8 Equivalent Expressions

Key Words

- equivalent
- like terms
- distributive property
- associative property

Equivalent expressions have the same value. However, equivalent expressions may not look the same even though they represent the same information or value. All of the expressions below are equivalent, even though they do not look the same.

$x + x + y + y$ $\quad 2x + y + y$ $\quad x + x + 2y$ $\quad 2x + 2y$ $\quad 2(x + y)$

You can use the properties of operations to create equivalent expressions. Terms with the same variable and power, called **like terms**, can be added or subtracted. You can also use the properties of operations, such as the **distributive property** and the **associative property**, to find out whether two expressions are equivalent.

Example 1

Use the distributive property to create an equivalent expression for $6x + 12y$.

The expression has two terms: $6x$ and $12y$.

The greatest common factor of both terms is 6.

$\frac{6x}{6} = x$ $\quad \frac{12y}{6} = 2y$

Factor out the 6.

$6x + 12y = 6(x + 2y)$

An equivalent expression for $6x + 12y$ is $6(x + 2y)$.

Example 2

Simplify $5(z + 6) - 3z + 25$ to create an equivalent expression.

Use the distributive property.
Multiply 5 and each addend in $(z + 6)$.

$5(z + 6) - 3z + 25$
$(5 \times z) + (5 \times 6) - 3z + 25$

Use the order of operations to simplify.

$5z + 30 - 3z + 25$

Use the associative property to combine like terms.

$(5z - 3z) + (30 + 25)$
$2z + 55$

$5(z + 6) - 3z + 25$ is equivalent to $2z + 55$.

CREATE

Create two equivalent expressions for the expression below.

$q + q + q + s + s + s + s + s + s$

Guided Practice

Simplify $8\left(\frac{1}{4}y + \frac{5}{2}\right) \div 4 - 2^2 + 3y$ to create an equivalent expression.

Step 1 Use the distributive property.

$8\left(\frac{1}{4}y + \frac{5}{2}\right) \div 4 - 2^2 + 3y$

$(8 \times \_\_\_\_\_) + (8 \times \_\_\_\_\_) \div 4 - 2^2 + 3y$

REMEMBER

The distributive property says multiply a value outside the parentheses by each value inside the parentheses.

Step 2 Evaluate the expression using the order of operations. Rewrite the expression after completing each step.

$(8 \times \_\_\_\_\_) + (8 \times \_\_\_\_\_) \div 4 - 2^2 + 3y$

_____ Multiply inside the parentheses.

_____ Evaluate exponents.

_____ Multiply or divide from left to right.

_____ Add or subtract from left to right.

Step 3 Combine the like terms.

$2y + 1 + 3y$

$(\_\_\_\_\_ + \_\_\_\_\_) + 1$

_____

REMEMBER

$2y$ and $3y$ are like terms, but 1 and $2y$ are not. Numbers without variables are like terms.

$8\left(\frac{1}{4}y + \frac{5}{2}\right) \div 4 - 2^2 + 3y$ is equivalent to _____.