

What is the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$?

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Understanding how to multiply mixed numbers and negative values can seem challenging at first, but with a clear step-by-step approach, it becomes manageable. In this comprehensive guide, we'll explore how to find the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$, breaking down each step to ensure clarity. Whether you're a student seeking homework help or someone interested in sharpening your math skills, this article will provide detailed explanations, relevant tips, and practical examples.

Understanding the Problem: Multiplying Mixed Numbers with Negative Signs

Before diving into calculations, it's essential to understand what the problem entails.

What Are Mixed Numbers?

Mixed numbers combine a whole number and a fraction, such as:

- $3 \frac{1}{3}$
- $8 \frac{7}{10}$

They are often easier to interpret and work with when converted into improper fractions during calculations.

The Role of Negative Numbers in Multiplication

Multiplying negative numbers follows specific rules:

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

In our case, both numbers are negative, so their product will be positive.

Step-by-Step Solution to Find the Product

Let's analyze how to compute the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$ systematically.

Step 1: Convert Mixed Numbers to Improper Fractions

Converting mixed numbers simplifies multiplication.

1. Convert $3 \frac{1}{3}$:

- Whole number: 3
- Fraction: $\frac{1}{3}$
- Conversion:
 - Multiply whole number by denominator: $3 \times 3 = 9$
 - Add numerator: $9 + 1 = 10$
 - Write as improper fraction: $\frac{10}{3}$

2. Convert $8 \frac{7}{10}$:

- Whole number: 8
- Fraction: $\frac{7}{10}$
- Conversion:
 - Multiply whole number by denominator: $8 \times 10 = 80$
 - Add numerator: $80 + 7 = 87$
 - Write as improper fraction: $\frac{87}{10}$

Step 2: Apply the Negative Sign

Since both original numbers are negative, the product will be positive.

- $(-3 \frac{1}{3})$ becomes $(\frac{10}{3})$

- $(-8 \frac{7}{10})$ becomes $(\frac{87}{10})$

Multiplying the absolute values:

$\frac{10}{3} \times \frac{87}{10}$

$$\left| -\frac{10}{3} \right| \times \left| -\frac{87}{10} \right| = \frac{10}{3} \times \frac{87}{10}$$

The negative signs cancel out because:

$$(-) \times (-) = (+)$$

Step 3: Multiply the Improper Fractions

Multiply numerators and denominators:

$$\frac{10 \times 87}{3 \times 10} = \frac{870}{30}$$

Step 4: Simplify the Resulting Fraction

Simplify $\frac{870}{30}$:

- Both numerator and denominator are divisible by 30.
- $(870 \div 30 = 29)$
- $(30 \div 30 = 1)$

Therefore, the product simplifies to:

$$\boxed{29}$$

Final Answer

The product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$ is 29.

Additional Insights and Tips

Understanding this problem opens the door to mastering similar calculations involving mixed numbers and negative values. Here are some helpful tips:

Tips for Multiplying Mixed Numbers

- Always convert mixed numbers to improper fractions before multiplying.

- Remember to check the signs of the numbers to determine the sign of the product.
- Simplify fractions at each step to make calculations easier.
- Use prime factorization for large numbers to simplify fractions efficiently.

Common Mistakes to Avoid

1. Forgetting to convert mixed numbers before multiplying.
2. Ignoring the negative signs and assuming the product is negative.
3. Failing to simplify the resulting fraction fully.

Practical Applications of Multiplying Mixed Numbers

Multiplying mixed numbers appears in various real-life contexts, including:

- Cooking and Recipes: Adjusting ingredient quantities.
- Construction and Engineering: Calculating areas or lengths involving fractional measurements.
- Financial Calculations: Computing interest rates or proportions involving fractions.

Recognizing how to handle these calculations efficiently can save time and reduce errors.

Conclusion

Calculating the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$ involves converting mixed numbers to improper fractions, applying the rules of multiplication for negative numbers, multiplying the fractions, and simplifying the result. The process highlights the importance of understanding fractions, signs, and simplification techniques. With practice, such calculations become intuitive, empowering you to solve more complex problems confidently.

Additional Resources for Learning Fraction Multiplication

- [Khan Academy: Fraction Multiplication](#)
- [Math Is Fun: Fractions](#)
- [TI Community: Multiplying Mixed Fractions](#)

By mastering the steps outlined above, you'll be well-equipped to handle similar problems with confidence and precision.

Frequently Asked Questions

What is the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$?

The product is $28 \frac{14}{15}$.

How do you multiply mixed numbers like $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$?

Convert each mixed number to an improper fraction, multiply the numerators and denominators, then simplify the result.

What is the first step to multiply $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$?

Convert $-3 \frac{1}{3}$ to an improper fraction (which is $-\frac{10}{3}$) and $-8 \frac{7}{10}$ to $-\frac{87}{10}$.

After converting to improper fractions, how do you multiply $-\frac{10}{3}$ and $-\frac{87}{10}$?

Multiply the numerators: $-10 \times -87 = 870$, and the denominators: $3 \times 10 = 30$, resulting in $\frac{870}{30}$.

What is the simplified form of $\frac{870}{30}$?

Simplify $\frac{870}{30}$ by dividing numerator and denominator by 30, resulting in 29.

What is the final answer when multiplying $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$?

The product is 29.

Are the signs of the numbers important when multiplying mixed numbers?

Yes, multiplying two negative numbers results in a positive product.

Can the answer to $-3 \frac{1}{3}$ times $-8 \frac{7}{10}$ be written as a mixed number?

Since the product simplifies to a whole number, 29, it can be expressed as a mixed number as 29.

What is the significance of converting mixed numbers to improper fractions before multiplication?

It simplifies the multiplication process and ensures accuracy in calculating the product.

Is the product of two negative mixed numbers always positive?

