

Simplify $\frac{5}{13} (75 - 49)$

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Understanding how to simplify fractions and perform operations involving fractions is a fundamental skill in mathematics. In this article, we will explore the process of simplifying the expression $\frac{5}{13} (75 - 49)$, breaking down each step to ensure clarity and comprehension. Whether you're a student learning fractions for the first time or someone seeking to improve your mathematical skills, this guide provides a comprehensive overview of the entire process, including the importance of simplifying, how to handle the subtraction within the parentheses, and how to finalize your calculations.

Understanding the Expression: Simplify $\frac{5}{13} (75 - 49)$

Before diving into the calculations, it's essential to interpret the expression correctly. The expression involves:

- A fraction: $\frac{5}{13}$
- A subtraction operation inside parentheses: $75 - 49$
- A multiplication implied between the fraction and the result of the subtraction

This type of expression is common in algebra and arithmetic, where multiple operations are combined. To simplify it effectively, we need to follow the order of operations, often remembered as PEMDAS (Parentheses, Exponents, Multiplication and Division, Addition and Subtraction).

Step-by-Step Process to Simplify the Expression

1. Evaluate the Parentheses: $75 - 49$

The first step is to perform the subtraction inside the parentheses:

- $75 - 49 = 26$

Now, the expression simplifies to:

- $\frac{5}{13} 26$

2. Understand the Multiplication of a Fraction and a Whole Number

The next step involves multiplying the fraction $5/13$ by the whole number 26.

Mathematically, this can be written as:

- $(5/13) \times 26$

Multiplying a fraction by a whole number is straightforward when you convert the whole number into a fraction.

- $26 = 26/1$

Therefore, the multiplication becomes:

- $(5/13) \times (26/1)$

3. Multiply the Numerators and Denominators

Recall that:

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

Applying this rule:

- Numerator: $5 \times 26 = 130$

- Denominator: $13 \times 1 = 13$

So, the product is:

- $130 / 13$

4. Simplify the Resulting Fraction

Now, simplify $130/13$:

- $130 \div 13 = 10$

Therefore, the simplified result of the entire expression is:

- 10

Additional Tips for Simplifying Fractions and Expressions

To enhance your understanding and efficiency in simplifying similar expressions, consider the following tips:

1. Always Follow the Order of Operations

Remember PEMDAS:

- Parentheses
- Exponents
- Multiplication and Division (from left to right)
- Addition and Subtraction (from left to right)

This ensures correct calculation sequences.

2. Convert Whole Numbers to Fractions When Needed

Multiplying fractions by whole numbers is easiest when the whole number is expressed as a fraction (e.g., 26 as $\frac{26}{1}$).

3. Simplify Fractions Before Multiplication

If possible, cancel common factors before multiplying to make calculations easier and to reduce the fraction to its simplest form.

4. Use Prime Factorization for Simplification

Breaking numbers into their prime factors can help identify common factors quickly.

Practical Applications of Simplifying Expressions

Understanding how to simplify expressions like $\frac{5}{13} (75 - 49)$ has numerous applications:

- Algebraic problem-solving: Simplifying complex expressions in equations.
- Real-world calculations: Computing proportions, ratios, or parts of quantities.
- Financial calculations: Calculating discounts, interest rates, or portions.

- Engineering and science: Simplifying formulas and expressions for clarity and accuracy.

Common Mistakes to Avoid

When working through such problems, be mindful of these common errors:

- Ignoring the order of operations: Performing addition/subtraction before multiplication when not in parentheses.
- Misinterpreting the expression: Confusing whether the fraction applies to the entire parentheses or just part of it.
- Incorrect multiplication of fractions: Forgetting to multiply numerator with numerator and denominator with denominator.
- Failing to simplify the final answer: Leaving fractions unsimplified when they can be reduced.

