

15) The Sum Of One-fourth, One-ninth And One- Third Of A Number Is 25. Find The Number.

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Understanding and solving algebraic word problems is a fundamental skill in mathematics that helps develop logical thinking and problem-solving abilities. One such problem involves finding an unknown number based on the sum of its fractional parts. In this article, we will explore how to approach this problem systematically, using algebraic methods, to find the value of the unknown number. This problem is not only a good exercise in algebra but also emphasizes the importance of understanding fractions and their operations within real-world contexts.

Understanding the Problem

The problem states:

"The sum of one-fourth, one-ninth, and one-third of a number is 25. Find the number."

This means that if we denote the unknown number as x , then:

$$\frac{1}{4}x + \frac{1}{9}x + \frac{1}{3}x = 25$$

Our goal is to determine the value of x .

To solve this, we need to understand the nature of the problem:

- It involves fractions of a number.
- The sum of these fractional parts equals a given number (25).
- The problem is algebraic, requiring the use of equations and simplification.

Step-by-Step Approach to the Solution

Solving the problem involves several key steps:

1. Express the problem algebraically.
2. Combine the fractional expressions.
3. Solve for the unknown variable.

Let's break down each step in detail.

Step 1: Express the Problem Algebraically

Given that the sum of the fractional parts of a number x equals 25, we write:

$$\frac{1}{4}x + \frac{1}{9}x + \frac{1}{3}x = 25$$

This is our starting equation.

Step 2: Find a Common Denominator and Combine Terms

To simplify the left side, we need to combine the fractions:

- The denominators are 4, 9, and 3.
- The least common denominator (LCD) of 4, 9, and 3 is 36.

Rewrite each fraction with denominator 36:

$$\begin{aligned}\frac{1}{4}x &= \frac{9}{36}x \\ \frac{1}{9}x &= \frac{4}{36}x \\ \frac{1}{3}x &= \frac{12}{36}x\end{aligned}$$

Now, sum the numerators:

$$\frac{9 + 4 + 12}{36}x = 25$$

Simplify numerator:

$$\frac{25}{36}x = 25$$

Step 3: Solve for the Unknown Number

To find x , rearrange the equation:

$$\frac{25}{36}x = 25$$

Divide both sides by $\frac{25}{36}$:

$$x = 25 \div \frac{25}{36}$$

Dividing by a fraction is equivalent to multiplying by its reciprocal:

$$x = 25 \times \frac{36}{25}$$

Simplify:

$$x = (25 \div 25) \times 36 = 1 \times 36 = 36$$

Therefore, the unknown number is 36.

Verification of the Result

Always verify the solution by substituting $x = 36$ back into the original statement:

Calculate each fractional part:

- $\frac{1}{4} \times 36 = 9$
- $\frac{1}{9} \times 36 = 4$
- $\frac{1}{3} \times 36 = 12$

Sum:

$$9 + 4 + 12 = 25$$

Since the sum matches the given value, the solution is verified.

Understanding the Importance of this Problem in Mathematics

This problem demonstrates several important concepts:

- Fractional parts of a number: Understanding how to manipulate fractions of a quantity.
- Combining like terms: Summing fractions with different denominators.
- Algebraic manipulation: Solving equations involving fractions.
- Verification: Always substituting the solution back into the original problem to ensure correctness.

Additional Tips for Solving Similar Problems

When faced with similar algebraic fraction problems, keep these tips in mind:

- Find the least common denominator (LCD) to combine fractions efficiently.
- Rewrite fractions with the LCD to simplify addition.
- Isolate the variable by multiplying or dividing both sides of the equation appropriately.
- Always verify your solution by substituting back into the original problem.

Practice Problems for Better Understanding

Enhance your skills with these practice problems:

- Problem 1: The sum of one-fifth, one-sixth, and one-half of a number is 20. Find the number.
- Problem 2: If one-third, one-fourth, and one-fifth of a number sum to 15, what is the number?
- Problem 3: The sum of one-seventh, one-third, and one-eighth of a number is 18. Find the number.

