

$\frac{1}{2} - \frac{1}{3}x = -4$ Solve The Equation

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Solving equations involving fractions can seem challenging at first, but with a clear step-by-step approach, you can master these algebraic problems. One such example is the equation $\frac{1}{2} - \frac{1}{3}x = -4$. In this article, we'll explore how to solve this equation comprehensively, including methods to isolate the variable, eliminate fractions, and verify your solution. Whether you're a student preparing for exams or someone looking to strengthen your algebra skills, this guide will walk you through each stage in detail.

Understanding the Equation $\frac{1}{2} - \frac{1}{3}x = -4$

Before diving into the solution process, it's important to understand the components of the equation.

Components Breakdown

- **Constant term:** $\frac{1}{2}$
- **Variable term:** $-\frac{1}{3}x$
- **Constant on the right side:** -4

This is a linear equation with fractions, which involves both constants and variables. To simplify, our goal is to isolate the variable x on one side of the equation.

Step-by-Step Solution Process

The process involves several key steps: eliminating fractions, isolating the variable, and solving for x . Let's go through each step carefully.

1. Eliminate Fractions by Finding the Least Common Denominator (LCD)

Since the equation involves fractions with denominators 2 and 3, the first step is to clear these

denominators to make the equation easier to work with.

- Find the LCD of 2 and 3, which is 6.
- Multiply every term in the equation by 6 to eliminate the fractions:

Multiplying through by 6:

$$6 \left(\frac{1}{2} - \frac{1}{3}x \right) = 6 \times -4$$

Simplify each term:

$$\begin{aligned} 6 \times \frac{1}{2} &= 3 \\ 6 \times \frac{1}{3}x &= 2x \\ 6 \times -4 &= -24 \end{aligned}$$

So, the new equation becomes:

$$3 - 2x = -24$$

2. Isolate the Variable Term

Next, we want to gather the variable term on one side and constants on the other.

- Subtract 3 from both sides to move constants to the right:

$$3 - 2x - 3 = -24 - 3$$

$$-2x = -27$$

3. Solve for x

Now, divide both sides by the coefficient of x (which is -2) to isolate x.

- Divide both sides by -2:

$$x = \frac{-27}{-2}$$

Simplify the fraction:

$$x = \frac{27}{2}$$

or as a mixed number:

$$x = 13 \frac{1}{2}$$

Final Answer and Verification

The solution to the equation $\frac{1}{2} - \frac{1}{3}x = -4$ is:

$$x = \left(\frac{27}{2}\right) \text{ or } 13.5$$

To verify the solution, substitute $x = \left(\frac{27}{2}\right)$ back into the original equation:

$$\frac{1}{2} - \frac{1}{3} \times \frac{27}{2} = -4$$

Calculate the second term:

$$\frac{1}{3} \times \frac{27}{2} = \frac{27}{6} = \frac{9}{2}$$

Now, the entire left side:

$$\frac{1}{2} - \frac{9}{2} = \frac{1}{2} - \frac{9}{2} = -\frac{8}{2} = -4$$

Since the left side equals the right side, the solution $x = \frac{27}{2}$ is verified.

Additional Tips for Solving Fractional Equations

To enhance your skills further, here are some helpful tips:

1. Always find the LCD to clear fractions

- This simplifies the equation, making it easier to solve.

2. Keep track of negative signs

- When dividing or multiplying both sides by negative numbers, remember to flip signs accordingly.

3. Double-check your solution by substitution

- Plug the value of x back into the original equation to verify correctness.

4. Practice with diverse equations

- Work on equations with different fractions and variables to build confidence.

Common Mistakes to Avoid

When solving equations like $\frac{1}{2} - \frac{1}{3}x = -4$, watch out for these errors:

- Forgetting to multiply every term by the LCD, leading to incorrect solutions.
- Incorrectly handling negative signs, especially when dividing or multiplying both sides.
- Failing to verify the solution by substitution, which might hide errors.

