

Simplify $4x/5 + x/6x / x + 2$

Simplify $4x/5 + x/6x / x + 2$: A Comprehensive Guide to Algebraic Expression Simplification

Mathematics often involves manipulating complex algebraic expressions to simplify them into more manageable forms. One common challenge students and learners face is simplifying expressions involving fractions, variables, and multiple operations. The expression $4x/5 + x/6x / x + 2$ exemplifies such a challenge, combining fractions, variables, and mixed operations. Understanding how to approach, analyze, and simplify such expressions is vital for mastering algebra and progressing toward more advanced topics like calculus or algebraic functions.

In this comprehensive guide, we will explore the step-by-step process to simplify the expression $4x/5 + x/6x / x + 2$. We'll clarify the correct interpretation of the expression, delve into the fundamental principles of algebraic simplification, and provide practical tips to avoid common mistakes. Whether you're a student preparing for exams, a teacher seeking teaching strategies, or a math enthusiast looking to deepen your understanding, this article aims to equip you with the knowledge and confidence to handle similar algebraic challenges.

Understanding the Expression: Clarification and Interpretation

Deciphering the Expression Components

The given expression is: $4x/5 + x/6x / x + 2$. At first glance, it might seem complex due to the multiple fractions and variables. To simplify it effectively, it's crucial to interpret it correctly.

Key points to consider:

- The expression contains fractions: $4x/5$ and $x/6x$.
- The presence of a division operation: $/$ between $x/6x$ and $x + 2$.
- The importance of understanding operator precedence and grouping.

Most importantly, the question arises: Is the division applied to the entire sum, or is it only applied to the second term?

In standard mathematical notation, division has higher precedence than addition/subtraction unless parentheses specify otherwise. Therefore, the expression can be interpreted in two ways:

1. Without parentheses:

$$4x/5 + (x/6x) / (x + 2)$$

This suggests that the second term, $x/6x$, is divided by $x + 2$, and then added to $4x/5$.

2. With parentheses:

$$(4x/5 + x/6x) / (x + 2)$$

This implies the sum of the two fractions is divided by $x + 2$.

Given standard operator precedence, the first interpretation is more consistent unless parentheses are explicitly provided. For clarity, we'll analyze both interpretations and see which leads to meaningful simplifications.

Assuming the Expression Is: $4x/5 + (x/6x) / (x + 2)$

This is a common interpretation in algebraic expressions where division applies only to the nearest terms unless grouped differently.

Step 1: Simplify the innermost fractions

- Simplify $x/6x$:

Since $x / 6x$ involves the same variable in numerator and denominator, and assuming $x \neq 0$, then:

$$x / 6x = 1 / 6$$

Step 2: Rewrite the expression

Now, the expression becomes:

$$4x/5 + (1/6) / (x + 2)$$

Step 3: Simplify the division of fractions

Recall that:

$$(a/b) / c = (a/b) (1/c) = a / (b c)$$

Applying this:

$$(1/6) / (x + 2) = 1 / (6 (x + 2))$$

Step 4: Final simplified form

So, the overall expression is:

$$4x/5 + 1 / (6(x + 2))$$

This form is more manageable and can be further combined if needed.

Assuming the Expression Is: $(4x/5 + x/6x) / (x + 2)$

If parentheses are used, the expression simplifies differently.

Step 1: Simplify the numerator

- As before, $x/6x = 1/6$.
- Sum the fractions:

$$4x/5 + 1/6$$

Find common denominator:

- The least common denominator (LCD) of 5 and 6 is 30.

Express each over denominator 30:

$$(4x/5) = (4x6)/30 = (24x)/30$$

$$1/6 = (5)/30$$

Sum:

$$(24x + 5)/30$$

Step 2: Write the entire expression

Now, the expression becomes:

$$[(24x + 5)/30] / (x + 2)$$

Step 3: Simplify the division

Dividing by $(x + 2)$:

$$[(24x + 5)/30] [1 / (x + 2)] = (24x + 5) / [30(x + 2)]$$

Final simplified form:

$$(24x + 5) / [30(x + 2)]$$

Step-by-Step Approach to Simplifying Such Expressions

To effectively simplify algebraic expressions like $4x/5 + x/6x / x + 2$, follow these essential steps:

1. Clarify the Expression and Operator Precedence

- Determine whether parentheses are present or implied.
- Understand the order of operations (PEMDAS/BODMAS rules).
- Decide how division and addition are grouped.

