

Use The Distributive Property To Write An Expression That Is Equivalent To $8 + 24x$

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Mathematics is a fundamental subject that forms the backbone of problem-solving, critical thinking, and logical reasoning. One of the essential concepts in algebra is the distributive property, which allows us to manipulate expressions, simplify calculations, and understand the relationships between different algebraic forms. Mastering how to use the distributive property is vital for students and professionals alike, especially when working with algebraic expressions involving variables and constants.

In this article, we will explore how to use the distributive property to write an expression equivalent to $8 + 24x$. We'll cover the basics of the distributive property, how it applies to algebraic expressions, and step-by-step instructions to transform the given expression into an equivalent form. Additionally, we'll discuss the importance of this property in various mathematical contexts and provide practice examples to reinforce your understanding.

Understanding the Distributive Property

What Is The Distributive Property?

The distributive property is a fundamental algebraic rule that describes how multiplication interacts with addition and subtraction within an expression. It states that:

For any numbers a , b , and c :

$$a \times (b + c) = a \times b + a \times c$$

Similarly, it also applies to subtraction:

$$a \times (b - c) = a \times b - a \times c$$

This property allows us to distribute a multiplier across terms inside parentheses, making expressions easier to simplify or factor.

Why Is The Distributive Property Important?

The distributive property is crucial because:

- It helps in expanding expressions, especially when simplifying algebraic equations.
- It aids in factoring expressions, which is vital in solving equations and polynomials.
- It provides a method to rewrite expressions in different forms, which can reveal easier ways to evaluate or manipulate them.
- It is foundational for understanding more advanced algebraic concepts such as polynomial multiplication, factoring, and solving equations.

Applying The Distributive Property To The Expression $8 + 24x$

Analyzing the Expression

The given expression is:

$$8 + 24x$$

This expression consists of a constant term (8) and a variable term ($24x$). Our goal is to rewrite this expression using the distributive property to find an equivalent form.

Step-by-Step Process to Rewrite $8 + 24x$

Let's explore how the distributive property can be applied here:

Step 1: Identify a common factor

Look at the coefficients 8 and 24. Both are divisible by 8:

- $8 \div 8 = 1$
- $24 \div 8 = 3$

This suggests that 8 is a common factor.

Step 2: Express the sum as a product

Since 8 is a common factor, we can factor it out:

$$8 + 24x = 8(1 + 3x)$$

Step 3: Verify the equivalence

To ensure the transformation is correct, expand the factored form:

$$8(1 + 3x) = 8 \times 1 + 8 \times 3x = 8 + 24x$$

This confirms that the factored form is equivalent to the original expression.

Understanding the Significance of Factoring Using the Distributive Property

Why Factor Out the Common Term?

Factoring expressions using the distributive property simplifies algebraic expressions, making it easier to:

- Solve equations
- Simplify complex expressions
- Find common denominators in fractions
- Factor polynomials for solving roots

In the case of $8 + 24x$, expressing the sum as $8(1 + 3x)$ reveals the common factor (8), which can be useful in solving equations or simplifying expressions further.

Example Applications

- Solving Equations: If $8 + 24x = 0$, then:

$$8(1 + 3x) = 0$$

Since $8 \neq 0$, divide both sides by 8:

$$1 + 3x = 0$$

$$3x = -1$$

$$x = -1/3$$

- Simplifying Expressions: Recognizing the common factor can simplify calculations in larger algebraic manipulations.

Additional Examples of Using The Distributive Property

To deepen understanding, let's explore more examples where the distributive property is used to manipulate expressions similar to $8 + 24x$.

Example 1: Factoring out a common factor from a similar expression

Given: $12 + 36x$

- Find the common factor:

Both 12 and 36 are divisible by 12:

$$12 \div 12 = 1$$

$$36 \div 12 = 3$$

- Rewrite as:

$$12 + 36x = 12(1 + 3x)$$

Example 2: Expanding an expression using the distributive property

Suppose we have:

$$4(2 + 5x)$$

- Apply the distributive property:

$$4 \times 2 + 4 \times 5x = 8 + 20x$$

- This is an expanded form, useful for simplifying or solving equations involving the expression.

Example 3: Combining like terms after applying the distributive property

Given: $3(4 + 2x) + 5x$

- Expand:

$$3 \times 4 + 3 \times 2x + 5x = 12 + 6x + 5x$$

- Combine like terms:

$$12 + (6x + 5x) = 12 + 11x$$

This process highlights how the distributive property facilitates the simplification of algebraic expressions.

