

Solve The Equation $\frac{3}{4}x - 5 = x$ Give Your Answers Correct To 2 Decimal Places

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Solving algebraic equations can sometimes seem challenging, especially when they involve fractions and variables on both sides. In this comprehensive guide, we will walk through the process of solving the equation $\frac{3}{4}x - 5 = x$ step-by-step, ensuring you understand every part of the process. We will also provide the solutions rounded to two decimal places, making it easier for practical applications. Whether you're a student preparing for exams or someone looking to strengthen your algebra skills, this article will serve as a valuable resource.

Understanding the Equation

Before diving into solving the equation, it's important to understand its structure. The given equation is:

$$\frac{3}{4}x - 5 = x$$

This equation involves a fraction coefficient multiplying the variable x , a constant term -5 , and the variable x itself on the right side. Our goal is to isolate x and find its numerical value.

Steps to Solve the Equation

Solving this kind of equation involves several algebraic steps:

1. Eliminate the fractions to simplify the equation.
2. Collect like terms and isolate the variable.
3. Solve for x.
4. Round the answer to two decimal places.

Let's go through each step in detail.

Step 1: Eliminate Fractions

The equation contains a fraction ($\frac{3}{4}$) multiplied by x. To eliminate the fraction, multiply every term of the equation by the denominator, which is 4:

$$(4) \left[\left(\frac{3}{4} \right)x - 5 \right] = (4) x$$

This simplifies to:

$$4 \left(\frac{3}{4} \right)x - 4 \cdot 5 = 4x$$

Calculating each term:

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

$$- 4 \cdot 5 = 20$$

So, the new equation becomes:

$$3x - 20 = 4x$$

Step 2: Bring Like Terms Together

Next, we want all x terms on one side and constants on the other:

Subtract 3x from both sides:

$$3x - 20 - 3x = 4x - 3x$$

Simplifying:

$$-20 = x$$

At this point, we've isolated x:

$$x = -20$$

Step 3: Verify the Solution

Always good practice to verify your solution by substituting $x = -20$ back into the original equation:

Original equation:

$$\left(\frac{3}{4}\right)x - 5 = x$$

Substitute $x = -20$:

$$\left(\frac{3}{4}\right)(-20) - 5 = -20$$

Calculate $\left(\frac{3}{4}\right)(-20)$:

$$\left(\frac{3}{4}\right)(-20) = -15$$

Now, compute the left side:

$$-15 - 5 = -20$$

The right side is -20 .

Since both sides are equal, $x = -20$ is indeed the solution.

Answer Correct to Two Decimal Places

In this case, the exact solution $x = -20$ already has two decimal places:

$$x = -20.00$$

If the solution had resulted in a decimal, we would round it to two decimal places accordingly.

Alternative Method: Using Algebraic Manipulation Without Clearing Fractions

While multiplying through by 4 is straightforward, you can also solve the equation without clearing fractions by following these steps:

Method Overview

- Subtract $(3/4)x$ from both sides
- Isolate x terms
- Solve for x

Let's illustrate this approach:

Step 1: Move all terms involving x to one side

Start with:

$$(3/4)x - 5 = x$$

Subtract $(3/4)x$ from both sides:

$$-5 = x - (3/4)x$$

Express x as (1)x:

$$-5 = (1)x - (3/4)x$$

Combine like terms:

$$-5 = (1 - 3/4) x$$

Calculate $(1 - 3/4)$:

$$(1 - 0.75) = 0.25$$

So,

$$-5 = 0.25 x$$

Step 2: Solve for x

Divide both sides by 0.25:

$$x = -5 / 0.25$$

Calculate:

$$x = -5 / 0.25 = -20$$

Again, the solution is $x = -20$.

Summary of Key Points

- To solve equations involving fractions, multiplying through by the denominator simplifies the process.
- Always verify your solution by substituting back into the original equation.
- The exact solution for $(\frac{3}{4})x - 5 = x$ is $x = -20$, which, rounded to two decimal places, remains -20.00 .
- Different algebraic methods can be used, such as clearing fractions or combining like terms, to arrive at the solution.

Common Mistakes to Avoid

When solving equations like this, be mindful of these common pitfalls:

- Forgetting to multiply all terms by the denominator when clearing fractions.
- Making errors in algebraic manipulation, such as incorrect subtraction or addition.
- Forgetting to verify the solution by substitution.
- Rounding prematurely; always solve with exact values first before rounding.

Practice Problems

Enhance your understanding by trying similar problems:

1. Solve $(\frac{2}{3})x + 4 = x$ and give your answer correct to 2 decimal places.
2. Solve $(\frac{5}{6})x - 2 = x$ and round to two decimal places.
3. Solve $(\frac{7}{8})x + 3 = 2x$ with the answer correct to two decimal places.

