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LESSON 1

Equivalent Expressions

An **algebraic expression** is a grouping of numbers, variables, and operations that shows the value of something.

You can rewrite expressions to have the same value. These are called **equivalent expressions.** Use the properties of operations to rewrite expressions.

Rewrite $(5 + 2n) + 6$ as equivalent expressions.

Use the commutative property to change the order of addends.

$$(5 + 2n) + 6 = (2n + 5) + 6$$

Use the associative property to change the grouping of addends.

$$(2n + 5) + 6 = 2n + (5 + 6)$$

Add the constants.

$$2n + (5 + 6) = 2n + 11$$

The expressions $(5 + 2n) + 6$, $(2n + 5) + 6$, $2n + (5 + 6)$, and $2n + 11$ are equivalent. They have the same value.

Equivalent expressions can tell you something about a situation.

A store is having a going-out-of-business sale. All items are 30% off. Write an expression that shows the percent of the original price, x, of each item a customer pays.

Use subtraction to represent a decrease in price.

$$x - 0.30x$$

This expression shows that 0.30, or 30%, of the original price is subtracted from the original price.

$$x - 0.30x = 0.70x$$

This means that a customer pays 0.70, or 70%, of the original price. The expressions $x - 0.30x$ and $0.70x$ are equivalent.

A **variable** is a symbol or letter that represents an unknown value or a value that can change.

A **coefficient** is a number in front of a variable that shows multiplication.

Commutative Property:

$$a + b = b + a$$
$$ab = ba$$

Associative Property:

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

Many different expressions can be written that are equivalent to each other.

GUIDED PRACTICE

Read and solve each problem.

1 Which expression is equivalent to $4a$?

A $12a - 6a$

B $4 + a$

C $10a + (-6a)$

D $a \cdot a \cdot a \cdot a$

What are some ways to rewrite the coefficient, the number that multiplies the variable?

2 Which expression has the same value as $2n + n$?

A $2n^2$

B $2 + n + n$

C $3n$

D $4n$

A variable by itself is understood to have a coefficient of 1.

3 Andrei buy 3 notebooks for d dollars each and a calculator for 7 dollars. A store coupon gives him $2 off his entire purchase. The expression $(3d + 7) - 2$ represents this situation. Write an equivalent expression in simpler form.

Answer _____

What property lets you regroup numbers?

4 Brendan earns 25% more than his regular hourly rate, d, when he works on holidays. Write an expression to represent the hourly rate Brendan earns working on a holiday.

Answer _____

The holiday rate is more than 100% of Brendan's regular hourly rate.

TEST YOURSELF

Read and solve each problem.

1 Which expression is equivalent to $6y - 3 + y$?

A $3y$

B $3 + y$

C $6 - 3y$

D $7y - 3$

2 Which expression is equivalent to $32a + 12b$?

A $12b + 32a$

B $(32 + 12)ab$

C $12a + 32b$

D $44(a + b)$

3 Which equation shows equivalent expressions?

A $(b + 2) + 6 = 2b + 6$

B $c + (9 - 4) = 9c - 4c$

C $(d \cdot 16) \cdot 25 = d \cdot (16 \cdot 25)$

D $e \cdot 12 \cdot 5 = 12e \cdot 5e$

4 Which expression is equivalent to $w \cdot \frac{2}{5} \cdot \frac{3}{4}$?

A $\frac{2}{5}w + \frac{3}{4}w$

B $w \cdot \frac{2}{5} \cdot \frac{4}{3}$

C $\frac{2w}{20}$

D $\frac{3}{10}w$

5 Caroline has g goldfish. Her sister has 3 less than twice as many goldfish as Caroline. The total number of goldfish they have is represented by $g + 2g - 3$. Which expression is equivalent to this?

A $3 - g$

B $2g - 3$

C $3 - 2g$

D $3g - 3$

6 Rewrite the expression $4p + 9$ using the commutative property.

Answer _____

7 Rewrite the expression $(2t + 6) + 7t$ in simplest form. Show your work.

Answer _____

8 Jeremy is 4 inches shorter than Kevin. Kevin is *n* inches tall.

Part A Write an expression to represent Jeremy's height.

Answer _____

Part B Dimitri is 3 inches taller than Jeremy. Write an expression to represent Dimitri's height. Use the expression to explain how Dimitri's height compares to Kevin's height.

_____

_____

9 In a gift shop, magnets cost $4.50 each and postcards cost $0.75 each.

Part A Marisol bought the same number, *n,* of magnets as postcards in this gift shop. Write an expression to show her total cost.

Answer _____

Part B Write another expression equivalent to the one you wrote in part A. Explain why both expressions are correct.

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