Practice Problems to Master the Distributive Property

Engaging with practice problems enhances understanding and proficiency. Here are some exercises related to the topic:

1. Factor out the greatest common factor (GCF) from the expression: $15 + 45x$

2. Expand the expression: $7(3 + 4x)$

3. Simplify the expression: $6(2 + 5x) + 4x$

4. Rewrite $10 + 20x$ as a product using the distributive property.

5. If $8 + 24x = 0$, find the value of x .

Answers:

1. $15(1 + 3x)$

2. $21 + 28x$

3. $6 \times 2 + 6 \times 5x + 4x = 12 + 30x + 4x = 12 + 34x$

4. $2(5 + 10x)$

5. $8 + 24x = 0 \rightarrow 8(1 + 3x) = 0 \rightarrow 1 + 3x = 0 \rightarrow 3x = -1 \rightarrow x = -1/3$

Conclusion: The Power of The Distributive Property in Algebra

The distributive property is a cornerstone of algebra that enables mathematicians and students to manipulate and simplify expressions efficiently. By recognizing common factors and applying the property, complex expressions become more manageable, paving the way for solving equations, factoring, and further algebraic operations.

In the specific case of rewriting $8 + 24x$, factoring out the greatest common factor yields the equivalent expression $8(1 + 3x)$. This transformation not only simplifies the expression but also provides deeper insight into its structure, which can be instrumental in solving equations or performing algebraic operations.

Mastering the use of the distributive property is essential for success in algebra and higher mathematics. Regular practice, understanding the underlying concepts, and recognizing opportunities to apply the property will enhance your problem-solving skills and mathematical fluency.

Remember, the key steps involve identifying common factors, applying the distributive property to expand or factor expressions, and verifying the equivalence through expansion. With consistent practice, you'll become proficient in using this powerful mathematical tool to tackle a wide range of algebraic challenges.

Frequently Asked Questions

How can I use the distributive property to rewrite the expression $8 +$

$24x$?

You can factor out the common factor from 8 and $24x$, which is 8, resulting in $8(1 + 3x)$.

What is the equivalent expression of $8 + 24x$ using the distributive property?

The equivalent expression is $8(1 + 3x)$.

Why is it helpful to use the distributive property on $8 + 24x$?

Using the distributive property simplifies the expression, making it easier to factor, solve, or analyze.

Can I factor out any other number from $8 + 24x$?

No, the greatest common factor of 8 and $24x$ is 8, so that is the best choice to factor out.

How do I verify that $8(1 + 3x)$ is equivalent to $8 + 24x$?

You can expand $8(1 + 3x)$ to get $8 \cdot 1 + 8 \cdot 3x = 8 + 24x$, confirming they are equivalent.

Is the distributive property useful for simplifying expressions like $8 + 24x$?

Yes, it helps rewrite the expression in a factored form, which can be useful for solving equations or simplifying further.

How would I write the expression $8 + 24x$ as a product of factors using the distributive property?

You can write it as $8(1 + 3x)$, factoring out the common factor 8.

Additional Resources

Use The Distributive Property To Write An Expression That Is Equivalent To $8 + 24x$

Understanding how to utilize the distributive property to write equivalent expressions is a fundamental skill in algebra that facilitates simplification, factoring, and solving equations. The phrase Use The Distributive Property To Write An Expression That Is Equivalent To $8 + 24x$ highlights a common technique used by students and mathematicians alike to manipulate algebraic expressions. Mastering this concept not only enhances problem-solving efficiency but also deepens comprehension of algebraic

structures. This article provides a comprehensive overview of the distributive property, its application to the expression $8 + 24x$, and its significance in algebraic operations.

What Is the Distributive Property?

Definition and Explanation

The distributive property is one of the fundamental properties of arithmetic and algebra. It states that for all real numbers a , b , and c :

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

In words, this means that multiplying a sum by a number is the same as multiplying each addend individually by that number and then adding the products.

Significance in Algebra

This property allows us to expand expressions, factor common terms, and simplify complex algebraic formulas. It is especially useful when working with expressions involving parentheses, where distributing multiplication over addition or subtraction simplifies the structure for further manipulation.

Features of the Distributive Property:

- Enables expansion of expressions
- Facilitates factoring and simplification
- Essential for solving equations
- Applies to both numerical and algebraic expressions

Applying the Distributive Property to the Expression $8 + 24x$

Understanding the Expression

The given expression, $8 + 24x$, consists of a constant term (8) and a term with a variable ($24x$). To utilize the distributive property, we aim to express this as a product of a common factor and a binomial or

monomial.

