

1-4 Simplifying Algebraic Expressions

Starter 1.4 HW 1.2, 1.3???
List words that indicate each operation.

1. addition sum, and, total
2. multiplication times, product

Evaluate each expression.

3. $3x$ for $x = 2$ 6
4. $5x - 4 - 3x$ for $x = 7$ 10

Simplify each expression.

5. $3(2x)$ $6x$
6. $4(x + y)$ $4x + 4y$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

There are three different ways in which a basketball player can score points during a game. There are 1-point free throws, 2-point field goals, and 3-point field goals. An algebraic expression can represent the total points scored during a game.

Total Points Scored
 $f + 2g + 3t$

↙ ↑ ↘
 Number of 1-point Number of 2-point Number of 3-point
 free throws field goals field goals

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

To translate a real-world situation into an algebraic expression, you must first determine the action being described. Then choose the operation that is indicated by the type of action and the context clues.

Action	Operation	Possible Context Clues
Combine	Add	How many total?
Combine equal groups	Multiply	How many altogether?
Separate	Subtract	How many more? How many remaining?
Separate into equal groups	Divide	How many in each group?

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Addition Phrases:

- More than
- Increase by
- Greater than
- Add
- Total
- Plus
- Sum

Subtraction Phrases:

- Decreased by
- Difference between
- Take Away
- Less
- Subtract
- Less than*
- Subtract from*

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Multiplication Phrases:

- Product
- Times
- Multiply
- Of
- Twice or double
- Triple

Division Phrases:

- Quotient
- Divide
- Divided by
- Split equally
- Per

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Operation	Verbal Expressions	Algebraic Expressions
+	<ul style="list-style-type: none"> • add 3 to a number • a number plus 3 • the sum of a number and 3 • 3 more than a number • a number increased by 3 	$n + 3$
-	<ul style="list-style-type: none"> • subtract 12 from a number • a number minus 12 • the difference of a number and 12 • 12 less than a number • a number decreased by 12 • take away 12 from a number • a number less 12 	$x - 12$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Operation	Verbal Expressions	Algebraic Expressions
\times	<ul style="list-style-type: none"> • 2 times a number • 2 multiplied by a number • the product of 2 and a number 	$2m$ or $2 \cdot m$
\div	<ul style="list-style-type: none"> • 6 divided into a number • a number divided by 6 • the quotient of a number and 6 	$a \div 6$ or $\frac{a}{6}$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Translating Words into Algebraic Expressions

- 3 more than x
- the sum of 10 and a number c
- a number n increased by 4.5
- a number t decreased by 4
- the difference between 10 and a number y
- 6 less than a number z
- the product of 3 and a number t
- twice the number x
- 4.2 times a number e
- the quotient of 25 and a number b
- the number y divided by 2
- 2.5 divide g

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Translating Words into Algebraic Expressions

- converting x inches into feet
- the cost for tickets if you purchase 5 adult tickets at x dollars each
- the cost for tickets if you purchase 3 children's tickets at y dollars each
- the difference of 3 times a number and 7
- the quotient of 4 and a number, increased by 10
- 4 times the difference of y and 8

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 1: Translating Words into Algebraic Expressions

Write an algebraic expression to represent each situation.

A. the number of apples in a basket of 12 after n more are added

$12 + n$ *Add n to 12.*

B. the number of days it will take to walk 100 miles if you walk M miles per day

$\frac{100}{M}$ *Divide 100 by M .*

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Check It Out! Example 1

Write an algebraic expression to represent each situation.

a. Lucy's age y years after her 18th birthday

$18 + y$ *Add y to 18.*

b. the number of seconds in h hours

$3600h$ *Multiply h by 3600.*

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

To evaluate an algebraic expression, substitute a number for each variable and simplify by using the order of operations. One way to remember the order of operations is by using the mnemonic **PEMDAS**.

Order of Operations
1. Parentheses and grouping symbols.
2. Exponents.
3. Multiply and Divide from left to right.
4. Add and Subtract from left to right.

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 2A: Evaluating Algebraic Expressions

Evaluate the expression for the given values of the variables.