Attempting these problems will strengthen your understanding of fractions and algebraic equations.

Conclusion

The problem involving the sum of fractional parts of a number is a classic exercise in algebra and fractions. By representing the problem algebraically, finding a common denominator, simplifying, and solving for the unknown, we determined that the number is 36. This process emphasizes the importance of systematic problem-solving and algebraic manipulation in mathematics. Mastering such problems enhances your ability to tackle real-world scenarios involving proportional reasoning and fractions.

Remember, always verify your solutions to ensure accuracy, and practice similar problems regularly to build confidence and proficiency in algebra and fractions.

Meta Description: Discover how to solve the problem: "The sum of one-fourth, one-ninth, and one-third of a number is 25," step-by-step. Learn algebraic techniques to find the unknown number efficiently.

Frequently Asked Questions

What is the main problem described in the question about the number?

The problem states that the sum of one-fourth, one-ninth, and one-third of a number is 25, and asks to find the number.

How do you set up an equation for the problem?

Let the number be x . Then, the equation is $(1/4)x + (1/9)x + (1/3)x = 25$.

What is the least common denominator when adding fractions (1/4, 1/9, 1/3)?

The least common denominator is 36.

How do you combine the fractions in the equation?

Convert each fraction to have denominator 36: $(9/36)x + (4/36)x + (12/36)x = 25$, then sum the numerators.

What is the sum of the numerators after combining the fractions?

The sum is $(9 + 4 + 12) / 36 = 25/36$, so the equation becomes $(25/36)x = 25$.

How do you solve for x in the equation $(25/36)x = 25$?

Multiply both sides by the reciprocal of $(25/36)$, which is $(36/25)$: $x = 25 (36/25)$.

What is the value of the number x after solving the equation?

$x = 25 (36/25) = 36$.

What is the final answer to the problem?

The number is 36.

Can this problem be solved using fractions directly without common denominators?

Yes, but using common denominators simplifies the calculation. Alternatively, you can compute each term separately and sum them up.

Why is it important to check the solution in the original

problem?

To ensure that substituting the value of the number back into the original expression results in 25, confirming the correctness of the solution.

Additional Resources

The Sum Of One-fourth, One-ninth And One-Third Of A Number Is 25. Find The Number. is a classic algebraic problem that tests one's understanding of fractions, algebraic expressions, and problem-solving techniques. This type of problem is a fundamental part of mathematics education, especially within the realm of algebra, as it combines conceptual understanding with procedural skills. It often serves as an excellent example for students to develop their ability to translate word problems into mathematical equations, manipulate those equations effectively, and arrive at a logical solution. As such, it is not only a question of finding the number but also an opportunity to understand the broader principles of algebra and problem-solving strategies.

Understanding the Problem

The problem states that the sum of one-fourth, one-ninth, and one-third of a certain number equals 25. The key here is to interpret the words correctly and convert them into a workable mathematical expression.

Breaking Down the Statement

- The phrase "One-fourth of a number" translates to $\frac{1}{4}x$.
- "One-ninth of a number" becomes $\frac{1}{9}x$.
- "One-third of a number" becomes $\frac{1}{3}x$.
- The sum of these three fractions equals 25: $\frac{1}{4}x + \frac{1}{9}x + \frac{1}{3}x = 25$.

The first step is to understand the structure of the problem and identify the unknown, which in this case is x , the number we need to find.

Formulating the Mathematical Equation

The next step is to convert the word problem into an algebraic equation:

$$\frac{1}{4}x + \frac{1}{9}x + \frac{1}{3}x = 25$$

This equation involves fractions, so simplifying it is crucial for solving efficiently.

Finding the Common Denominator

The denominators are 4, 9, and 3. The least common denominator (LCD) for these is 36:

$$4 = 2^2$$

- $(9 = 3^2)$
- $(3 = 3)$

The LCD of 4, 9, and 3 is 36.

