

What Is The Simplified Form Of $8b^3c^2 + 4b^3c^2 = \dots$ a. $12bcc$. $12b^3c^2d$. $12b^9c^4$

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Understanding how to simplify algebraic expressions is fundamental in mathematics, especially in algebra. When working with expressions like $8b^3c^2 + 4b^3c^2$, the goal is to combine like terms efficiently and accurately to arrive at the simplest possible form. This process not only helps in solving equations but also enhances problem-solving skills and conceptual understanding of algebraic principles. In this article, we will explore the step-by-step process of simplifying such expressions, identify the correct simplified form among the options provided, and discuss related concepts to deepen your understanding of algebraic simplification.

Understanding the Components of the Expression

Before diving into the simplification process, it is essential to understand the structure of the given algebraic expression:

$$8b^3c^2 + 4b^3c^2$$

Here, each term consists of:

- Numerical coefficients: 8 and 4
- Variables with exponents: b^3 and c^2

Recognizing these components allows us to identify like terms and apply the appropriate algebraic rules.

What Are Like Terms in Algebra?

Definition of Like Terms

Like terms are terms that have:

- The same variables raised to the same powers
- The same variable(s) involved

In the given expression, both terms contain b^3 and c^2 . Therefore, they are like terms and can be combined.

Importance of Like Terms in Simplification

Combining like terms simplifies the expression, making it more manageable and easier to interpret or solve further equations.

Step-by-Step Guide to Simplify $8b^3c^2 + 4b^3c^2$

Step 1: Identify the Like Terms

- Both terms contain b^3 and c^2 ; hence, they are like terms.

Step 2: Add the Numerical Coefficients

- $8 + 4 = 12$

Step 3: Keep the Variables with Their Exponents

- Since the variables are the same, retain b^3 and c^2

Step 4: Write the Combined Term

- The simplified expression becomes:

$$12b^3c^2$$

Understanding the Multiple-Choice Options

Given the options:

- a. $12bcc$
- b. $12b^3c^2$
- c. $12b^3c^2d$
- d. $12b^9c^4$

Let's analyze each:

1. Option a: $12bcc$
 - This suggests the variables are b and c multiplied twice.
 - However, the original variables are b^3 and c^2 , so this option does not accurately represent the simplified form.
2. Option b: $12b^3c^2$
 - This matches our simplified expression.
 - Correctly maintains the exponents and coefficients.
3. Option c: $12b^3c^2d$
 - Adds an extra variable d , which is not present in the original expression, making it incorrect.
4. Option d: $12b^9c^4$
 - Exponents are significantly different; this suggests some form of multiplication or exponent rules not applicable here.
 - Not related to the original expression.

Conclusion: The correct simplified form among the options is Option b: $12b^3c^2$.

Additional Concepts in Algebraic Simplification

Exponent Rules

Understanding how exponents work is crucial. Some key rules include:

1. **Product of Powers:** $a^m a^n = a^{(m + n)}$
2. **Power of a Power:** $(a^m)^n = a^{(m n)}$
3. **Product of Different Bases:** $a^m b^n$ remains separate unless bases are

the same

In our simplification, the first rule applies when combining coefficients with like bases.

Multiplying Variables with Exponents

If, for example, the terms were to be multiplied, exponents would be added:

$$b^m b^n = b^{(m + n)}$$

Similarly for c.

Implications for More Complex Expressions

Mastering these rules allows for simplifying more complicated expressions involving multiple variables and exponents.

Practical Applications of Simplifying Algebraic Expressions

Simplification isn't just an academic exercise; it has real-world applications, including:

- Solving equations in engineering and physics
- Calculating compound interest in finance
- Modeling real-world phenomena with algebraic formulas
- Optimizing functions in computer science and data analysis

Being proficient in simplifying expressions leads to more efficient problem-solving and accurate results across various domains.

