? Topic Essential Question

How can properties of operations help to generate equivalent expressions that can be used in solving problems?

Vocabulary Review

Complete each definition and then provide an example of each vocabulary word.

Vocabulary	coefficient	constant	variable	factor	expression

Definition	Example
1. A term that contains only a number is a _____ .	
2. The number part of a term that contains a variable is a _____ .	
3. A _____ is a letter that represents an unknown value.	

Use Vocabulary in Writing

Membership in a digital library has a $5 startup fee and then costs $9.95 per month. Membership in a video streaming service costs $7.99 per month with no startup fee. Use vocabulary words to explain how this information could be used to write an expression for the total cost of both memberships after *m* months.

Concepts and Skills Review

Write and Evaluate Algebraic Expressions

Quick Review

You can use an algebraic expression to represent and solve a problem with unknown values. The expression can consist of coefficients, constants, and variables. You can substitute values for variables to evaluate expressions.

Example

A farm charges \$1.75 for each pound of strawberries picked and \$2 for a basket to hold the strawberries. What is the total cost to pick 5 pounds of strawberries?

Write an expression to represent the total cost in dollars to pick p pounds of strawberries.

$1.75p + 2$

Substitute 5 for p.

$1.75(5) + 2 = 8.75 + 2 = 10.75$

It costs \$10.75 to pick 5 pounds of strawberries.

Practice

1. Adanya makes and sells knit scarves. Next week she will pay a \$25.25 fee for the use of a booth at a craft fair. She will charge \$12.75 for each scarf she sells at the fair. Write an expression to determine Adanya's profit for selling s scarves after paying the fee for the use of the booth.

2. The cost to buy p pounds of potatoes at \$0.32 per pound and n pounds of onions at \$0.48 per pound can be determined by using the expression $0.32p + 0.48n$. How much will it cost to buy 4.5 pounds of potatoes and 2.5 pounds of onions?

Generate Equivalent Expressions and Simplify Expressions

Quick Review

You can use properties of operations and combine like terms to simplify expressions. Like terms are terms that have the same variable part.

Example

Simplify the expression below.

$-7 + \frac{1}{3}n - \frac{4}{3} + 2n$

Use the Commutative Property to put like terms together,

$\frac{1}{3}n + 2n - 7 - \frac{4}{3}$

Combine like terms.

$2\frac{1}{3}n - 8\frac{1}{3}$

Practice

Simplify each expression below.

1. $\frac{5}{8}m + 9 - \frac{3}{8}m - 15$

2. $-8\frac{2}{5}w + (-4\frac{1}{2}z) + 2 + 6\frac{7}{15}w + 9\frac{3}{4}z - 7$

3. $-6.8 + (-2.2d) + (-4.5d) + 3.4d$

Expand Expressions

Quick Review

The Distributive Property allows you to multiply each term inside parentheses by a factor that is outside the parentheses. This means that you can use the Distributive Property to expand expressions.

Example

Expand the expression $\frac{1}{4}(h + 7)$.

$$\left(\frac{1}{4} \times h\right) + \left(\frac{1}{4} \times 7\right) = \frac{1}{4}h + 1.75$$

Practice

1. Expand the expression $3.5(-3n + 4)$.

2. Expand the expression $-\frac{3}{5}\left(-8 + \frac{5}{9}x - 3\right)$. Then combine like terms.

LESSON **4-5** **Write Equivalent Expressions**

Quick Review

When you factor an expression, you write it as a product of two expressions. The new expression is equivalent to the original expression. The greatest common factor (GCF) and the Distributive Property are tools that you use when you need to factor an expression.

Example

Factor the expression $12x - 9y + 15$.

The GCF of $12x$, 15, and $-9y$ is 3.

Rewrite each term using 3 as a factor.

$12x = 3 \cdot 4x$

$-9y = 3 \cdot (-3y)$

$15 = 3 \cdot 5$

Use the Distributive Property to factor the expression.

$3(4x - 3y + 5)$

Practice

Factor each expression.

1. $63a - 42b$

2. $\frac{1}{2}y - 5\frac{1}{2}$

3. Which expressions are equivalent to $t(-7.4s + 3.8 - 4.5) - t$? Select all that apply.

☐ $-7.4st - 1.7t$

☐ $t(-3.6s - 4.5) - t$

☐ $t(3.8s - 7.4 - 4.5) + 10.2t$

☐ $t(-7.4s - 0.7) - t$

☐ $t(-7.4s + 3.8) - 5.5t$

Add and Subtract Expressions

Quick Review

Adding and subtracting expressions may require combining like terms. This means that you must use the Commutative and Associative Properties to reorder and group terms as needed.

Example

Kesia has n markers. Rico has 1 marker fewer than twice the number of markers Kesia has. Write an expression for the total number of markers they have. Then combine like terms.

Number of markers Kesia has: n

Number of markers Rico has: $2n - 1$

Total number of markers:

$n + (2n - 1)$

$(n + 2n) - 1$

$3n - 1$

Practice

Add or subtract each expression.

1. $(5.2c - 7.35) + (-3.9c + 2.65)$

2. $(6.82x - 2.53y - 5.72) - (-5.72 + 9.45y - 8.11x)$

3. Last week Thema ran 2 fewer than $4m$ miles. This week she ran 0.5 miles more than last week. Write an expression for the total number of miles Thema ran in the two weeks. Then combine like terms.

Analyze Equivalent Expressions

Quick Review

Equivalent expressions can help to show new information about a problem. Sometimes the equivalent expression will be an expanded expression. In other cases, it will be a factored expression.

Example

The perimeter of a square is represented with the expression $84 + 44s$. What is the length of one side of the square?

A square has 4 sides, so factor 4 out of each term in the expression for the perimeter.

$84 + 44s = 4 \cdot 21 + 4 \cdot 11s = 4(21 + 11s)$

The factor within the parentheses represents the length of one side of the square.

The length of one side is $21 + 11s$.

Practice

1. Arturo earns n dollars per hour. Next month he will receive a 2% raise in pay per hour. The expression $n + 0.02n$ is one way to represent Arturo's pay per hour after the raise. Write an equivalent simplified expression that will represent his pay per hour after the raise.

2. The area of a garden plot can be represented by the expression $85.2z - 58.8$. The garden will be divided into six sections for planting six different vegetables. The sections will be equal in area. Write an expression that represents the area of each section.