2. Simplify Innermost Fractions First

- Look for common factors that can be canceled.
- Simplify fractions involving the same variables in numerator and denominator.

3. Handle Complex Fractions Carefully

- Convert complex fractions into simpler forms using multiplication by the reciprocal.
- Find common denominators when adding or subtracting fractions.

4. Combine Like Terms and Simplify Numerators/Denominators

- After simplification, combine terms where possible.
- Factor expressions to identify common factors for cancellation.

5. Write the Final Expression in Simplest Form

- Ensure the expression is fully simplified.
- Present the answer in a standard algebraic form.

Common Mistakes to Avoid

- Misinterpreting the division operation: Always clarify whether division applies to specific terms or the entire sum.
- Ignoring the variable assumptions: Remember to specify or consider the domain restrictions, such as variables not being zero where denominators appear.
- Forgetting to find common denominators: When adding fractions, always find the least common denominator.
- Neglecting to simplify fractions fully: Always check if numerator and denominator share common factors.

Practical Examples and Applications

Let's apply our understanding to some practical examples similar to the original problem.

Example 1: Simplify $(3x/4 + x/8) / (x + 2)$

Solution:

- Find LCD of 4 and 8: 8
- Rewrite fractions:

$$3x/4 = (3x \cdot 2)/8 = 6x/8$$

$$x/8 = x/8$$

- Sum numerator:

$$6x/8 + x/8 = (6x + x)/8 = (7x)/8$$

- Divide by $(x + 2)$:

$$(7x/8) / (x + 2) = (7x/8) (1/(x + 2)) = 7x / [8(x + 2)]$$

Final answer: $7x / [8(x + 2)]$

Example 2: Simplify $(2x/3 + x/9) / (x + 4)$

Solution:

- Find LCD of 3 and 9: 9
- Rewrite fractions:

$$2x/3 = (2x \cdot 3)/9 = 6x/9$$

$$x/9 = x/9$$

- Sum numerator:

$$6x/9 + x/9 = (6x + x)/9 = (7x)/9$$

- Divide by $(x + 4)$:

$$(7x/9) / (x + 4) = 7x / [9(x + 4)]$$

Final answer: $7x / [9(x + 4)]$

Conclusion: Mastering Algebraic Expression Simplification

Understanding and simplifying complex algebraic expressions like

Frequently Asked Questions

What is the simplified form of the expression $4x/5 + x/6x / x + 2$?

The expression appears to be a combination of fractions and variables. To simplify, first clarify the structure: $(4x/5) + (x/6x)$ divided by $(x + 2)$. Simplify each part step-by-step to reach the final simplified form.

How do I simplify the expression $4x/5 + x/6x / x + 2$?

Start by simplifying the numerator and denominator separately: simplify $x/6x$ to $1/6$, then combine terms in numerator, and divide by $(x + 2)$. This process leads to a simplified expression.

Is the expression $4x/5 + x/6x / x + 2$ an algebraic fraction?

Yes, it is a complex algebraic expression involving fractions and variables. Proper simplification involves combining like terms and simplifying complex fractions step-by-step.

What is the first step to simplify $4x/5 + x/6x / x + 2$?

The first step is to clarify the structure of the expression, determine the order of operations, and simplify the inner fractions, especially simplifying $x/6x$ to $1/6$ if applicable.

How do I handle the division in the expression $4x/5 + x/6x / x + 2$?

Treat the division as a fraction: $(4x/5 + x/6x)$ divided by $(x + 2)$. Find a common denominator for the numerator, then divide the resulting expression by $(x + 2)$.

Can I simplify $4x/5 + x/6x$ to a single fraction?