$2x - xy + 4y$ for $x = 5$ and $y = 2$

$2(5) - (5)(2) + 4(2)$ *Substitute 5 for x and 2 for y.*

$10 - 10 + 8$ *Multiply from left to right.*

$0 + 8$ *Add and subtract from left to right.*

8

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 2B: Evaluating Algebraic Expressions

Evaluate the expression for the given values of the variables.

$q^2 + 4qr - r^2$ for $r = 3$ and $q = 7$

$(7)^2 + 4(7)(3) - (3)^2$ *Substitute 3 for r and 7 for q.*

$49 + 4(7)(3) - 9$ *Evaluate exponential expressions.*

$49 + 84 - 9$ *Multiply from left to right.*

124 *Add and subtract from left to right.*

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Check It Out! Example 2

Evaluate $x^2y - xy^2 + 3y$ for $x = 2$ and $y = 5$.

$(2)^2(5) - (2)(5)^2 + 3(5)$ *Substitute 2 for x and 5 for y.*

$4(5) - 2(25) + 3(5)$ *Evaluate exponential expressions.*

$20 - 50 + 15$ *Multiply from left to right.*

-15 *Add and subtract from left to right.*

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

- **Like terms** have the same variables raised to the same exponents.
- **Constant terms** are like terms that always have the same value.

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

To simplify an algebraic expression, combine like terms by adding or subtracting their coefficients. Algebraic expressions are equivalent if they contain exactly the same terms when simplified.

Remember!

Terms that are written without a coefficient have an understood coefficient of 1.

$x^2 = 1x^2$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 3A: Simplifying Expressions

Simplify the expression.

$3x^2 + 2x - 3y + 4x^2$

$3x^2 + 2x - 3y + 4x^2$ *Identify like terms.*

$7x^2 + 2x - 3y$ *Combine like terms.*
 $3x^2 + 4x^2 = 7x^2$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 3B: Simplifying Expressions

Simplify the expression.

$$j(6k^2 + 7k) + 9jk^2 - 7jk$$

$$6jk^2 + 7jk + 9jk^2 - 7jk \quad \text{Distribute, and identify like terms.}$$

$$15jk^2 \quad \text{Combine like terms.}$$

$$7jk - 7jk = 0$$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Check It Out! Example 3

Simplify the expression $-3(2x - xy + 3y) - 11xy$.

$$-6x + 3xy - 9y - 11xy \quad \text{Distribute, and identify like terms.}$$

$$-6x - 8xy - 9y \quad \text{Combine like terms.}$$

$$3xy - 11xy = -8xy$$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 4A: Application

Apples cost \$2 per pound, and grapes cost \$3 per pound.

Write and simplify an expression for the total cost if you buy 10 lb of apples and grapes combined.

Let A be the number of pounds of apples.
 Then $10 - A$ is the number of pounds of grapes.

$$2A + 3(10 - A) = 2A + 30 - 3A \quad \text{Distribute 3.}$$

$$= 30 - A \quad \text{Combine like terms.}$$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Example 4B: Application

Apples cost \$2 per pound, and grapes cost \$3 per pound.

What is the total cost if 2 lb of the 10 lb are apples?

Evaluate $30 - A$ for $A = 2$.

$$30 - (2) = 28$$

The total cost is \$28 if 2 lb are apples.

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Check It Out! Example 4a

A travel agent is selling 100 discount packages. He makes \$50 for each Hawaii package and \$80 for each Cancún package.

Write an expression to represent the total the agent will make selling a combination of the two packages.

Let h be the number of Hawaii packages.
 Then $100 - h$ is the remaining Cancun packages.

$$50h + 80(100 - h) = 50h + 8000 - 80h \quad \text{Distribute 80.}$$

$$= 8000 - 30h \quad \text{Combine like terms.}$$

Holt Algebra 2

1-4 Simplifying Algebraic Expressions

Check It Out! Example 4b

How much will he make if he sells 28 Hawaii packages?

Evaluate $8000 - 30h$ for $h = 28$.

$$8000 - 30(28) = 8000 - 840$$

$$= 7160$$

He will make \$7160.

Holt Algebra 2