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Understanding how to multiply mixed numbers like $-3 \frac{2}{3}$ and $1 \frac{3}{4}$ is an essential skill in mathematics, especially when dealing with real-world problems involving fractions and negative numbers. These types of calculations often appear in contexts such as financial computations, measurements, and various applied sciences. This article provides a comprehensive guide to multiplying mixed numbers, focusing on the example of $-3 \frac{2}{3}$ times $1 \frac{3}{4}$. We will explore step-by-step procedures, tips for simplifying calculations, and common pitfalls to avoid. Whether you're a student learning fractions or someone needing a refresher, this guide aims to clarify the process and deepen your understanding.

Understanding Mixed Numbers and Their Significance

What Are Mixed Numbers?

Mixed numbers are numbers that combine an integer and a proper fraction. For example, $-3 \frac{2}{3}$ consists of the integer -3 and the fraction $\frac{2}{3}$. Similarly, $1 \frac{3}{4}$ combines the integer 1 with the fraction $\frac{3}{4}$.

Why Are Mixed Numbers Important?

Mixed numbers are often used in everyday situations where quantities are not whole numbers, such as measuring lengths, weights, or volumes. They provide a more precise representation of measurements than whole numbers alone.

Converting Mixed Numbers to Improper Fractions

To simplify multiplication involving mixed numbers, converting them into improper fractions is a standard step. An improper fraction has a numerator larger than its denominator, like $\frac{11}{3}$ or $\frac{7}{4}$.

Step-by-Step Guide to Multiplying Mixed

Numbers

Multiplying mixed numbers involves several clear steps:

Step 1: Convert Mixed Numbers to Improper Fractions

- For each mixed number, multiply the whole number by the denominator.
- Add the numerator to this product.
- Place the result over the original denominator.

Example Conversion:

- $-3 \frac{2}{3}$:
- Whole number: -3
- Fraction: $\frac{2}{3}$
- Convert:
- $\text{\textbackslash}(-3 \text{\textbackslash}times 3 = -9\text{\textbackslash})$
- $\text{\textbackslash}(-9 + 2 = -7\text{\textbackslash})$
- Improper fraction: $\text{\textbackslash}(-7/3\text{\textbackslash})$

- $1 \frac{3}{4}$:
- Whole number: 1
- Fraction: $\frac{3}{4}$
- Convert:
- $\text{\textbackslash}(1 \text{\textbackslash}times 4 = 4\text{\textbackslash})$
- $\text{\textbackslash}(4 + 3 = 7\text{\textbackslash})$
- Improper fraction: $\text{\textbackslash}(7/4\text{\textbackslash})$

Step 2: Multiply the Improper Fractions

- Multiply numerators together.
- Multiply denominators together.

Calculation:

$$\text{\textbackslash}\left(-\frac{7}{3}\right) \text{\textbackslash}times \text{\textbackslash}\left(\frac{7}{4}\right) = \frac{-7 \text{\textbackslash}times 7}{3 \text{\textbackslash}times 4} = \frac{-49}{12} \text{\textbackslash}$$

Step 3: Simplify the Result (if possible)

- Check if the numerator and denominator can be simplified by dividing by common factors.
- In this case, 49 and 12 have no common factors other than 1, so the fraction is already simplified.

Step 4: Convert the Improper Fraction Back to a Mixed Number (Optional)

- Divide numerator by denominator:

$$\begin{aligned} & \backslash \\ & -49 \div 12 = -4 \text{ with a remainder of } 1 \\ & \backslash \end{aligned}$$

- Write as a mixed number:

$$\begin{aligned} & \backslash \\ & -4 \frac{1}{12} \\ & \backslash \end{aligned}$$

Complete Calculation for $-3 \frac{2}{3}$ Times $1 \frac{3}{4}$

Putting it all together:

1. Convert to improper fractions:

$$\begin{aligned} & - \left(-3 \frac{2}{3} = -\frac{7}{3} \right) \\ & - \left(1 \frac{3}{4} = \frac{7}{4} \right) \end{aligned}$$

2. Multiply:

$$- \left(-\frac{7}{3} \times \frac{7}{4} = -\frac{49}{12} \right)$$

3. Convert back to mixed number:

$$\begin{aligned} & - \left(-49 \div 12 = -4 \right) \text{ with a remainder of } 1 \\ & - \text{Result: } \left(-4 \frac{1}{12} \right) \end{aligned}$$

Final answer:

$$\begin{aligned} & \backslash \\ & -3 \frac{2}{3} \times 1 \frac{3}{4} = -4 \frac{1}{12} \\ & \backslash \end{aligned}$$

Key Tips and Tricks for Multiplying Mixed Numbers

Always Convert to Improper Fractions

This simplifies multiplication, as multiplying fractions is straightforward.

