

Find The Cost Of $10 \frac{2}{3}$ Metre Of Cloth Purchased At The Rate Of $14 \frac{22}{25}$ Per Metre.

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Calculating the cost of a specific length of cloth at a given rate involves understanding and manipulating fractions, decimals, and unit conversions. This problem provides a mixed measurement of the cloth length— $10 \frac{2}{3}$ meters—and a complex rate expressed as a mixed number— $14 \frac{22}{25}$ per meter. To determine the total cost accurately, we need to convert all mixed numbers into improper fractions or decimals, perform the multiplication, and then simplify the result. This process is fundamental in financial calculations involving measurements, especially in tailoring, textiles, and retail commerce.

In this article, we will walk through the detailed steps to find the total cost, explore related concepts, and understand how to handle similar problems efficiently. Whether you're a student learning fractions or a professional needing precise calculations, mastering these techniques is invaluable.

Understanding the Components of the Problem

Before diving into calculations, it's essential to understand what information we have and what we are asked to find.

Length of Cloth

- Given as $10 \frac{2}{3}$ meters.
- This is a mixed number, combining a whole number (10) and a fraction ($\frac{2}{3}$).

Rate per Meter

- Given as $14 \frac{22}{25}$.
- This mixed number indicates the cost per meter, combining a whole number (14) and a fraction ($\frac{22}{25}$).

Objective

- To find the total cost for purchasing $10 \frac{2}{3}$ meters at the rate of $14 \frac{22}{25}$ per meter.

Converting Mixed Numbers to Improper Fractions

Handling mixed numbers directly can be cumbersome. Converting them into improper fractions simplifies multiplication.

Converting $10 \frac{2}{3}$ to an Improper Fraction

- The whole number is 10.
- The fractional part is $\frac{2}{3}$.
- To convert:

1. Multiply the whole number by the denominator: $10 \times 3 = 30$.
2. Add the numerator: $30 + 2 = 32$.
3. Write as a fraction: $\frac{32}{3}$.

Thus, $10 \frac{2}{3} = \frac{32}{3}$.

Converting $14 \frac{22}{25}$ to an Improper Fraction

- Whole number: 14.
- Fraction: $\frac{22}{25}$.
- Conversion steps:

1. Multiply the whole number by the denominator: $14 \times 25 = 350$.
2. Add the numerator: $350 + 22 = 372$.
3. Write as a fraction: $\frac{372}{25}$.

Therefore, $14 \frac{22}{25} = \frac{372}{25}$.

Calculating the Total Cost

With both mixed numbers converted, the total cost is obtained by multiplying the length of cloth by the rate per meter.

Step 1: Set up the multiplication

- Length: $32/3$ meters.
- Rate: $372/25$ per meter.

The total cost (C) is:

$$C = \text{length} \times \text{rate} = \frac{32}{3} \times \frac{372}{25}$$

Step 2: Multiply the numerators and denominators

- Numerator: 32×372
- Denominator: 3×25

Calculations:

1. 32×372 :

- $30 \times 372 = 11,160$
- $2 \times 372 = 744$
- Sum: $11,160 + 744 = 11,904$

2. Denominator: $3 \times 25 = 75$

So,

$$C = \frac{11,904}{75}$$

Step 3: Simplify the fraction

- To simplify, divide numerator and denominator by their greatest common divisor (GCD).

Finding GCD of 11,904 and 75:

- 75 factors into 3×5^2 .
- Check if 75 divides 11,904:

$$11,904 \div 75 = 159.36 \text{ (not an integer).}$$

- So, GCD is not 75.

Try dividing numerator and denominator by common factors:

- $75 = 3 \times 5^2$.
- Does 11,904 divide evenly by 3?

Sum of digits: $1+1+9+0+4 = 15$, which is divisible by 3, so yes.

- $11,904 \div 3 = 3,968.$

Now, check if 3,968 divides evenly by 25:

- $25 \times 158 = 3,950$
- $25 \times 159 = 3,975$

No, so not evenly divisible by 25.

Alternatively, simplify numerator and denominator by dividing both by 3:

$$\left[\frac{11,904 \div 3}{75 \div 3} = \frac{3,968}{25} \right]$$

Since 25 is prime and does not divide 3,968 evenly, the fraction cannot be simplified further.

Final simplified fraction:

$$\left[C = \frac{3,968}{25} \right]$$

Converting the Result to a Decimal and Rupees (if relevant)

To express the total cost more intuitively, convert the fraction to a decimal:

$$\left[C = \frac{3,968}{25} \right]$$

Divide 3,968 by 25:

- $25 \times 158 = 3,950$
- Remainder: $3,968 - 3,950 = 18$

Now, $18/25 = 0.72$

Adding to 158:

$$\left[C = 158 + 0.72 = 158.72 \right]$$

Result: The total cost of the cloth is ₹158.72 (if the currency is rupees).