Yes, multiplying two negative numbers always results in a positive product.

Additional Resources

What is the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$?

Understanding the multiplication of mixed numbers, especially when involving negative values, is an essential skill in mathematics that bridges basic arithmetic with more advanced algebraic concepts. This problem, which asks for the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$, serves as a practical example to explore various aspects of fractions, negative numbers, and their interactions. This article delves into the intricacies of this calculation, providing a comprehensive analysis suitable for learners, educators, and anyone interested in mathematical reasoning.

Breaking Down the Problem: What Are the Numbers Involved?

Before diving into calculations, it's vital to understand the components of the problem:

- Mixed Numbers: Both numbers are expressed as mixed numbers, combining whole numbers with fractional parts:
- $-3 \frac{1}{3}$
- $-8 \frac{7}{10}$

- Negative Signs: Both numbers are negative, which influences the sign of the product.

This section clarifies the nature of these numbers and prepares us for accurate conversion and calculation.

Understanding Mixed Numbers and Their Conversion

Mixed numbers are a combination of whole numbers and proper fractions. They are often used in everyday contexts, such as measurements or quantities that are not whole. To facilitate multiplication, these mixed numbers need to be converted into improper fractions.

What is an Improper Fraction?

An improper fraction has a numerator larger than its denominator (e.g., $7/4$). It simplifies the process of multiplication and division involving fractions.

Conversion Process

To convert a mixed number to an improper fraction:

1. Multiply the whole number part by the denominator.
2. Add the result to the numerator.
3. Place this sum over the original denominator.

Let's apply this process to each number:

For $-3 \frac{1}{3}$:

- Whole number: 3
- Fraction: $\frac{1}{3}$

Conversion:

- 3×3 (denominator) = 9
- $9 + 1 = 10$
- Improper fraction: $\frac{10}{3}$

Since the original number is negative:

$$-3 \frac{1}{3} = -\frac{10}{3}$$

For $-8 \frac{7}{10}$:

- Whole number: 8
- Fraction: $\frac{7}{10}$

Conversion:

- $8 \times 10 = 80$
- $80 + 7 = 87$
- Improper fraction: $87/10$

Including the negative sign:

- $-8 \frac{7}{10} = -87/10$

Calculating the Product: Multiplying Mixed Numbers as Improper Fractions

With both numbers converted, the multiplication involves two improper fractions:

- $(-10/3) \times (-87/10)$

Rules of Multiplying Fractions

- Multiply numerators to get the numerator of the product.
- Multiply denominators to get the denominator of the product.
- Simplify the resulting fraction if possible.
- Consider the signs: multiplying two negatives results in a positive.

Step-by-Step Calculation

1. Multiply numerators:

$$-10 \times -87 = (\text{since negative} \times \text{negative} = \text{positive}):$$

$$10 \times 87 = 870$$

2. Multiply denominators:

$$3 \times 10 = 30$$

3. Form the fraction:

$$870/30$$

4. Simplify the fraction:

$$870 \div 30 = 29$$

So, the simplified product is 29.

Final Sign:

- Negative times negative = positive.
- Therefore, the product is +29.

Interpreting the Result: What Does the Answer Mean?

The multiplication yields a positive whole number: 29. This outcome aligns with mathematical rules: multiplying two negative numbers results in a positive number, regardless of their fractional parts.

This result has several implications:

- Magnitude: The product reflects the combined magnitude of the two numbers, emphasizing how negative quantities influence each other in multiplication.
- Real-world analogy: If negative numbers represent debt or loss, then multiplying two negative quantities could relate to scenarios where the "double negative" results in a positive, such as in financial mathematics or physics.

Additional Considerations and Mathematical Insights

This problem is not only about straightforward calculation; it also offers avenues to explore deeper mathematical concepts:

Sign Rules in Multiplication

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

Understanding these rules is fundamental in algebra and helps prevent common errors.

Significance of Converting Mixed Numbers

Converting mixed numbers to improper fractions simplifies calculations, especially when multiplying or dividing. This process illustrates the importance of flexibility in mathematical representations.

Simplification and Fractions

The process demonstrates how fractions can be simplified after multiplication, emphasizing the importance of factoring and reducing to simplest terms.

Practical Applications of the Calculation

While this problem appears purely theoretical, it has practical applications in various fields:

- Engineering and Measurements: Converting mixed measurements into improper fractions facilitates precise calculations.
- Finance: Negative numbers often denote losses; understanding how they interact mathematically can inform financial modeling.
- Physics: Negative quantities in physics, such as displacement or charge, require careful handling during calculations.

Common Mistakes and How to Avoid Them

In solving similar problems, students and practitioners often encounter pitfalls:

- Misreading signs: Remember that multiplying two negatives results in a positive.
- Incorrect conversion: Ensure accurate conversion of mixed numbers into improper fractions.
- Simplification errors: Always check if the resulting fraction can be simplified further.

By adhering to mathematical rules and double-checking work, these errors can be minimized.

Conclusion: The Significance of the Result

The calculation of the product of $-3 \frac{1}{3}$ and $-8 \frac{7}{10}$, culminating in a clean, positive answer of 29, encapsulates many fundamental principles of arithmetic involving mixed numbers and negative values. It highlights the importance of proper conversion, sign rules, and simplification in mathematical operations. Beyond the numbers, this process underscores the logical structure underlying arithmetic and its relevance across disciplines, from everyday measurements to complex scientific calculations.

Understanding such problems enhances numerical literacy, promotes precision, and fosters

a deeper appreciation for the elegance and consistency of mathematics. As learners become more comfortable with these techniques, they unlock the ability to tackle increasingly complex problems with confidence and clarity, making mathematics not just a subject of rote computation but a powerful tool for reasoning and problem-solving in the real world.

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