Conclusion

Mastering the skill of solving equations like $(\frac{3}{4})x - 5 = x$ forms a foundational part of algebra. By following systematic steps—eliminating fractions, isolating the variable, and verifying solutions—you can confidently solve similar equations. Remember, practice makes perfect. Regularly working through different types of algebraic problems will strengthen your skills and boost your confidence in tackling more complex equations in the future.

If you need further assistance, consider resources such as algebra textbooks, online tutorials, or seeking guidance from educators to deepen your understanding. Happy solving!

Frequently Asked Questions

How do I solve the equation $(\frac{3}{4})x - 5 = x$ for x ?

First, rewrite the equation as $(\frac{3}{4})x - 5 = x$. Subtract $(\frac{3}{4})x$ from both sides to get $-5 = x - (\frac{3}{4})x$.

Simplify the right side: $x - (\frac{3}{4})x = (\frac{1}{4})x$. So, $-5 = (\frac{1}{4})x$. Multiply both sides by 4 to solve for x : $x = -20$. Correct to 2 decimal places, $x = -20.00$.

What is the solution to $(\frac{3}{4})x - 5 = x$, rounded to two decimal places?

The solution is $x = -20.00$.

Can you show the step-by-step process to solve $(\frac{3}{4})x - 5 = x$?

Yes. Starting with $(\frac{3}{4})x - 5 = x$, subtract $(\frac{3}{4})x$ from both sides: $-5 = x - (\frac{3}{4})x$. Simplify the right side: $x - (\frac{3}{4})x = (\frac{1}{4})x$. Now, $-5 = (\frac{1}{4})x$. Multiply both sides by 4: $-20 = x$. Therefore, $x = -20.00$.

Is the solution to $(\frac{3}{4})x - 5 = x$ unique?

Yes, solving the equation yields a single unique solution: $x = -20.00$.

What is the value of x in the equation $(\frac{3}{4})x - 5 = x$?

The value of x is -20.00 .

Why do we multiply both sides by 4 when solving $(\frac{3}{4})x - 5 = x$?

Multiplying both sides by 4 eliminates the fraction $(\frac{3}{4})$, simplifying the equation and making it easier to solve for x .

If I have the equation $(\frac{3}{4})x - 5 = x$, how do I verify my solution?

Substitute your found value of x back into the original equation and check if both sides are equal. For $x = -20.00$, $(\frac{3}{4})(-20) - 5 = -20.00$. Calculate: $(\frac{3}{4})(-20) = -15$, then $-15 - 5 = -20$, which matches x , confirming the solution is correct.

Additional Resources

Solve The Equation $\frac{3}{4}x - 5 = x$: A Comprehensive Guide to Solving Linear Equations

Introduction

Mathematics is a universal language that enables us to quantify, analyze, and understand the world around us. One of the fundamental skills in algebra is solving linear equations, which forms the backbone of much higher mathematics and real-world problem-solving. In this detailed guide, we will explore the process of solving the specific linear equation:

$$\frac{3}{4}x - 5 = x$$

with the goal of finding the value of x correct to two decimal places. This process will be broken down step-by-step, ensuring clarity and understanding for learners of all levels.

Understanding the Equation

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

$$\frac{3}{4}x - 5 = x$$

- Linear Equation: The equation is linear because the variable x appears to the first power and the highest degree of any term is 1.
- Coefficients and Constants: $\frac{3}{4}$ is the coefficient multiplying x , and -5 is a constant term.
- Goal: To isolate x on one side of the equation and compute its value accurately to two decimal

places.

Step 1: Simplify the Equation

The initial step involves rewriting the equation to make the variable terms easier to manipulate. Since $\frac{3}{4}x$ involves a fraction, it's often easier to work with decimals or clear fractions.

Option 1: Convert $\frac{3}{4}$ to decimal form:

$$\frac{3}{4} = 0.75$$

Thus, the equation becomes:

$$0.75x - 5 = x$$

This decimal form is more straightforward for algebraic manipulation.

Option 2: Keep the fractional form for exactness until the final step, then convert to decimal. For simplicity, we will proceed with decimal form.

Step 2: Rearrange Terms to Isolate x

The goal is to get all terms involving x on one side, and constants on the other. Let's move all x

terms to the left:

$$\begin{aligned} & \backslash \\ & 0.75x - 5 = x \\ & \backslash \end{aligned}$$

Subtract $\backslash(x\backslash)$ from both sides:

$$\begin{aligned} & \backslash \\ & 0.75x - x - 5 = 0 \\ & \backslash \end{aligned}$$

Simplify:

$$\begin{aligned} & \backslash \\ & (0.75x - 1x) - 5 = 0 \\ & \backslash \end{aligned}$$

$$\begin{aligned} & \backslash \\ & -0.25x - 5 = 0 \\ & \backslash \end{aligned}$$

Now, the variable term is $\backslash(-0.25x\backslash)$, and the constant term is $\backslash(-5\backslash)$.