Pay Attention to Sign Rules

- Multiplying a negative by a positive yields a negative.
- Multiplying two negatives yields a positive.

Reduce Fractions Before Multiplying

- Simplify fractions where possible to make calculations easier.

Double-Check Your Work

- Ensure you have converted correctly.
- Verify signs and simplifications.

Common Mistakes to Avoid

- Forgetting to convert mixed numbers to improper fractions before multiplying.
- Mismanaging signs, especially with negative numbers.
- Incorrectly multiplying numerators and denominators, leading to errors.
- Neglecting to simplify the final answer, which might make it less clear or less reduced.

Additional Examples and Practice Problems

To reinforce your understanding, here are additional examples:

1. Multiply $2 \frac{1}{2}$ by $3 \frac{2}{3}$
2. Multiply $-4 \frac{1}{4}$ by $2 \frac{3}{8}$
3. Multiply $0 \frac{5}{6}$ by $-1 \frac{1}{2}$

Solutions:

Example 1:

- Convert:
 - $(2 \frac{1}{2} = \frac{5}{2})$
 - $(3 \frac{2}{3} = \frac{11}{3})$
- Multiply:

- $(\frac{5}{2} \times \frac{11}{3} = \frac{5 \times 11}{2 \times 3} = \frac{55}{6})$
- Convert:
- $(\frac{55}{6} = 9)$ with remainder 1
- Result: $(9 \frac{1}{6})$

Example 2:

- Convert:
- $(-4 \frac{1}{4} = -\frac{17}{4})$
- $(2 \frac{3}{8} = \frac{19}{8})$
- Multiply:
- $(-\frac{17}{4} \times \frac{19}{8} = \frac{-17 \times 19}{4 \times 8} = -\frac{323}{32})$
- Convert:
- $(\frac{323}{32} = 10)$ remainder 3
- Result: $(-10 \frac{3}{32})$

Example 3:

- Convert:
- $(0 \frac{5}{6} = \frac{5}{6})$
- $(-1 \frac{1}{2} = -\frac{3}{2})$
- Multiply:
- $(\frac{5}{6} \times -\frac{3}{2} = \frac{5 \times -3}{6 \times 2} = -\frac{15}{12})$
- Simplify:
- $(-\frac{15}{12} = -\frac{5}{4})$
- Convert:
- $(-\frac{5}{4} = -1 \frac{1}{4})$

Practical Applications of Multiplying Mixed Numbers

Multiplying mixed numbers is not just an academic exercise; it has real-world applications:

- Cooking and Recipes: Adjusting ingredient quantities.
- Construction: Calculating lengths, areas, or volumes.
- Financial Calculations: Computing interest rates, payments, or discounts involving fractions.
- Physics: Calculations involving measurements and ratios.
- Education and Testing: Developing problem-solving skills and understanding fractions.

Conclusion: Mastering the Multiplication of

Mixed Numbers

Multiplying mixed numbers, especially with negative values, can initially seem challenging. However, by following a systematic approach—converting to improper fractions, multiplying numerators and denominators, and converting back to mixed numbers—you can perform these calculations accurately and efficiently. Remember to pay close attention to signs and to simplify your results whenever possible. With practice, multiplying mixed numbers becomes a straightforward process that you can confidently apply in various mathematical and real-world contexts.

Summary of Steps:

1. Convert mixed numbers to improper fractions.
2. Multiply numerators and denominators.
3. Simplify the resulting fraction.
4. Convert back to a mixed number if desired.
5. Keep track of signs throughout the process.

Embrace these methods to enhance your mathematical proficiency and solve fraction multiplication problems with ease, including complex examples like $-3 \frac{2}{3}$ times $1 \frac{3}{4}$.

Keywords: multiplying mixed numbers, improper fractions, converting mixed numbers, fraction multiplication, negative mixed numbers, fraction simplification, real-world applications of fractions

Frequently Asked Questions

How do I multiply mixed numbers like $-3 \frac{2}{3}$ and $1 \frac{3}{4}$?

Convert both mixed numbers to improper fractions, then multiply the numerators and denominators, and simplify the result if possible.

What is the first step to solve $-3 \frac{2}{3} \times 1 \frac{3}{4}$?

Convert $-3 \frac{2}{3}$ to an improper fraction ($-11/3$) and $1 \frac{3}{4}$ to $7/4$, then multiply the two fractions.

How do I convert mixed numbers to improper fractions?

Multiply the whole number by the denominator, add the numerator, then place the result over the original denominator.