Summary and Key Takeaways

- Like terms in algebra have the same variables raised to the same powers.
- To simplify expressions like $8b^3c^2 + 4b^3c^2$, combine the coefficients and keep the variables unchanged.
- The simplified form of the given expression is $12b^3c^2$.
- Among provided options, the correct answer is option b.
- Understanding the underlying rules of exponents and algebraic properties is essential for effective simplification.

Final Thoughts on Algebraic Simplification

Mastering the process of simplifying algebraic expressions is a fundamental skill that underpins higher-level mathematics and practical problem-solving. Recognizing like terms, applying exponent rules, and verifying solutions against multiple-choice options build confidence and competence. Whether you're tackling homework problems, preparing for exams, or applying mathematics in real-world scenarios, a solid grasp of these concepts will serve you well. Remember, practice makes perfect—regularly working through various problems will sharpen your skills and deepen your understanding of algebraic simplification.

In conclusion, the simplified form of $8b^3c^2 + 4b^3c^2$ is $12b^3c^2$, which aligns with option b among the multiple-choice answers. This process exemplifies fundamental algebraic principles that are essential for more advanced mathematical concepts and real-life applications.

Frequently Asked Questions

What is the simplified form of $8b^3c^2 + 4b^3c^2$?

The simplified form is $12b^3c^2$.

How do you combine like terms in algebraic expressions like $8b^3c^2 + 4b^3c^2$?

By adding their coefficients, so $8b^3c^2 + 4b^3c^2 = (8 + 4)b^3c^2 = 12b^3c^2$.

Which option correctly represents the simplified sum of $8b^3c^2$ and $4b^3c^2$?

Option a. $12bcc$ is incorrect; the correct answer is $12b^3c^2$, which matches option c.

Why isn't the simplified form $12b^{(9)}c^{(4)}$?

Because that would involve multiplying exponents, which is not appropriate when adding like terms; addition keeps exponents the same.

Is $12b^3c^2$ a correct simplified form of the expression $8b^3c^2 + 4b^3c^2$?

Yes, because adding the coefficients results in $12b^3c^2$.

What is the importance of like terms in simplifying algebraic expressions?

Like terms have the same variables raised to the same powers, allowing their coefficients to be combined through addition or subtraction.

Among the options given, which one correctly shows the simplified sum of $8b^3c^2 + 4b^3c^2$?

Option c. $12b^3c^2$ is correct.

Additional Resources

Simplification of Algebraic Expressions: Unveiling the Power of Combining Like Terms

Introduction

Mathematics, especially algebra, is often viewed as a language of patterns and relationships. Among its core principles is the simplification of expressions—transforming complex-looking formulas into their most manageable, elegant forms. This process not only makes calculations more straightforward but also reveals the underlying structure and relationships within the problem.

Today, we'll explore a specific algebraic expression:

$$8b^3c^2 + 4b^3c^2 = \dots$$

and analyze how to simplify it to its most concise form. This example may seem straightforward at first glance, but it encapsulates fundamental algebraic concepts such as combining like terms, factoring, and understanding exponents. We'll break down each step carefully, providing insights into the reasoning process, and finally, we'll compare the simplified expression to the multiple-choice options:

- a. $12b\ c$
- b. $12b^3c^2$
- c. $12b^3c^2d$
- d. $12b^9c^4$

Through this journey, you'll gain a deeper understanding of algebraic simplification, empowering you to approach similar problems with confidence.

Understanding the Components of the Expression

Before diving into the simplification, let's dissect the original expression:

$$8b^3c^2 + 4b^3c^2$$

This expression consists of two terms, each involving variables b and c , with exponents:

- $8b^3c^2$: Coefficient 8, variables b raised to the power 3, and c raised to the power 2.
- $4b^3c^2$: Coefficient 4, with the same variable parts as the first term.

Note: The presence of the same variable parts in both terms indicates they are like terms, which can be combined.

Why Is Combining Like Terms Important?

