3.4 THE DISTRIBUTIVE PROPERTY

ESSENTIIAL QUESTION: How do you use the Distributive Property to simplify expressions?

SIMPLIFY THE EXPRESSION $4(x + 9)$ $= 4 \cdot x + 4 \cdot 9 = 4x + 36$

House — Trick or Treaters

The Distributive Property

Multiply each term in the Sum or difference by the term outside the parenthesis. Then evaluate.

$3(w + 7)$

$3 \cdot w + 3 \cdot 7$

$3w + 21$

Algebra

$a(b + c) = ab + ac$

$3(w - 7)$

$3 \cdot w - 3 \cdot 7$

$3w - 21$

Algebra

$a(b - c) = ab - ac$

EXAMPLE 1

Use the Distributive Property to simplify the expression.

1) $4(n + 5)$

$4 \cdot n + 4 \cdot 5$

$4n + 20$

2) $12(2y - 3)$

$12 \cdot 2y - 12 \cdot 3$

$24y - 36$

3) $9(6 + x + 2)$

$9 \cdot 6 + 9 \cdot x + 9 \cdot 2$

$54 + 9x + 18$

$9x + 72$

ON YOUR OWN

Use the Distributive Property to simplify the expression.

1) $7(d + 2)$

$7 \cdot d + 7 \cdot 2$

$7d + 14$

2) $3(d - 11)$

$3 \cdot d - 3 \cdot 11$

$3d - 33$

3) $7(2 + 6 - 4d)$

$7 \cdot 2 + 7 \cdot 6 - 7 \cdot 4d$

$14 + 42 - 28d$

$56 - 28d$

EXAMPLE 2

Jose is x years old. His brother, Felipe, is 2 years older than Jose. Their aunt, Maria, is three times old as Felipe. Write and simplify an expression that represents Maria's age in years.

Jose $= x$

Felipe $= x + 2$

Marie $3(x + 2)$

Expression $= 3(x + 2)$

$3 \cdot x + 3 \cdot 2$

$3x + 6$

Alexis is x years old. Her sister, Gloria, is 7 years older than Alexis. Their grandfather is five times as old as Gloria. Write and simplify an expression that represents their grandfather's age in years.

Alexis $= x$

Gloria $= x + 7$

Grandfather $= 5(x + 7)$

Expression $= 5(x + 7)$

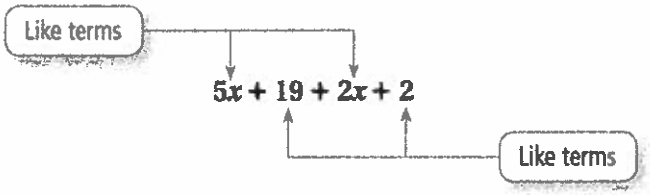
$5 \cdot x + 5 \cdot 7$

$5x + 35$

Like terms -> Terms that have the same variable raised to the same exponents
Constant terms are also like terms.

12 *and* 7 → like terms
$7r$ *and* r → like terms
$5x$ *and* $5w$ → not like terms
$9x^2$ *and* $2x$ → not like terms

Like terms can be added or combined.



EXAMPLE 3

Simplify each expression. (Combine like terms.)

1) $3x + 9 + 2x - 5$

$5x + 4$

2) $y + y + y$

$3y$

3) $7z + 2(z - 5y)$

$7z + 2 \cdot z - 2 \cdot 5y$
$7z + 2z - 10y$
$9z - 10y$

ON YOUR OWN

Simplify each expression. (Combine like terms.)

1) $8 + 3z - z$

$8 + 2z$

2) $3(b + 5) + b + 2$

$3 \cdot b + 3 \cdot 5 + b + 2$
$3b + 15 + b + 2$
$4b + 17$

3) $10 + 7(3 + x)$

$10 + 7 \cdot 3 + 7 \cdot x$
$10 + 21 + 7x$
$31 + 7x$

4) $5(2w + 8) - 3w$

$5 \cdot 2w + 5 \cdot 8 - 3w$
$10w + 40 - 3w$
$7w + 40$

5) $5(4 + 8k) + 12$

$5 \cdot 4 + 5 \cdot 8k + 12$
$20 + 40k + 12$
$32 + 40k$

6) $8(x + y) - 5x$

$8 \cdot x + 8 \cdot y - 5x$
$8x + 8y - 5x$
$3x + 8y$

7) $2c + 3(f + 5c)$

$2c + 3 \cdot f + 3 \cdot 5c$
$2c + 3f + 15c$
$17c + 3f$

8) $3(x + 5) + 4(2 + x)$

$3 \cdot x + 3 \cdot 5 + 4 \cdot 2 + 4 \cdot x$
$3x + 15 + 8 + 4x$
$7x + 23$