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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 Q.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
 - \mathbf{C} 10a + (-6a)
 - **D** a · a · a · 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?
 - $\mathbf{A} \quad 2n^2$
 - **B** 2 + n + n
 - **C** 3*n*
 - **D** 4n

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

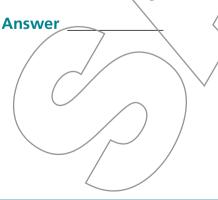
3 Andrei buy 3 notebooks for d dollars each and a calculator for 7 dollars. A store coupon gives him \$2 off his entire purchase. The expression (3d + 7) - 2 represents this situation. Write an equivalent expression in simpler form.

What property lets you regroup numbers?

Answer _____

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.

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** 3*y*
 - **B** 3 + y
 - \mathbf{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
 - $(d \cdot 16) \cdot 25 = d \cdot (16 / 25)$
 - **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** $W \cdot \frac{2}{5} \cdot \frac{4}{3}$
 - $\frac{2w}{20}$
 - $D = \frac{3}{10}W$
- **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
 - \mathbf{B} 2g/-3
 - C > 3 2g
 - $\sqrt{2}$ $\sqrt{3g} 3$
- **6** Rewrite the expression 4p + 9 using the commutative property.

Answer

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



- **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 postçards 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.