Summary of the Calculation Process

Here's a quick recap of how to handle the expression step-by-step:

1. Calculate the value inside parentheses: $75 - 49 = 26$
2. Rewrite the expression: $5/13 \times 26$
3. Convert 26 to a fraction: $26/1$
4. Multiply numerators and denominators: $(5 \times 26) / (13 \times 1) = 130 / 13$
5. Simplify the fraction: $130 \div 13 = 10$

Final result: 10

Conclusion

Simplifying the expression $5/13 (75 - 49)$ demonstrates the importance of understanding the order of operations, fraction multiplication, and simplification techniques. By carefully evaluating the parentheses first, converting whole numbers into fractions, and simplifying the resulting fraction, you arrive at the simplified answer: 10. Mastering these steps enhances your overall mathematical skills and prepares you for more complex problems involving fractions and algebraic expressions.

Remember, practice makes perfect. Try applying this method to similar problems to become more confident and efficient in your calculations. Whether in academic settings or

real-life situations, these foundational skills are invaluable for accurate and effective mathematical reasoning.

Frequently Asked Questions

How do I simplify the expression $\frac{5}{13} (75 - 49)$?

First, subtract 49 from 75 to get 26. Then multiply $\frac{5}{13}$ by 26: $(\frac{5}{13}) 26$. Simplify $\frac{26}{13}$ to 2, so the expression becomes $5 \times 2 = 10$.

What is the value of $\frac{5}{13}$ times the difference between 75 and 49?

Calculate $75 - 49 = 26$. Then multiply $\frac{5}{13}$ by 26: $(\frac{5}{13}) 26 = 10$.

Can you explain the steps to solve $\frac{5}{13} (75 - 49)$?

Yes. Step 1: subtract 49 from 75 to get 26. Step 2: multiply $\frac{5}{13}$ by 26. Since 26 divided by 13 is 2, the multiplication becomes 5 times 2, which equals 10.

Is there a shortcut to simplify $\frac{5}{13} (75 - 49)$?

Yes. Recognize that $75 - 49$ equals 26, then multiply $\frac{5}{13}$ by 26. Since $\frac{26}{13}$ equals 2, the result is 5 times 2, which is 10.

What is the final answer for the expression $\frac{5}{13} (75 - 49)$?

The final answer is 10.

Additional Resources

Simplify $\frac{5}{13} (75 - 49)$: A Comprehensive Analysis of Mathematical Simplification and Its Applications

Introduction

Mathematics is an essential discipline that underpins numerous aspects of our daily lives, from basic arithmetic to complex scientific computations. At the core of mathematical understanding lies the process of simplification—reducing expressions to their most manageable form for clarity and efficiency. One such example involves the expression $\frac{5}{13} (75 - 49)$, a seemingly straightforward problem that, when examined in detail, reveals important principles of algebraic manipulation, fraction handling, and computational

efficiency.

This article aims to thoroughly analyze this expression by breaking down each component, exploring the principles behind simplification, and discussing its practical implications across various contexts. Whether you're a student seeking to improve your mathematical skills or a professional integrating such calculations into your workflow, understanding the nuances behind this problem offers valuable insights.

The Context and Significance of Simplification in Mathematics

Why Simplify Expressions?

Simplification serves multiple purposes in mathematics:

- Clarity: Simplified expressions are easier to interpret and understand.
- Efficiency: Reducing complexity minimizes computational effort, especially important in programming and algorithm design.
- Error Reduction: Handling simpler forms reduces the likelihood of mistakes during calculations.
- Foundation for Advanced Concepts: Simplification is foundational for solving equations, optimizing functions, and performing algebraic manipulations.

In real-world applications, such as engineering, finance, and data science, the ability to efficiently simplify expressions directly impacts the accuracy and speed of problem-solving.

Dissecting the Expression: Step-by-Step Breakdown

The given expression is:

$$\left[\frac{5}{13} \times (75 - 49) \right]$$

Let's analyze each component:

1. Understanding the Components

- Fraction: $\left(\frac{5}{13} \right)$
- Parentheses: $\left((75 - 49) \right)$

The parentheses indicate that the subtraction should be performed before multiplying by the fraction, in accordance with the order of operations (PEMDAS/BODMAS).

2. Computing the Parentheses

Calculate $\left((75 - 49) \right)$:

$$\left[75 - 49 = 26 \right]$$

This step simplifies the expression to:

$$\left[\frac{5}{13} \times 26 \right]$$

3. Multiplying the Fraction by the Result

The key calculation:

$$\left[\frac{5}{13} \times 26 \right]$$

which can be approached in multiple ways to simplify efficiently.