In algebra, like terms are terms that share the same variables raised to the same powers. When terms are like, they can be added directly by summing their coefficients, simplifying the expression without altering its value.

In our case, both terms have:

- The same variable b raised to the 3rd power (b^3).
- The same variable c raised to the 2nd power (c^2).

This commonality makes them like terms, opening the door to their combination.

Step-by-Step Simplification Process

1. Identify Like Terms

As established, $8b^3c^2$ and $4b^3c^2$ are like terms because they share the same variable parts.

2. Add the Coefficients

To simplify, add the coefficients (numbers in front):

$$- 8 + 4 = 12$$

This gives us a combined coefficient of 12 for the common variables.

3. Combine the Variables

Since the variables are the same, and their exponents are identical, the variable part remains as b^3c^2 .

4. Write the Simplified Expression

Putting it all together:

$$12b^3c^2$$

This is the simplified form of the original expression.

Confirming the Result with the Multiple-Choice Options

Now, let's compare our simplified expression to the options provided:

- a. $12b^1c^1$: This suggests b raised to the 1st power and c to the 1st power, which is not equivalent.
- b. $12b^3c^2$: Matches our simplified result exactly.
- c. $12b^3c^2d$: Includes an additional d , which is not present in the original expression.
- d. $12b^9c^4$: Has different exponents, not matching our result.

Thus, option b is the correct choice.

Additional Insights: Beyond Basic Simplification

While the straightforward process leads us to the answer, understanding some underlying principles enriches our grasp:

a) The Role of Exponents

- When combining like terms, exponents must be identical.
- For different exponents, the terms are not like and cannot be combined directly.
- For example, b^3 and b^4 are not like terms, but b^3 and b^3 are.

b) Factoring as an Alternative Method

Sometimes, factoring out the common term helps in understanding the structure:

- Factor b^3c^2 from both terms:

$$8b^3c^2 + 4b^3c^2 = (b^3c^2)(8 + 4) = 12b^3c^2$$

This approach confirms the combination process and reveals the common factor explicitly.

c) Significance in Larger Contexts

- Simplifying algebraic expressions is foundational in calculus, physics, engineering, and computer science.
- It streamlines complex equations, making it easier to analyze systems or solve for variables.
- Mastery of these techniques enables tackling advanced problems with confidence.

Practical Applications of Simplified Expressions

Understanding how to simplify algebraic expressions like $8b^3c^2 + 4b^3c^2$ is more than an academic exercise—it has real-world implications:

- Engineering: Simplifying formulas for stress, strain, or electrical networks.
- Physics: Reducing complex equations describing motion or energy.
- Computer Science: Optimizing code involving algebraic computations.
- Economics: Modeling and simplifying cost, revenue, or profit functions.

In each of these fields, the ability to distill complex expressions into their simplest form provides clarity and efficiency.

Summary of Key Takeaways

- Like terms are algebraic terms with identical variable parts and exponents.
- To simplify, combine the coefficients of like terms.
- The variables and exponents remain unchanged during addition; only the coefficients are summed.
- In the specific problem $8b^3c^2 + 4b^3c^2$, the simplified form is $12b^3c^2$.

- This matches option b in the multiple-choice list.

Final Thoughts

Mastering the art of algebraic simplification is essential for anyone seeking a strong foundation in mathematics. The example of combining $8b^3c^2 + 4b^3c^2$ into $12b^3c^2$ illustrates how recognizing like terms and understanding exponents streamline problem-solving processes.

Whether you're a student aiming to ace your math tests, a professional applying algebra in practical scenarios, or simply a curious learner exploring the language of mathematics, grasping these core concepts empowers you to approach complex problems with confidence and precision.

Remember: In algebra, as in many areas of life, simplification often leads to clarity, efficiency, and deeper understanding.

What Is The Simplified Form Of $8b^3c^2 + 4b^3c^2$ A $12b^3c^2$ B $32b^3c^2$ C $12b^6c^4$ D $12b^9c^4$

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