Summary

Solving the equation $\frac{1}{2} - \frac{1}{3}x = -4$ involves a systematic approach:

1. Find the LCD (6) and multiply every term by it to clear fractions.
2. Simplify the resulting equation to isolate the variable term.
3. Move constants to one side and solve for x .

4. Verify the solution by substituting back into the original equation.

The final solution is $x = 27/2$ or 13.5. With practice, solving similar fractional equations becomes straightforward, and you'll be able to handle them confidently in your math studies.

If you'd like more practice problems or explanations on solving equations with fractions, feel free to explore additional resources or ask for specific examples. Mastering these skills will significantly improve your algebra proficiency and prepare you for more advanced mathematics.

Frequently Asked Questions

How do I solve the equation $1/2 - 1/3x = -4$?

First, isolate the variable term by subtracting $1/2$ from both sides: $-1/3x = -4 - 1/2$. Then, combine the constants and solve for x by multiplying both sides by -3 .

What is the first step to solve $1/2 - 1/3x = -4$?

Subtract $1/2$ from both sides to get $-1/3x = -4 - 1/2$.

How do I combine -4 and $1/2$ in the equation?

Express -4 as a fraction with denominator 2: $-4 = -8/2$. Then, $-8/2 - 1/2 = -9/2$.

What is the value of x in the equation $1/2 - 1/3x = -4$?

After simplifying, you find $x = 9/2$ or 4.5.

Can I use a calculator to solve this equation?

Yes, using a calculator can help with fractional calculations and to verify your solution quickly.

Why do I multiply both sides by -3 in this problem?

Multiplying both sides by -3 eliminates the fraction coefficient of x ($-1/3$), making it easier to solve for x .

Is the solution to $1/2 - 1/3x = -4$ equal to $x = 4.5$?

Yes, solving step-by-step confirms that $x = 9/2$, which equals 4.5.

What are common mistakes to avoid when solving this

equation?

Common mistakes include forgetting to combine fractions properly, not applying the same operation to both sides, or miscalculating the fraction arithmetic. Always double-check each step.

Additional Resources

Solving the Equation $\left(\frac{1}{2} - \frac{1}{3}x = -4\right)$: An In-Depth Exploration

Mathematics, often regarded as the universal language, offers countless puzzles and challenges that test our analytical skills and logical reasoning. One such problem that exemplifies algebraic manipulation and understanding is solving the linear equation:

$$\left(\frac{1}{2} - \frac{1}{3}x = -4\right)$$

At first glance, this equation appears straightforward, but it serves as an excellent example to review key algebraic concepts such as fractions, variable isolation, and equation balancing. In this article, we will thoroughly analyze this problem—breaking it down step by step, discussing the underlying principles, and providing insights into best practices for solving similar equations.

Understanding the Equation

Before diving into solving, it's crucial to understand the structure of the given equation:

$$\left(\frac{1}{2} - \frac{1}{3}x = -4\right)$$

This is a linear equation involving a single variable (x) , combined with fractional coefficients. The goal is to find the value of (x) that makes the equation true.

Key components:

- Constants: $\left(\frac{1}{2}\right)$ and (-4)
- Variable term: $\left(-\frac{1}{3}x\right)$

The equation is in a form where the variable term is subtracted from a constant, which is common in algebra.

Step-by-Step Solution Approach

To solve the equation, the general strategy involves isolating x on one side of the equation. The typical steps are:

1. Eliminate the constant term on the left side
2. Isolate the term with x
3. Solve for x by dividing both sides appropriately

We'll now examine each step in meticulous detail.