Summary of the Calculation Steps

1. Convert mixed numbers to improper fractions:

- $10 \frac{2}{3} \rightarrow \frac{32}{3}$
- $14 \frac{22}{25} \rightarrow \frac{372}{25}$

2. Multiply the fractions:

$$\left[\frac{32}{3} \times \frac{372}{25} = \frac{11,904}{75} \right]$$

3. Simplify the fraction:

$$\left[\frac{3,968}{25} \right]$$

4. Convert to decimal:

$$\left[3,968 \div 25 = 158.72 \right]$$

Final Answer: The total cost of $10 \frac{2}{3}$ meters of cloth at the rate of $14 \frac{22}{25}$ per metre is ₹158.72.

Additional Tips for Similar Calculations

- Always convert mixed numbers into improper fractions for ease of multiplication.
- Simplify fractions after multiplication to keep calculations manageable.
- Use decimal conversion for quick understanding of the final amount.
- When dealing with currency or measurements, double-check units and conversions.
- Use prime factorization or Euclidean algorithm to find GCDs for fraction simplification.

Conclusion

Calculating the cost of a specific length of cloth at a given rate involves systematic steps to handle mixed numbers, fractions, and decimals. By converting mixed numbers into improper fractions, multiplying, and simplifying, you can accurately determine total costs for various measurement and rate scenarios. This process is not only useful in textiles and retail but also in many real-world applications involving measurements and pricing. Mastering these techniques enhances your mathematical proficiency and ensures precise calculations in everyday transactions and professional tasks.

Frequently Asked Questions

What is the total cost of $10 \frac{2}{3}$ metres of cloth purchased at the rate of $14 \frac{22}{25}$ per metre?

The total cost is ₹151.36.

How do you convert mixed numbers like $14 \frac{22}{25}$ into improper fractions for calculation?

Convert $14 \frac{22}{25}$ to an improper fraction: $(14 \times 25 + 22)/25 = (350 + 22)/25 = 372/25$.

How do you calculate the cost of cloth for a length of $10 \frac{2}{3}$ metres at a given rate?

Multiply the length (in mixed number form) by the rate per metre, ensuring both are in compatible forms, then simplify to find the total cost.

What is the importance of converting mixed numbers to improper fractions in such calculations?

Converting to improper fractions simplifies multiplication and division, making calculations more straightforward and accurate.

Can the total length of cloth be expressed as an improper fraction before calculating the total cost?

Yes, $10 \frac{2}{3}$ metres can be written as $\frac{32}{3}$ metres, which can then be multiplied by the rate per metre.

What is the step-by-step method to find the total cost in this problem?

Convert length and rate to improper fractions, multiply them, then simplify the result to find the total cost.

Is it necessary to convert the rate to a decimal or fraction before multiplying?

It's preferable to convert the rate into an improper fraction for precise calculation, but converting to decimal is also acceptable if done carefully.

What is the final calculated cost for $10\frac{2}{3}$ metres of cloth at the rate of $14\frac{22}{25}$ per metre?

The total cost is ₹151.36.

Additional Resources

Find The Cost Of $10\frac{2}{3}$ Metre Of Cloth Purchased At The Rate Of $14\frac{22}{25}$ Per Metre

In the realm of everyday commerce, understanding how to calculate the total cost of goods based on their unit price and quantity is a fundamental skill—particularly in trades involving textiles, where measurements and fractions often intertwine. Today, we delve into a practical example: determining the total expenditure for purchasing $10\frac{2}{3}$ metres of cloth at a specified rate of $14\frac{22}{25}$ per metre. This scenario not only highlights essential arithmetic operations but also underscores the importance of dealing with mixed numbers and fractional rates accurately, ensuring clarity in financial transactions.

Understanding the Problem

At first glance, the problem appears straightforward: we have a quantity of cloth, expressed as a mixed number, and a rate per metre, also given as a mixed number. The goal is to find the total cost, which involves multiplying these two figures. However, the challenge lies in correctly interpreting the mixed numbers and performing precise calculations.

Let's break down the problem:

- Quantity of cloth: $10\frac{2}{3}$ metres
- Rate per metre: $14\frac{22}{25}$

To proceed, we need to convert these mixed numbers into improper fractions or decimals, which are easier to manipulate mathematically.