Methods of Simplification

Method 1: Direct Multiplication

Express the multiplication as a single fraction:

$$\left[\frac{5}{13} \times 26 = \frac{5}{13} \times \frac{26}{1} \right]$$

Multiplying numerators and denominators:

$$\left[\frac{5 \times 26}{13 \times 1} = \frac{130}{13} \right]$$

Simplify numerator and denominator:

$$\left[\frac{130}{13} = 10 \right]$$

Result: The entire expression simplifies to 10.

Method 2: Cross-Cancellation for Greater Efficiency

Before multiplying, look for common factors to reduce the fraction:

- Recognize that 26 and 13 share a common factor:

$$\left[26 = 13 \times 2 \right]$$

Rewrite:

$$\left[\frac{5}{13} \times 26 = \frac{5}{13} \times 13 \times 2 \right]$$

Cancel out 13:

$$\left[\frac{5}{\cancel{13}} \times \cancel{13} \times 2 = 5 \times 2 = 10 \right]$$

This method streamlines the calculation and minimizes potential errors.

Practical Applications of Simplification

Understanding how to simplify expressions such as $\left(\frac{5}{13} \times (75 - 49)\right)$ is not only an academic exercise but also a practical skill with broad applications.

1. Financial Calculations

In finance, proportions and ratios are commonplace. For example, calculating interest, profit margins, or discounts often involves similar expressions. Recognizing how to simplify helps in swiftly deriving accurate figures, especially when dealing with large datasets or complex formulas.

2. Engineering and Physics

Engineers frequently encounter expressions involving fractions and differences, such as force distributions or electrical calculations. Simplification reduces computational load and enhances the precision of measurements and simulations.

3. Computer Science and Programming

Algorithms that involve mathematical operations benefit from simplified expressions for optimized performance. Knowing how to algebraically reduce operations can lead to more efficient code, particularly in environments with limited processing power.

Broader Mathematical Concepts Illustrated

The example encapsulates several key mathematical principles:

1. Order of Operations

The importance of correctly evaluating parentheses before multiplication underscores the foundational rule in mathematics, preventing miscalculations.

2. Fraction Multiplication and Simplification

Understanding the rules for multiplying fractions and reducing them to simplest form is vital for higher-level mathematics, including calculus, algebra, and number theory.

3. Cross-Cancellation Technique

The process of canceling common factors before multiplication exemplifies efficient problem-solving strategies, saving time and reducing errors.

Extending the Concept: Variations and Related Problems

To deepen understanding, consider exploring related scenarios:

- Varying the Numbers: How does changing the numbers inside parentheses or the fraction affect the outcome?
- Complex Fractions: How to handle fractions involving multiple terms or nested expressions?
- Algebraic Expressions: Applying similar principles to algebraic variables, such as $\left(\frac{a}{b} \times (c - d)\right)$.

This exploration enhances flexibility and adaptability in tackling diverse mathematical problems.

Educational Implications and Teaching Strategies

Teaching the process of simplifying expressions like $\left(\frac{5}{13} \times (75 - 49)\right)$ can benefit from:

- Visual Aids: Diagrams illustrating cancellation and multiplication.
- Step-by-Step Demonstrations: Breaking down each step to reinforce understanding.
- Practice Problems: Providing varied exercises to build proficiency.
- Real-World Contexts: Connecting problems to practical scenarios to increase engagement.

By fostering a deep understanding of simplification, educators prepare students for advanced math and real-world problem-solving.

Conclusion

The seemingly simple expression $\left(\frac{5}{13} \times (75 - 49)\right)$ offers a window into the fundamental processes of mathematical simplification. By carefully analyzing each component, applying efficient techniques such as cross-cancellation, and understanding the underlying principles, one can arrive at the solution with clarity and confidence.

This problem exemplifies the importance of foundational math skills that extend beyond the classroom into everyday life, professional work, and advanced scientific endeavors. Mastery of such techniques not only streamlines calculations but also cultivates a logical and analytical mindset essential for navigating the complexities of the modern world.

In essence, mastering the art of simplification transforms complex expressions into manageable, insightful solutions—empowering individuals across disciplines to think critically and act efficiently.

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