Step 1: Eliminating the Constant Term

The first obstacle is the fractional constant $\frac{1}{2}$, which is added to the term involving x . To simplify the equation, we can subtract $\frac{1}{2}$ from both sides:

$$\frac{1}{2} - \frac{1}{3}x = -4$$

Subtract $\frac{1}{2}$:

$$\left(\frac{1}{2} - \frac{1}{2} \right) - \frac{1}{3}x = -4 - \frac{1}{2}$$
$$0 - \frac{1}{3}x = -4 - \frac{1}{2}$$

Now, simplify the right side:

$$-4 - \frac{1}{2}$$

To combine these, convert -4 to a fraction with denominator 2:

$$-4 = -\frac{8}{2}$$

So,

$$-\frac{8}{2} - \frac{1}{2} = -\frac{8 + 1}{2} = -\frac{9}{2}$$

Now, the equation is:

$$-\frac{1}{3}x = -\frac{9}{2}$$

Summary of Step 1:

$$-\frac{1}{3}x = -\frac{9}{2}$$

Step 2: Isolating x

To isolate x , we need to eliminate the coefficient $(-\frac{1}{3})$. This involves multiplying both sides of the equation by the reciprocal of $(-\frac{1}{3})$, which is (-3) :

$$x = \left(-\frac{9}{2}\right) \times (-3)$$

Let's compute this carefully:

$$x = -\frac{9}{2} \times -3$$

Note that multiplying two negatives yields a positive:

$$x = \left(\frac{9}{2}\right) \times 3$$

Express 3 as a fraction:

$$x = \frac{9}{2} \times \frac{3}{1}$$

Multiply numerators and denominators:

$$x = \frac{9 \times 3}{2 \times 1} = \frac{27}{2}$$

Thus,

$$x = \frac{27}{2}$$

or in decimal form:

$$x = 13.5$$

Summary of Step 2:

$$\boxed{x = \frac{27}{2}}$$

Verifying the Solution

Always verify your solution by substituting $x = \frac{27}{2}$ back into the original equation:

$$\frac{1}{2} - \frac{1}{3}x = -4$$

Plug in $x = \frac{27}{2}$:

$$\frac{1}{2} - \frac{1}{3} \times \frac{27}{2} = -4$$

Calculate the second term:

$$\frac{1}{3} \times \frac{27}{2} = \frac{27}{3 \times 2} = \frac{27}{6} = \frac{9}{2}$$

Now, evaluate the left side:

$$\frac{1}{2} - \frac{9}{2} = -4$$

Express both fractions with common denominator 2:

$$\frac{1}{2}$$

$$\frac{1}{2} - \frac{9}{2} = \frac{1 - 9}{2} = -\frac{8}{2} = -4$$

This matches the right side of the original equation, confirming our solution is correct.

Key Takeaways and Best Practices

When approaching equations like $\left(\frac{1}{2} - \frac{1}{3}x = -4\right)$, keep these tips in mind:

- Always aim to clear fractions early: Multiplying through by the least common denominator (LCD) simplifies calculations.
- Maintain balance: Whatever operation is performed on one side, perform it on the other.
- Be meticulous with signs: Negative signs can cause errors; verify their accuracy at each step.
- Double-check your work: Substitution and verification can prevent mistakes.
- Simplify stepwise: Breaking down complex fractions and operations prevents confusion.

Extending the Concept: Solving Similar Equations

The techniques demonstrated here are widely applicable:

- Equations with fractional coefficients: Use LCD to clear fractions.
- Equations involving variables on both sides: Bring all variable terms to one side.
- Quadratic or higher degree equations: Factor or use quadratic formulas, depending on the degree.

Always adapt the approach based on the complexity of the specific problem.

Conclusion

Solving the equation $\left(\frac{1}{2} - \frac{1}{3}x = -4\right)$ showcases fundamental algebraic skills: clearing fractions, isolating variables, and verifying solutions. By methodically applying these strategies, one can confidently tackle similar equations, enhancing problem-solving efficiency and mathematical understanding.

Final answer:

$$\boxed{x = \frac{27}{2} \quad \text{or approximately} \quad 13.5}$$

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Mastery of such problems builds a solid foundation for more advanced algebra and mathematical reasoning, essential for academic success and real-world problem-solving.

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