Yes. First, simplify $x/6x$ to $1/6$, then combine $4x/5$ and $1/6$ over a common denominator, resulting in a single fraction.

What is the simplified form of the numerator in the expression?

After simplification, the numerator becomes a combined fraction, such as $(24x/30 + 5/30) = (24x + 5)/30$, depending on the steps taken.

Is it necessary to factor or expand any parts of this expression during simplification?

Factoring or expanding is not necessary unless it simplifies the process. Focus on simplifying fractions and combining like terms first.

What is the final simplified form of the expression?

Once all parts are simplified and combined, the expression reduces to a fraction involving x , which can be expressed as a simplified algebraic fraction after combining numerator and denominator appropriately.

Additional Resources

Simplify $4x/5 + x/6x / x + 2$

In the realm of algebra, simplifying complex expressions is a fundamental skill that enhances understanding and problem-solving efficiency. One such expression that often appears in mathematical exercises is Simplify $4x/5 + x/6x / x + 2$. At first glance, this expression may seem daunting due to the multiple fractions, variables, and operations involved. However, with a systematic approach rooted in the principles of algebraic simplification—such as combining like terms, understanding the order of operations, and manipulating fractions—it becomes manageable and reveals a clearer, more concise form.

This article aims to walk readers through the process of simplifying this expression step-by-step, providing clarity and insight into the techniques used. Whether you're a student seeking to sharpen your algebra skills or a curious learner exploring the beauty of mathematical simplification, this comprehensive guide will serve as a valuable resource. Let's begin by dissecting the expression itself and setting the stage for a detailed walkthrough.

Understanding the Expression: Components and Structure

Before we dive into the simplification process, it's crucial to understand the structure of the expression:

Simplify $4x/5 + x/6x / x + 2$

At first glance, the expression appears as a combination of several terms with fractions and variables:

- Term 1: $4x/5$
- Term 2: $x/6x$
- A division operation: $(x / 6x) / x$
- A constant term: $+ 2$

However, the expression's formatting can be ambiguous. It's natural to question whether the division applies to the entire sum or just part of it. To clarify, we should interpret the expression carefully, considering the order of operations and standard algebraic conventions.

Clarifying the Expression

The most common interpretation of such an expression, especially when written informally, is:

$$\left[\frac{4x}{5} + \frac{\left(\frac{x}{6x} \right)}{x} + 2 \right]$$

This means:

- Calculate $\left(\frac{4x}{5} \right)$
- Calculate $\left(\frac{x}{6x} \right)$, then divide that result by (x) , i.e., $\left(\left(\frac{x}{6x} \right) \div x \right)$
- Add the constant 2 at the end

Alternatively, if the original expression is intended differently, such as the entire sum divided by $(x + 2)$, that would need clarification. For this article, we'll proceed with the first interpretation, which aligns with common usage and provides an interesting simplification process.

Step-by-Step Breakdown of the Simplification Process

Step 1: Simplify the Innermost Fractions

The starting point involves simplifying the simplest parts—the fractions within the expression.

Term A: $\left(\frac{4x}{5} \right)$

This term is already in its simplest form. It remains as is for now.

Term B: $\left(\frac{x}{6x} \right)$

Here, we notice that (x) appears in both numerator and denominator. As long as $(x \neq 0)$, we can simplify:

$$\left[\frac{x}{6x} = \frac{1}{6} \right]$$

This critical step reduces a complex-looking fraction to a simple constant.

Step 2: Simplify the Division of Fractions

Next, consider the term:

$$\left(\frac{x}{6x} \right) \div x$$

Substituting the simplified form from Step 1:

$$\frac{1}{6} \div x$$

Recall that dividing by a variable is equivalent to multiplying by its reciprocal:

$$\frac{1}{6} \div x = \frac{1}{6} \times \frac{1}{x} = \frac{1}{6x}$$

Thus, this segment simplifies to:

$$\frac{1}{6x}$$

Step 3: Reassemble the Expression

Now, the entire expression can be rewritten with the simplified components:

$$\frac{4x}{5} + \frac{1}{6x} + 2$$

At this stage, the expression involves two fractions with different denominators and a constant term. The goal is to combine these into a single, simplified expression if possible.