What is the product of $-11/3$ and $7/4$?

Multiply numerators: $-11 \times 7 = -77$; multiply denominators: $3 \times 4 = 12$; so, the product is $-77/12$.

How do I simplify the fraction $-77/12$?

Since 77 and 12 have no common factors other than 1, $-77/12$ is already in simplest form, or you can write it as a mixed number: $-6 \frac{5}{12}$.

What is the final answer to $-3 \frac{2}{3}$ times $1 \frac{3}{4}$?

The product is $-77/12$, which can be expressed as $-6 \frac{5}{12}$ in mixed number form.

Are negative mixed numbers handled differently in multiplication?

No, convert to improper fractions, multiply normally, then apply the negative sign to the result as needed.

Can I use a calculator to multiply mixed numbers directly?

It's best to convert mixed numbers to improper fractions first, then multiply, but some calculators can handle mixed numbers directly if supported.

What are some tips for multiplying mixed numbers accurately?

Always convert to improper fractions, multiply numerators and denominators separately, and simplify the result for an accurate answer.

Additional Resources

Understanding the Multiplication of Fractions: Exploring $-3 \frac{2}{3} \times 1 \frac{3}{4}$

Multiplying mixed numbers can seem daunting at first glance, but with a clear understanding of the process and underlying principles, it becomes an accessible and even enjoyable mathematical activity. Today, we will dissect the problem: $-3 \frac{2}{3} \times 1 \frac{3}{4}$, exploring each step in detail, the rationale behind the methods used, and practical applications. Whether you're a student brushing up on fractions or an educator preparing a lesson plan, this comprehensive review aims to leave no stone unturned.

Breaking Down the Expression: Understanding Mixed Numbers

Before diving into calculations, it's essential to clarify what mixed numbers are and how

they can be manipulated algebraically.

What are Mixed Numbers?

- Mixed numbers combine a whole number and a proper fraction. For example, $-3 \frac{2}{3}$ comprises:

- Whole part: -3
- Fractional part: $\frac{2}{3}$

- Similarly, $1 \frac{3}{4}$ has:

- Whole part: 1
- Fractional part: $\frac{3}{4}$

Why Convert Mixed Numbers to Improper Fractions?

- Simplifies calculations
- Facilitates multiplication and division
- Eliminates ambiguity associated with mixed notation

Step-by-Step Conversion to Improper Fractions

To multiply mixed numbers, the standard procedure involves converting each into an improper fraction:

Converting $-3 \frac{2}{3}$ to an Improper Fraction

1. Ignore the negative sign momentarily during conversion; handle it after calculation.
2. Calculate the improper fraction:

$$\begin{aligned} & \backslash \\ -3 \frac{2}{3} &= - \left(3 + \frac{2}{3} \right) \\ & \backslash \end{aligned}$$

3. Convert whole number to fraction with denominator 3:

$$\begin{aligned} & \backslash \\ 3 &= \frac{3 \times 3}{3} = \frac{9}{3} \\ & \backslash \end{aligned}$$

4. Add the fractional parts:

$$\begin{aligned} & \backslash \\ \frac{9}{3} + \frac{2}{3} &= \frac{11}{3} \\ & \backslash \end{aligned}$$

5. Apply the negative sign:

$$\begin{aligned} & \backslash \\ & - \frac{11}{3} \\ & \backslash \end{aligned}$$

Converting $1 \frac{3}{4}$ to an Improper Fraction

1. Express whole number:

$$\begin{aligned} & \backslash \\ 1 &= \frac{1 \times 4}{4} = \frac{4}{4} \\ & \backslash \end{aligned}$$

2. Add fractional part:

$$\begin{aligned} & \backslash \\ \frac{4}{4} &+ \frac{3}{4} = \frac{7}{4} \\ & \backslash \end{aligned}$$

Performing the Multiplication

Now, the original problem transforms into:

$$\begin{aligned} & \backslash \\ & - \frac{11}{3} \times \frac{7}{4} \\ & \backslash \end{aligned}$$

Handling the Negative Sign

- The negative sign applies to the entire product unless specified otherwise.
- The multiplication involves a negative and positive fraction, resulting in a negative product.

Multiplication of Fractions

- Multiply the numerators:

$$\begin{aligned} & \backslash \\ & - \frac{11 \times 7}{3 \times 4} = - \frac{77}{12} \\ & \backslash \end{aligned}$$

- Simplify if possible: In this case, 77 and 12 share no common divisors other than 1, so the fraction is already in simplest form.

Converting Back to a Mixed Number (Optional)

While improper fractions are often preferable for calculations, converting back to mixed numbers can make the result more understandable.

