^-5r + 24q + 16r \qquad \text{distr.}$$
$$5q^2 + 11r + 24q \qquad \text{subs}$$

## ConceptSummary  Properties of Numbers

The following properties are true for any numbers $a$, $b$, and $c$.

| Properties | Addition | Multiplication |
|---|---|---|
| Commutative | $a + b = b + a$ | $ab = ba$ |
| Associative | $(a + b) + c = a + (b + c)$ | $(ab)c = a(bc)$ |
| Identity | 0 is the identity. $a + 0 = 0 + a = a$ | 1 is the identity. $a \cdot 1 = 1 \cdot a = a$ |
| Zero | — | $a \cdot 0 = 0 \cdot a = 0$ |
| Distributive | $a(b + c) = ab + ac$ and $(b + c)a = ba + ca$ | |
| Substitution | If $a = b$, then $a$ may be substituted for $b$. | |

**Simplify each expression.**

**42.** $6x + 4y + 5x$

**43.** $3m + 5g + 6g + 11m$

**44.** $4a + 5a^2 + 2a^2 + a^2$

**45.** $5k + 3k^3 + 7k + 9k^3$

**46.** $6d + 4(3d + 5)$

**47.** $2(6x + 4) + 7x$