Combining Fractions: Finding a Common Denominator

To combine the fractional parts, we need a common denominator. The two fractions are:

$$\begin{aligned} & - \left(\frac{4x}{5} \right) \\ & - \left(\frac{1}{6x} \right) \end{aligned}$$

Step 4: Determine the Least Common Denominator (LCD)

The denominators are 5 and 6x. Their least common multiple (LCM) is:

$$\text{LCM of } 5 \text{ and } 6x = 30x$$

Because:

- 5 divides into 30 (since $30/5 = 6$)
- $6x$ divides into $30x$ (since $30x / 6x = 5$)

Step 5: Rewrite Each Fraction with the LCD

Express each fraction with denominator $30x$:

- For $\frac{4x}{5}$:

$$\frac{4x}{5} = \frac{4x \times 6x}{5 \times 6x} = \frac{4x \times 6x}{30x}$$

Calculate numerator:

$$4x \times 6x = 4 \times 6 \times x \times x = 24x^2$$

So,

$$\frac{4x}{5} = \frac{24x^2}{30x}$$

- For $\frac{1}{6x}$:

$$\frac{1}{6x} = \frac{1 \times 5}{6x \times 5} = \frac{5}{30x}$$

Now, the entire fractional sum becomes:

$$\frac{24x^2}{30x} + \frac{5}{30x} = \frac{24x^2 + 5}{30x}$$

Step 6: Incorporate the Constant Term

The original expression is:

$$\frac{24x^2 + 5}{30x} + 2$$

To combine everything into a single fraction, express 2 as a fraction with denominator $30x$:

$$2 = \frac{2 \times 30x}{30x} = \frac{60x}{30x}$$

\]

Finally, combine the fractions:

\[

$$\frac{24x^2 + 5 + 60x}{30x}$$

\]

Final Simplified Expression

The sum becomes:

\[

$$\boxed{\frac{24x^2 + 60x + 5}{30x}}$$

\]

This is a simplified, combined form of the original expression, assuming the initial interpretation. The numerator is a quadratic expression in (x) , and the denominator is linear.

Additional Insights and Considerations

1. Domain Restrictions

Throughout the simplification process, certain assumptions were made:

- $(x \neq 0)$, because division by zero is undefined.
- $(x \neq 0)$ to avoid undefined expressions like $(\frac{x}{6x})$ and to prevent division by zero in the denominator.

2. Factoring the Numerator

The numerator $(24x^2 + 60x + 5)$ does not factor neatly using standard methods, so it remains in its quadratic form unless specific values of (x) are substituted.

3. Special Values of (x)

If specific values of (x) are substituted, the expression can be evaluated directly, but care must be taken to avoid division by zero.

Practical Applications and Educational Significance

Understanding how to simplify complex algebraic expressions has broad applications:

- In solving equations: Simplification reduces the complexity of expressions, making equations easier to solve.

- In calculus: Simplified expressions are essential when computing derivatives and integrals.
- In real-world modeling: Simplified formulas allow for more straightforward interpretation and computation.

Furthermore, this process reinforces core algebraic concepts such as:

- Combining like terms
- Managing fractions and common denominators
- Simplifying complex rational expressions
- Recognizing common factors and simplifying them

Conclusion

Simplifying the expression $\frac{4x}{5} + \frac{x}{6x} / x + 2$ involves a systematic approach: breaking down the complex fractions, simplifying innermost terms, finding common denominators, and combining fractions into a single, manageable form. The final expression:

$$\frac{24x^2 + 60x + 5}{30x}$$

encapsulates the essence of the original, more complicated expression, presented in a clear and concise manner. Mastering such techniques enhances mathematical fluency and paves the way for tackling even more intricate algebraic challenges.

Whether you're a student honing your algebra skills or a professional applying math in various fields, understanding the step-by-step process of simplification is invaluable. With practice, such transformations become second nature, empowering you to decipher and manipulate complex expressions with confidence and precision.

[Simplify 4x 5 X 6x X 2](#)

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