Express each term with denominator 36:

$$\left[\frac{1}{4}x = \frac{9}{36}x, \quad \frac{1}{9}x = \frac{4}{36}x, \quad \frac{1}{3}x = \frac{12}{36}x \right]$$

Now, the equation becomes:

$$\left[\frac{9}{36}x + \frac{4}{36}x + \frac{12}{36}x = 25 \right]$$

Combine the fractions:

$$\left[\left(\frac{9 + 4 + 12}{36} \right) x = 25 \right]$$

$$\left[\frac{25}{36}x = 25 \right]$$

Pros of this approach:

- Simplifies the addition of fractions.
- Clarifies the relationship between the parts.

Cons:

- Involves working with fractions, which can sometimes lead to calculation errors if not careful.

Solving for the Unknown Number

To find (x) , multiply both sides of the equation by 36 to clear the denominator:

$$\left[25x = 25 \times 36 \right]$$

Divide both sides by 25:

$$\left[x = \frac{25 \times 36}{25} = 36 \right]$$

Thus, the number (x) is 36.

Verification of the Solution

It's always good to verify the solution by substituting back into the original problem:

- One-fourth of 36: $\left(\frac{1}{4} \times 36 = 9 \right)$

- One-ninth of 36: $\frac{1}{9} \times 36 = 4$
- One-third of 36: $\frac{1}{3} \times 36 = 12$

Sum these:

$$9 + 4 + 12 = 25$$

The sum matches the given condition, confirming that 36 is the correct answer.

Alternative Methods to Solve the Problem

While the algebraic approach is straightforward, there are other methods to solve such problems, each with its own pros and cons.

Method 1: Using a Common Variable for Fractions

- Assign (x) as the original number.
- Write the sum as an algebraic expression.
- Solve as demonstrated above.

Pros:

- Logical and systematic.
- Suitable for more complex problems.

Cons:

- Requires understanding of algebraic manipulation.

Method 2: Approximate or Numerical Approach

- Estimate by testing values that satisfy the approximate sum.
- Not precise but useful for rough calculations or checks.

Pros:

- Quick for rough estimates.
- Useful for real-world problems where approximate solutions suffice.

Cons:

- Not exact; can lead to errors if not careful.

Features and Educational Significance

This problem exemplifies key features of algebraic problem-solving:

- Understanding fractions and their manipulation
- Translating words into equations
- Finding common denominators
- Simplifying algebraic expressions

- Verifying solutions

It emphasizes the importance of careful calculation and checking work to prevent errors.

Common Mistakes and Tips

- Misinterpreting fractions: Always convert fractions carefully and check their denominators.
- Incorrect Least Common Denominator (LCD): Make sure to identify the correct LCD.
- Forgetting to verify: Always substitute the found value back into the original equation.
- Calculation errors: Use step-by-step simplification to minimize mistakes.

Tips:

- Write each step clearly.
- Cross-check calculations.
- Practice similar problems to build confidence.

Real-Life Applications

Though this problem is theoretical, similar problems appear in real life:

- Distributing parts of a quantity (like ingredients or resources).
- Calculating proportions in recipes or mixtures.
- Financial calculations involving fractions or ratios.
- Engineering problems involving parts of a whole.

Understanding how to manipulate fractions and set up equations is essential for solving practical problems efficiently.

Conclusion

The problem, "The sum of one-fourth, one-ninth, and one-third of a number is 25," is a classic example of algebraic reasoning. It demonstrates how translating a word problem into an algebraic equation enables straightforward solution. The key steps involve identifying the fractions, finding a common denominator, simplifying the expression, and solving for the unknown. The solution, $(x=36)$, is verified by substituting back into the original expressions, ensuring accuracy. Such problems reinforce foundational algebra skills and problem-solving strategies, which are vital for more advanced mathematical concepts and real-life applications. Mastery of these techniques allows students and practitioners to approach a wide variety of problems confidently and efficiently.

Summary of Features:

- Clear translation of words into algebra.
- Effective use of common denominators.
- Systematic approach to solving fractional equations.
- Emphasis on verification.
- Practical relevance and applicability.

By understanding and practicing problems like this, learners develop critical thinking and mathematical fluency, essential for academic success and everyday problem-solving.

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