Expressing $(-\frac{77}{12})$ as a mixed number:

1. Divide numerator by denominator:

$$\begin{array}{l} \backslash \\ 77 \div 12 = 6 \text{ with a remainder} \\ \backslash \end{array}$$

2. Calculate quotient and remainder:

$$\begin{array}{l} \backslash \\ 12 \times 6 = 72 \\ \backslash \\ \backslash \\ 77 - 72 = 5 \\ \backslash \end{array}$$

3. Write as mixed number:

$$\begin{array}{l} \backslash \\ 6 \frac{5}{12} \\ \backslash \end{array}$$

4. Apply the negative sign:

$$\begin{array}{l} \backslash \\ - 6 \frac{5}{12} \\ \backslash \end{array}$$

Exploring the Sign and Its Implications

The negative sign in the original problem indicates the final result is negative. This is consistent with the rules of multiplication involving signed numbers:

- Negative $\times$ Positive = Negative
- Positive $\times$ Negative = Negative
- Negative $\times$ Negative = Positive

In our case, since $(-3 \frac{2}{3})$ is negative and $(1 \frac{3}{4})$ is positive, their product must be negative, which aligns with our computed answer: $(- 6 \frac{5}{12})$.

Alternative Approaches and Insights

While converting to improper fractions is standard, alternative perspectives can deepen understanding.

Visualizing Fraction Multiplication

- Area Model: Imagine rectangles representing each fraction; multiplying the two gives a new smaller rectangle, illustrating the area proportional to the product.
- Number Line: Plotting mixed numbers and their product can help visualize the multiplication, especially for negative values.

Using Decimals for Approximate Results

- Convert to decimals:

$$-3\frac{2}{3} \approx -3.6667$$

$$1\frac{3}{4} = 1.75$$

- Multiply:

$$-3.6667 \times 1.75 \approx -6.4167$$

- Convert back to a mixed number:

$$-6\frac{5}{12} \approx -6.4167$$

This confirms our exact calculation, illustrating the consistency between fraction and decimal methods.

Practical Applications and Real-World Contexts

Understanding how to multiply mixed numbers is not just a theoretical exercise; it has concrete applications in various fields:

- Construction and Engineering: Calculating areas, volumes, or material quantities involving mixed measurements.
- Cooking and Recipes: Adjusting ingredient proportions when recipes are scaled up or down.
- Finance: Computing proportional interests or discounts expressed in mixed terms.
- Education: Enhancing students' number sense and their ability to manipulate fractions confidently.

Common Mistakes and How to Avoid Them

While the process seems straightforward, several typical errors can occur:

- Forgetting to convert mixed numbers to improper fractions: Leads to incorrect calculations.
- Incorrectly handling signs: Not paying attention to negative signs can produce errors in the final answer.
- Simplifying prematurely: Always perform multiplication first, then simplify if necessary.
- Miscalculating remainders when converting back to mixed numbers: Double-check division and remainder calculations.

To avoid these pitfalls:

- Always convert mixed numbers to improper fractions before multiplying.
- Keep track of signs separately or incorporate them into the fractions.
- Perform multiplication carefully, verifying each step.
- Use a calculator for division and remainders when in doubt.

Summary of the Process

To encapsulate the entire process:

1. Convert each mixed number to an improper fraction.
2. Multiply the numerators and denominators.
3. Simplify the resulting fraction if possible.
4. Convert back to a mixed number if desired.
5. Apply the correct sign based on the original numbers.

Applying these steps to $-3 \frac{2}{3} \times 1 \frac{3}{4}$ yields the final answer:

\[
\boxed{
- 6 \frac{5}{12}}

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Conclusion: Mastering Fraction Multiplication with Confidence

The detailed exploration of $-3\frac{2}{3} \times 1\frac{3}{4}$ showcases the importance of understanding the underlying mechanics of fractions, signs, and conversions. Mastery of these concepts allows for accurate and efficient calculation, vital in academic, professional, and everyday contexts. The approach—converting mixed numbers to improper fractions, performing multiplication, and converting back—is a robust method that can be applied to all similar problems.

By internalizing these steps and recognizing potential pitfalls, learners can develop a strong foundation in fractional arithmetic, enhancing their mathematical fluency and problem-solving skills. Remember, practice makes perfect: regularly working through such problems solidifies understanding and builds confidence.

Whether solving for homework, designing a project, or simply satisfying curiosity, mastering the multiplication of mixed numbers like $-3\frac{2}{3} \times 1\frac{3}{4}$ opens the door to a deeper appreciation of the elegance and utility of fractions in the mathematical landscape.

[3 2 3 Times 1 3 4](#)

3 2 3 Times 1 3 4

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