Variables and Expressions

Warm Up

Lesson Presentation

Lesson Quiz

Warm Up

Add or subtract.

1. 6 + 104   110

2. 12(9)   108

3. 23 − 8   15

4. $\dfrac{1}{2} + \dfrac{1}{5}$ $\dfrac{7}{10}$

Multiply or divide.

5. 324 ÷ 18   18

6. $\dfrac{1}{4}(24)$ 6

7. 13.5(10)   135

8. 18.2 ÷ 2   9.1

Objectives

Translate between words and algebra.

Evaluate algebraic expressions.

Vocabulary

variable

constant

numerical expression

algebraic expression

evaluate

Variables and Expressions

A **variable** is a letter or a symbol used to represent a value that can change.

A **constant** is a value that does not change.

A **numerical expression** contains only constants and operations.

An **algebraic expression** may contain variables, constants, and operations.

You will need to translate between algebraic expressions and words to be successful in math.

+ Plus, sum, increased by	**–** Minus, difference, less than
× Times, product, equal groups of	**÷** Divided by, quotient

Writing Math

These expressions all mean "2 times y":

$2y$	$2(y)$
$2 \bullet y$	$(2)(y)$
$2 \times y$	$(2)y$

Example 1: Translating from Algebra to Words

Give two ways to write each algebraic expression in words.

A. $9 + r$

the sum of 9 and r

9 increased by r

B. $q - 3$

the difference of q and 3

3 less than q

C. $7m$

the product of m and 7

m times 7

D. $j \div 6$

the quotient of j and 6

j divided by 6

Variables and Expressions

Check It Out! Example 1

Give two ways to write each algebraic expression in words.

1a. 4 - *n*

4 decreased by *n*

n less than 4

1b. $\dfrac{t}{5}$

the quotient of *t* and 5

t divided by 5

1c. 9 + *q*

the sum of 9 and *q*

q added to 9

1d. 3(*h*)

the product of 3 and *h*

3 times *h*

To translate words into algebraic expressions, look for words that indicate the action that is taking place.

Add Put together, combine	**Subtract** Find how much more or less
Multiply Put together equal groups	**Divide** Separate into equal groups

Example 2A: Translating from Words to Algebra

John types 62 words per minute. Write an expression for the number of words he types in *m* minutes.

m represents the number of minutes that John types.

$62 \cdot m$ or $62m$ *Think: m groups of 62 words*

Example 2B: Translating from Words to Algebra

Roberto is 4 years older than Emily, who is y years old. Write an expression for Roberto's age

y represents Emily's age.

$y + 4$ *Think: "older than" means "greater than."*

Example 2C: Translating from Words to Algebra

Joey earns $5 for each car he washes. Write an expression for the number of cars Joey must wash to earn *d* dollars.

d represents the total amount that Joey will earn.

$$\frac{d}{5}$$

Think: How many groups of $5 are in d?

Check It Out! Example 2a

Lou drives at 65 mi/h. Write an expression for the number of miles that Lou drives in *t* hours.

t represents the number of hours that Lou drives.

65*t*   *Think: number of hours times rate per hour.*

Check It Out! Example 2b

Miriam is 5 cm taller than her sister, than her sister who is *m* centimeters tall. Write an expression for Miriam's height in centimeters.

m represents Miriam's sister's height in centimeters.

m + 5   *Think: Miriam's height is 5 added to her sister's height.*

Check It Out! Example 2c

Elaine earns $32 per day. Write an expression for the amount she earns in _d_ days.

_d_ represents the amount of money Elaine will earn each day.

32_d_   *Think: The number of days times the amount Elaine would earn each day.*

To **evaluate** an expression is to find its value.

To evaluate an algebraic expression, substitute numbers for the variables in the expression and then simplify the expression.

Example 3: Evaluating Algebraic Expressions

Evaluate each expression for $a = 4$, $b = 7$, and $c = 2$.

A. $b - c$

$b - c = 7 - 2$ *Substitute 7 for b and 2 for c.*

   $= 5$ *Simplify.*

B. ac

$ac = 4 \cdot 2$ *Substitute 4 for a and 2 for c.*

   $= 8$ *Simplify.*

Check It Out! Example 3

Evaluate each expression for $m = 3$, $n = 2$, and $p = 9$.

a. mn

$mn = 3 \cdot 2$ *Substitute 3 for m and 2 for n.*
$ = 6$ *Simplify.*

b. $p - n$

$p - n = 9 - 2$ *Substitute 9 for p and 2 for n.*
$ = 7$ *Simplify.*

c. $p \div m$

$p \div m = 9 \div 3$ *Substitute 9 for p and 3 for m.*
$ = 3$ *Simplify.*

Example 4A: Recycling Application

Approximately eighty-five 20-ounce plastic bottles must be recycled to produce the fiberfill for a sleeping bag.

Write an expression for the number of bottles needed to make *s* sleeping bags.

The expression 85*s* models the number of bottles to make *s* sleeping bags.

Example 4B: Recycling Application Continued

Approximately eighty-five 20-ounce plastic bottles must be recycled to produce the fiberfill for a sleeping bag.

Find the number of bottles needed to make 20, 50, and 325 sleeping bags.

Evaluate $85s$ for $s = 20$, 50, and 325.

s	$85s$
20	$85(20) = 1700$
50	$85(50) = 4250$
325	$85(325) = 27{,}625$

To make 20 sleeping bags, 1700 bottles are needed.

To make 50 sleeping bags, 4250 bottles are needed.

To make 325 sleeping bags, 27,625 bottles are needed.

Writing Math

A replacement set is a set of numbers that can be substituted for a variable. The replacement set in Example 4 is (20, 50, and 325).

Check It Out! Example 4a

To make one sweater, 63 twenty ounce plastic drink bottles must be recycled.

Write an expression for the number of bottles needed to make s sweaters.

The expression $63s$ models the number of bottles to make s sweaters.

Check It Out! Example 4b Continued

To make one sweater, 63 twenty ounce plastic drink bottles must be recycled.

Find the number of bottles needed to make 12, 25 and 50 sweaters.

Evaluate $63s$ for $s = 12, 25,$ and 50.

s	$63s$
12	$63(12) = 756$
25	$63(25) = 1575$
50	$63(50) = 3150$

To make 12 sweaters, 756 bottles are needed.

To make 25 sweaters, 1575 bottles are needed.

To make 50 sweaters, 3150 bottles are needed.

Lesson Quiz: Part I

Give two ways to write each algebraic expression in words.

1. $j - 3$ The difference of j and 3; 3 less than j.

2. $4p$ 4 times p; The product of 4 and p.

3. Mark is 5 years older than Juan, who is y years old. Write an expression for Mark's age. $y + 5$

Variables and Expressions

Lesson Quiz: Part II

Evaluate each expression for *c* = 6, *d* = 5, and *e* = 10.

4. $\dfrac{d}{e}$ $\dfrac{1}{2}$

5. $c + d$ 11

Shemika practices basketball for 2 hours each day.

6. Write an expression for the number of hours she practices in *d* days. 2*d*

7. Find the number of hours she practices in 5, 12, and 20 days. 10 hours; 24 hours; 40 hours