Step-by-Step Process

1. Identify common factors:

Inspect the coefficients 8 and 24 to see if they share a common factor.

2. Factor out the greatest common factor (GCF):

The GCF of 8 and 24 is 8.

3. Rewrite the expression as a product:

Express $8 + 24x$ as 8 times an expression that, when distributed back, yields the original expression.

4. Express in the form $a(b + c)$:

Here, the common factor 8 can be factored out:

$$8 + 24x = 8(1) + 8(3x) = 8(1 + 3x)$$

5. Verify the equivalence:

Distribute 8 over $(1 + 3x)$:

$$8 \cdot 1 + 8 \cdot 3x = 8 + 24x$$

which confirms the correctness.

Result:

Using the distributive property, the expression $8 + 24x$ is equivalent to $8(1 + 3x)$.

Benefits of Using the Distributive Property in This Context

Advantages

- Simplifies expressions: Factoring out the GCF reduces the expression to a more manageable form.
- Facilitates solving equations: Recognizing common factors makes it easier to isolate variables.
- Prepares for further algebraic operations: Factored forms are useful for polynomial division, solving equations, and graphing.

Potential Challenges

- Identifying the GCF: Especially in more complex expressions, finding the greatest common factor can be tricky.
- Misapplication: Applying the distributive property incorrectly can lead to errors, particularly with negative signs or multiple terms.
- Not always necessary: Sometimes, distributing isn't necessary if the goal is simply to evaluate or simplify.

Features and Variations of the Distributive Property

Variants and Extensions

- Distributive property over subtraction:

$$a(b - c) = ab - ac$$

- Distributive property in algebraic expressions:

Used with polynomials, e.g., $(x + 2)(x + 3) = x(x + 3) + 2(x + 3)$

- Distributive property with multiple terms:

For example, $3(2x + 4y + 5) = 32x + 34y + 35$

Features:

- Works seamlessly with addition and subtraction.
- Extends to multiple terms and variables.
- Underpins many algebraic techniques such as factoring and expansion.

Practical Applications and Examples

Expanding Expressions

Suppose you have an algebraic expression like $8(1 + 3x)$. Distributing yields:

$$8 \cdot 1 + 8 \cdot 3x = 8 + 24x$$

This process is essential for simplifying expressions, especially when substituting values or solving equations.

Factoring Expressions

Given the expression $8 + 24x$, recognizing the GCF (8) allows us to write it as:

$$8(1 + 3x)$$

This is useful in solving equations where you need to isolate variables or simplify expressions for substitution.

Solving Equations

Consider the equation:

$$8 + 24x = 56$$

Factoring out 8:

$$8(1 + 3x) = 56$$

Dividing both sides by 8:

$$1 + 3x = 7$$

Subtracting 1:

$$3x = 6$$

Dividing by 3:

$$x = 2$$

This illustrates how the distributive property streamlines solving linear equations.

Common Mistakes and Tips for Success

Common Mistakes

- Incorrect GCF identification:

Sometimes, students pick a factor that doesn't divide all terms evenly.

- Misplacing signs:

When distributing over subtraction, signs can be overlooked or mishandled.

- Forgetting to verify:

Always expand the factored expression to ensure equivalence.

Tips for Effective Use

- Always check for the greatest common factor before factoring.
- Write out steps clearly to avoid sign errors.
- Practice with diverse examples to build intuition.
- Use visual aids, such as diagrams or algebra tiles, for kinesthetic understanding.

Conclusion

Mastering the use of the distributive property to write an expression equivalent to $8 + 24x$ is a vital skill that enhances algebraic fluency. By factoring out the greatest common factor, students can transform a simple sum involving a constant and a variable term into a more manageable product: $8(1 + 3x)$. This not only simplifies calculations but also lays the groundwork for solving equations, factoring, and understanding polynomial structures. While the concept is straightforward, attention to detail and practice are essential to avoid common pitfalls. Embracing the distributive property as a powerful tool allows students and mathematicians to approach algebraic problems with confidence and clarity, fostering a deeper understanding of the underlying mathematical principles.

In summary:

- The distributive property states that $a(b + c) = ab + ac$.
- Applying it to $8 + 24x$, we factor out 8 to get $8(1 + 3x)$.
- This process simplifies expressions and aids in solving equations.

- Recognizing common factors is key to effective application.
- Practice and careful verification ensure accuracy and reinforce understanding.

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