

Explain How To Use The Commutative Property Of Multiplication To Rewrite $4gh^3g^2h$.

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Understanding the properties of algebraic expressions is fundamental to mastering mathematics. One such property, the commutative property of multiplication, allows us to rearrange factors within a multiplication expression without changing its value. This property is particularly useful when simplifying complex algebraic expressions, making them easier to evaluate or factor. In this article, we will explore how to apply the commutative property to rewrite the expression $4gh^3g^2h$ effectively.

Introduction to the Commutative Property of Multiplication

The commutative property states that for any two numbers or algebraic expressions, the order in which they are multiplied does not affect the product. Formally:

- For numbers: $a \times b = b \times a$
- For algebraic expressions: $A \times B = B \times A$

This property is fundamental in algebra and helps in rearranging terms to simplify expressions, factor, or evaluate expressions more efficiently.

Example:

- $3 \times 5 = 5 \times 3$
- $xy \times z = z \times xy$

By reordering factors, algebraic expressions become more manageable, especially when combined with other properties like the associative or distributive properties.

Understanding the Expression: $4gh^3g^2h$

Before applying the commutative property, it is essential to analyze the expression carefully:

Original Expression: $4gh^3g^2h$

Let's break it down:

- The constant coefficient: 4
- Variables involved: g and h
- Exponents: h^3 and g^2
- The variables g and h appear multiple times, which suggests combining like terms could simplify the expression.

Note: The expression contains multiple factors involving g and h. The goal is to rearrange the factors to group similar bases together, which makes simplification straightforward.

Applying the Commutative Property to Rewrite the Expression

The main idea is to rearrange the factors 4, g, h^3 , g^2 , and h within the expression, leveraging the commutative property to group like bases together.

Step-by-step process:

Step 1: Recognize the multiplication sequence

The expression $4gh^3g^2h$ can be viewed as a product:

$$4 \times g \times h^3 \times g^2 \times h$$

Step 2: Rearrange factors using the commutative property

Since multiplication is commutative, we can rearrange the factors in any order:

$$4 \times g \times h^3 \times g^2 \times h = 4 \times g \times g^2 \times h^3 \times h$$

This grouping allows us to combine like bases more easily.

Step 3: Group like bases to simplify

- g terms: g and g^2
- h terms: h^3 and h

The expression now is:

$$4 \times g \times g^2 \times h^3 \times h$$

Step 4: Simplify the powers of variables

Using the laws of exponents:

- $g \times g^2 = g^{(1+2)} = g^3$
- $h^3 \times h = h^{(3+1)} = h^4$

So, the expression simplifies to:

$$4 \times g^3 \times h^4$$

Final Rewritten Expression

By applying the commutative property to rearrange the factors, the expression $4gh^3g^2h$ simplifies to:

$$4g^3h^4$$

This rewritten form is more concise and easier to evaluate or factor further.

Why Is Using the Commutative Property Important?

Using the commutative property in algebra helps:

- Simplify complex expressions
- Group like terms for easier exponentiation
- Prepare expressions for factoring or solving equations

- Enhance understanding of algebraic structures

In the case of $4gh^3g^2h$, it allows us to combine powers of the same variables seamlessly.

Additional Examples of Using the Commutative Property

To solidify understanding, here are more examples demonstrating how the commutative property can be applied:

Example 1:

Rewrite $2ab + 3ba$ using the commutative property.

Solution:

- Recognize that $ab = ba$
- The expression becomes $2ab + 3ab = (2 + 3)ab = 5ab$

Example 2:

Simplify $x^2 y \times y x^3$

Solution:

- Rearrange using commutative property: $x^2 y \times y x^3 = x^2 \times x^3 \times y \times y$
- Combine like bases: $x^{\{2+3\}} \times y^{\{1+1\}} = x^5 y^2$

Summary and Key Takeaways

- The commutative property of multiplication allows the rearrangement of factors without changing the product.
- To rewrite $4gh^3g^2h$, first rearrange to group like bases.
- Combine exponents using the laws of exponents after grouping.
- The final simplified expression is $4g^3h^4$.

Conclusion

Mastering the use of the commutative property of multiplication is essential in algebra, especially when simplifying complex expressions involving multiple variables and exponents. In the specific example of $4gh^3g^2h$, applying this property enables us to reorganize and combine similar factors efficiently, leading to a more manageable expression $4g^3h^4$. This process not only simplifies calculations but also provides a deeper understanding of algebraic structures and properties. Practice applying the commutative property to various expressions to strengthen your algebraic skills and improve problem-solving efficiency.

Additional Resources for Further Learning

- Algebra textbooks and workbooks
- Online algebra tutorials
- Interactive algebra practice platforms
- Videos explaining the properties of exponents and algebraic simplification

By consistently practicing these concepts, you'll become proficient in manipulating algebraic expressions and applying fundamental properties like the commutative property of multiplication with confidence.

Frequently Asked Questions

What is the commutative property of multiplication?

The commutative property of multiplication states that changing the order of the factors does not change the product, i.e., $a \times b = b \times a$.

How can I apply the commutative property to rewrite $4gh^3g^2h$?