Step 3: Isolate $\backslash(x\backslash)$

Next, add 5 to both sides to move the constant term:

$$\backslash$$

$$-0.25x = 5$$

\]

Now, divide both sides by (-0.25) to solve for (x) :

\[

$$x = \frac{5}{-0.25}$$

\]

Calculate the division:

\[

$$x = -\frac{5}{0.25}$$

\]

Since $(0.25 = \frac{1}{4})$, dividing by 0.25 is equivalent to multiplying by 4:

\[

$$x = -5 \times 4$$

\]

\[

$$x = -20$$

\]

Step 4: Final Answer and Rounding

The exact solution is:

\[

$$x = -20$$

\]

Since the problem asks for the answer correct to two decimal places, express (-20) as:

\[

$$x = -20.00$$

\]

Verification of the Solution

It's always good practice to verify the solution by substituting $(x = -20.00)$ back into the original equation:

\[

$$\frac{3}{4}x - 5 = x$$

\]

Substitute:

\[

$$\frac{3}{4} \times (-20.00) - 5 = -20.00$$

\]

Calculate:

\[

$$0.75 \times (-20.00) - 5 = -20.00$$

\]

$$\begin{aligned} & \backslash[\\ & -15.00 - 5 = -20.00 \end{aligned}$$

$\backslash]$

$$\begin{aligned} & \backslash[\\ & -20.00 = -20.00 \end{aligned}$$

$\backslash]$

The left-hand side equals the right-hand side, confirming that $(x = -20.00)$ is the correct solution.

Additional Considerations

Handling Fractions Directly

While converting to decimal simplifies calculations, it's sometimes advantageous to work directly with fractions:

- Original equation:

$$\begin{aligned} & \backslash[\\ & \frac{3}{4}x - 5 = x \end{aligned}$$

$\backslash]$

- Multiply the entire equation by 4 (the denominator) to clear fractions:

$$\begin{aligned} & \backslash[\\ & 4 \times \left(\frac{3}{4}x - 5 \right) = 4 \times x \end{aligned}$$

$\backslash]$

\[

$$3x - 20 = 4x$$

\]

- Rearranged:

\[

$$3x - 4x = 20$$

\]

\[

$$-x = 20$$

\]

\[

$$x = -20$$

\]

This approach also confirms the solution, showing the utility of clearing fractions early in the process.

Practical Tips for Solving Similar Equations

- Always check for fractions or decimals: Simplify fractions to decimals or clear denominators early.
- Maintain variable terms on one side: To avoid confusion, gather all x terms on one side.
- Be cautious with signs: Pay close attention when adding or subtracting terms, especially with negative numbers.
- Use a calculator for complex fractions: For more complicated equations, calculators ensure accuracy.
- Verify your solution: Substitute your answer back into the original to confirm correctness.

Rounding and Presenting the Final Answer

The problem explicitly requests answers correct to two decimal places. While the exact solution is $\sqrt{-20}$, the rounded form is:

$$\boxed{-20.00}$$

This presentation aligns with standard mathematical conventions for decimal precision and provides clarity for reporting solutions.

Common Mistakes to Avoid

- Incorrectly handling fractions: Always double-check your fraction arithmetic.
- Forgetting to verify: Always substitute your solution back into the original equation.
- Mixing decimal and fractional forms: Be consistent in your approach for clarity.
- Misplacing negative signs: Negative numbers can be tricky; double-check each step involving signs.

Extending the Concept: More Complex Equations

Once comfortable with solving linear equations like $\frac{3}{4}x - 5 = x$, learners can progress to more complex equations involving:

- Multiple variables (systems of equations)

- Quadratic equations
- Inequalities
- Equations with variables on both sides and fractions

Mastering the basic principles laid out here—such as isolating the variable, eliminating fractions, and verifying solutions—lays a strong foundation for tackling advanced problems.

Summary

In conclusion, solving the equation $\frac{3}{4}x - 5 = x$ involves:

1. Converting the fractional coefficient to decimal (or clearing fractions).
2. Rearranging terms to gather all variable terms on one side.
3. Simplifying to isolate x .
4. Calculating the exact value.
5. Rounding the final answer to two decimal places.

The final answer is:

$$\boxed{-20.00}$$

which has been verified by substitution. This process demonstrates fundamental algebraic techniques that are essential for students and professionals alike, providing a reliable method for solving linear equations accurately and efficiently.

Final Thoughts

Mastering the art of solving equations like $\frac{3}{4}x - 5 = x$ not only enhances your mathematical skills but also improves logical thinking and problem-solving capabilities. Whether you're preparing for exams, working on real-world calculations, or advancing to higher mathematics, a solid grasp of these techniques is indispensable.

Always remember to check your work, keep your calculations organized, and approach each problem methodically. With practice, solving such equations becomes intuitive, and you'll develop confidence in handling even more complex algebraic challenges.

Happy solving!

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