Converting Mixed Numbers into Improper Fractions

The first step involves converting both the quantity and the rate into improper fractions:

1. Converting $10\frac{2}{3}$ to an Improper Fraction

- Whole number part: 10
- Fraction part: $\frac{2}{3}$

Conversion process:

- Multiply the whole number by the denominator of the fractional part: $10 \times 3 = 30$
- Add the numerator of the fractional part: $30 + 2 = 32$
- Write as a fraction over the original denominator:

$$10 \frac{2}{3} = \frac{32}{3}$$

2. Converting $14 \frac{22}{25}$ to an Improper Fraction

- Whole number part: 14
- Fraction part: $\frac{22}{25}$

Conversion process:

- Multiply the whole number by the denominator: $14 \times 25 = 350$
- Add the numerator: $350 + 22 = 372$
- Write as a fraction:

$$14 \frac{22}{25} = \frac{372}{25}$$

Now, with both quantities expressed as improper fractions, the calculation becomes more straightforward.

Calculating the Total Cost

The total cost is obtained by multiplying the quantity (in metres) by the rate per metre:

$$\text{Total Cost} = \text{Quantity} \times \text{Rate}$$

Expressed mathematically:

$$\text{Total Cost} = \frac{32}{3} \times \frac{372}{25}$$

Simplifying the Multiplication

Multiplying two fractions involves multiplying their numerators and denominators:

$$\left[\frac{32}{3} \times \frac{372}{25} = \frac{32 \times 372}{3 \times 25} \right]$$

Calculating numerator and denominator separately:

- Numerator: 32×372
- Denominator: 3×25

First, compute the numerator:

$$\left[32 \times 372 \right]$$

Breaking it down:

- $32 \times 372 = (30 + 2) \times 372 = (30 \times 372) + (2 \times 372)$
- $30 \times 372 = 11,160$
- $2 \times 372 = 744$
- Sum: $11,160 + 744 = 11,904$

Next, compute the denominator:

$$\left[3 \times 25 = 75 \right]$$

Thus, the total cost as an improper fraction:

$$\left[\frac{11,904}{75} \right]$$

Reducing the Fraction to Its Simplest Form

To express the total cost neatly, we should simplify the fraction:

- Check for common factors between numerator and denominator:

Prime factors of 75: $3 \times 5 \times 5$

Prime factors of 11,904:

- Let's test divisibility by 3:

Sum of digits of 11,904: $1 + 1 + 9 + 0 + 4 = 15$

Since 15 is divisible by 3, 11,904 is divisible by 3.

Divide numerator and denominator by 3:

- Numerator: $11,904 \div 3 = 3,968$
- Denominator: $75 \div 3 = 25$

Now, the fraction is:

$$\left[\frac{3,968}{25} \right]$$

Next, check if numerator and denominator can be further simplified:

- 25 is prime factors 5×5
- 3,968 is divisible by 5? No, since last digit is not 0 or 5.

Therefore, the fraction $\left(\frac{3,968}{25} \right)$ is in its simplest form.

Converting to Decimal (Optional)

For practical purposes, especially in financial transactions, it may be helpful to convert the total cost into decimal form:

Divide numerator by denominator:

$$\left[\begin{array}{l} 3,968 \div 25 \end{array} \right]$$

Calculating:

- $25 \times 158 = 3,950$
- Remainder: $3,968 - 3,950 = 18$
- $18 \div 25 = 0.72$

Adding:

$$\left[\begin{array}{l} 158 + 0.72 = 158.72 \end{array} \right]$$

Total Cost = Rs. 158.72

This means that purchasing $10 \frac{2}{3}$ metres of cloth at the rate of $14 \frac{22}{25}$ per metre costs approximately Rs. 158.72.

Final Answer and Practical Interpretation

Based on the calculations, the total expenditure for the specified cloth is Rs. 158.72. This precise figure allows buyers and sellers to transact confidently, ensuring transparency and accuracy.

Key Takeaways:

- Converting mixed numbers into improper fractions simplifies calculations.
- Multiplying fractions involves multiplying numerators and denominators.
- Simplifying the resulting fraction makes it easier to interpret.
- Converting to decimal provides a practical, quick reference for financial dealings.

Additional Considerations in Real-world Transactions

While the above calculation provides an exact figure, several factors can influence real-world transactions:

- Rounding: Retailers might round the total cost to the nearest rupee or paise.
- Taxation: Additional taxes or discounts could apply, altering the final amount.
- Measurement Precision: Slight variations in measurement or fractional rates can impact total costs.
- Currency and Units: Ensuring consistent units and currency denominations is vital for accuracy.

Conclusion

Calculating the cost of purchasing cloth with fractional measurements and rates is a fundamental skill that combines understanding mixed numbers, fractions, and basic arithmetic operations. By carefully converting mixed numbers into improper fractions, performing multiplication, and simplifying the results, buyers and sellers can determine total costs with confidence. This process underscores the importance of mathematical literacy in commerce and everyday transactions, ensuring clarity, fairness, and precision in financial dealings.

Whether you're a student mastering fractions or a merchant handling textile sales, mastering such calculations enhances your ability to manage transactions effectively, fostering trust and transparency in trade.

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