You can rearrange the factors in any order, grouping similar terms, to make the expression easier to simplify, for example, by moving constants and like variables next to each other.

What is the simplified form of $4gh^3g^2h$ using the commutative property?

The simplified form is $4g^3h^4$, obtained by rearranging and combining like terms using the commutative property.

How do I combine exponents when rewriting the expression?

When rearranging, you can combine exponents of the same base by adding their powers, e.g., $g^1 g^2 = g^{1+2} = g^3$.

Is it necessary to rearrange all the factors in the expression?

No, it's not necessary, but rearranging factors using the commutative property can make it easier to combine like terms and simplify the expression.

Can the commutative property help in factoring the expression $4gh^3g^2h$?

Yes, by rearranging factors, you can recognize common factors and factor the expression more easily, such as extracting common powers of g and h .

Additional Resources

Explain How To Use The Commutative Property Of Multiplication To Rewrite $4gh^3g^2h$

Understanding how to manipulate algebraic expressions is fundamental in mathematics, especially when simplifying or factoring complex expressions. One of the key tools in this process is the commutative property of multiplication, which states that the order in which two numbers or variables are multiplied does not affect the product. When applied correctly, this property allows us to rearrange terms to make expressions more manageable or to highlight common factors.

In this guide, we'll explore how to use the commutative property of multiplication to rewrite $4gh^3g^2h$. This specific expression combines constants and variables with exponents, offering a perfect example of how the commutative property can simplify and reorganize algebraic terms efficiently.

What Is The Commutative Property Of Multiplication?

Before diving into the specific expression, let's clarify what the commutative property of multiplication entails:

- Definition: For any two numbers or variables, a and b , the property states that:
 $a \times b = b \times a$

- Application in algebra: This property applies to variables and constants alike, allowing the rearrangement of factors within a product without changing the overall value.

Example:

$$a \times b \times c = c \times a \times b = b \times c \times a, \text{ etc.}$$

This flexibility is vital when simplifying expressions involving multiple variables and constants because it helps group like terms and identify common factors.

Step-by-Step Breakdown of the Expression $4gh^3g^2h$

The expression we are analyzing is:

$$4gh^3g^2h$$

At first glance, it looks complex due to the repeated variables and exponents. Our goal is to use the commutative property of multiplication to rewrite this expression in a more simplified or organized form.

Step 1: Recognize and Group Like Terms

The key to simplifying this expression lies in recognizing that variables and their exponents can be rearranged because multiplication is commutative.

The original expression:

$$4gh^3g^2h$$

Let's identify the parts:

- Constant: 4
- Variables: g , h , g^2 , h

The expression contains:

- g and g^2 : which are like terms involving the same variable.
- h^3 and h : also like terms involving the same variable.

Step 2: Rearrange Using Commutative Property

Applying the commutative property, we can rearrange the factors to group similar variables together:

$$4 \times g \times g^2 \times h^3 \times h$$

This step involves swapping the positions of factors as needed, which does not change the value of the expression.

Step 3: Simplify the Variable Terms

Now, focus on the variables:

- $g \times g^2$: Since both are powers of g , we can use the exponent rules to simplify.
- $h^3 \times h$: Similarly, since h and h^3 are like bases, we can combine exponents.

Recall exponent rule:

$$a^m \times a^n = a^{m+n}$$

Applying this rule:

$$- g \times g^2 = g^{1+2} = g^3$$

$$- h^3 \times h = h^{3+1} = h^4$$

Step 4: Write the Simplified Expression

Putting it all together:

$$4 \times g^3 \times h^4$$

Or, more compactly:

$$4g^3h^4$$

This is the simplified form of the original expression, achieved by strategically using the commutative property to rearrange factors and then applying exponent rules to combine like bases.

Additional Tips for Using The Commutative Property in Similar Problems

- Always look for like bases: Variables with the same base can be combined by adding exponents when multiplied.
- Use rearrangement to simplify: Rearranging terms can make it easier to identify common factors or apply exponent rules.
- Keep constants separate: Constants like 4 can be factored out if needed, especially when simplifying or factoring expressions.
- Be cautious with addition/subtraction: The commutative property applies only to multiplication and addition, not to subtraction or division.

Summary: How To Use The Commutative Property To Rewrite Expressions

1. Identify the factors within the expression, including constants, variables, and exponents.
2. Apply the commutative property to rearrange the factors so that like terms are grouped together.
3. Combine like terms using exponent rules (e.g., $a^m \times a^n = a^{m+n}$).
4. Express the simplified form to make the expression more manageable or to prepare for further operations like factoring.

Final Thoughts

The commutative property of multiplication is a fundamental concept that simplifies the process of rewriting and understanding algebraic expressions. In the case of $4gh^3g^2h$, it allows us to re-order the factors to facilitate the combination of like terms, leading to a neater, more manageable expression: $4g^3h^4$.

Mastering this property not only streamlines algebraic simplification but also lays the groundwork for more advanced topics such as polynomial factoring, solving equations, and algebraic manipulation. Practicing the rearrangement of factors with various expressions will strengthen your algebraic intuition and problem-solving skills.

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