3x+4/5=7-2x What Is The Solution To The Equation?

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Understanding and solving algebraic equations is a fundamental skill in mathematics that applies to various real-world scenarios, from engineering to economics. One such equation that often appears in algebra practice is:

$$\frac{3x + 4}{5} = 7 - 2x$$

This article aims to provide a comprehensive, step-by-step guide on how to solve this equation, breaking down each process for clarity and ensuring you grasp the underlying principles involved. Whether you're a student preparing for exams or someone interested in sharpening your algebra skills, this detailed guide will help you understand how to find the value of x that satisfies the equation.

Understanding the Equation

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

$$\frac{3x + 4}{5} = 7 - 2x$$

This is a linear algebraic equation involving a rational expression. The main goal is to isolate the variable x and find its value that makes the equation true.

Key components:

- Fractional term: $\frac{3x + 4}{5}$
- Constant term: 7
- Linear term: $-2x$

Step-by-Step Approach to Solving the Equation

To solve the equation effectively, follow these systematic steps:

Step 1: Eliminate the Denominator

Since the equation contains a fraction, the first step is to eliminate the denominator to simplify the equation. To do this:

- Multiply both sides of the equation by 5, the denominator of the fractional expression.

Mathematically:

$$ 5 \times \left(\frac{3x + 4}{5}\right) = 5 \times (7 - 2x) $$

which simplifies to:

$$ 3x + 4 = 5 \times (7 - 2x) $$

Step 2: Expand the Right Side

Distribute the 5 across the terms inside the parentheses:

$$ 3x + 4 = 5 \times 7 - 5 \times 2x $$

$$ 3x + 4 = 35 - 10x $$

This expansion converts the equation into a form more conducive to isolating x.

Step 3: Collect Like Terms

Bring all terms involving x to one side and constants to the other:

- Add $10x$ to both sides:

$$ 3x + 10x + 4 = 35 $$

- Combine like terms:

$$ 13x + 4 = 35 $$

- Subtract 4 from both sides:

$$ 13x = 35 - 4 $$

$$ 13x = 31 $$

Step 4: Solve for x

Divide both sides by 13 to find the value of x:

$$ x = \frac{31}{13} $$

The solution is:

$$ \boxed{\frac{31}{13}} $$

or approximately 2.3846.

Verification of the Solution

To ensure the solution is correct, substitute $x = \frac{31}{13}$ back into the original equation:

$$ \frac{3x + 4}{5} = 7 - 2x $$

Substitution:

$$ \frac{3 \times \frac{31}{13} + 4}{5} = 7 - 2 \times \frac{31}{13} $$

Calculate numerator on the left:

$$ 3 \times \frac{31}{13} = \frac{93}{13} $$

Add 4 (which is $ \frac{52}{13} $):

$$ \frac{93}{13} + \frac{52}{13} = \frac{145}{13} $$

Now, divide by 5:

$$ \frac{\frac{145}{13}}{5} = \frac{145}{13} \times \frac{1}{5} = \frac{145}{65} $$

Simplify numerator and denominator:

$$ \frac{145}{65} = \frac{29}{13} $$

Calculate right side:

$$ 7 - 2 \times \frac{31}{13} = 7 - \frac{62}{13} $$

Express 7 as a fraction:

$$ \frac{91}{13} - \frac{62}{13} = \frac{29}{13} $$

Both sides equal $\frac{29}{13}$, confirming the solution is correct.

Additional Tips for Solving Similar Equations

When tackling equations like $\frac{3x + 4}{5} = 7 - 2x$, keep in mind these helpful strategies:

1. Always clear fractions early

Multiplying both sides by the least common denominator (LCD) simplifies the equation significantly.

2. Be cautious with signs

When moving terms across the equals sign, pay attention to the signs to avoid errors.

3. Simplify step-by-step

Breaking the problem into smaller, manageable parts reduces the chance of mistakes.

4. Verify solutions

Always substitute your solution back into the original equation to confirm correctness, especially for complex equations.

Common Mistakes to Avoid

- Incorrectly distributing: Ensure when distributing multiplication over parentheses, all terms are included.
- Forgetting to distribute negative signs: When moving terms across the equal sign, change their signs accordingly.
- Dividing by zero: Confirm the denominator is not zero to avoid invalid solutions.
- Skipping verification: Always check your solution by substitution.

Real-World Applications of Solving Algebraic Equations

Understanding how to solve equations like $\frac{3x + 4}{5} = 7 - 2x$ extends beyond pure mathematics. Here are some practical examples:

- Financial calculations: Determining unknown interest rates or payments.
- Physics: Calculating unknown quantities such as velocity, distance, or time.
- Engineering: Solving for variables in system equations.
- Statistics: Finding parameters in models involving algebraic relationships.

Mastering these types of equations enhances problem-solving skills applicable across various disciplines.

Conclusion

The solution to the equation $\frac{3x + 4}{5} = 7 - 2x$ is $\boxed{\frac{31}{13}}$. By systematically eliminating fractions, expanding expressions, collecting like terms, and solving for the variable, you can confidently tackle similar algebraic equations. Remember to verify your solutions and be mindful of common pitfalls. Developing proficiency in solving such equations not only improves your math grades but also equips you with essential analytical skills useful in multiple fields.

Frequently Asked Questions (FAQs)

Q1: Can this method be applied to more complex equations?
Absolutely. While the steps might become more involved, the core principles—eliminating fractions, expanding, collecting like terms, and solving—remain the same.

Q2: What if the solution results in a denominator of zero?
Always check for any restrictions on the variable that could make denominators zero. If the solution makes a denominator zero, it is not valid.

Q3: How can I improve my algebra skills?
Practice a variety of problems regularly, understand the underlying principles, and verify solutions to build confidence.

Q4: Are there online tools to help solve equations?
Yes, many online calculators and algebra software can verify solutions, but understanding the steps is crucial for learning.

Q5: Why is verifying the solution important?
Verification ensures the solution satisfies the original equation and helps catch any calculation errors.

Whether you are a student, educator, or enthusiast, mastering the solution of algebraic equations like $\frac{3x + 4}{5} = 7 - 2x$ is a vital step in mathematical literacy. With practice and attention to detail, solving these equations becomes an intuitive process, opening doors to more advanced mathematical concepts and real-world problem-solving.

Frequently Asked Questions

How do I solve the equation $3x + 4/5 = 7 - 2x$?

To solve $3x + 4/5 = 7 - 2x$, first eliminate the fraction by multiplying both sides by 5, then combine like terms and solve for x step-by-step.

What is the first step to isolate x in the equation $3x + 4/5 = 7 - 2x$?

The first step is to eliminate the fraction by multiplying the entire equation by 5.

How do I eliminate the fraction in the equation $3x + 4/5 = 7 - 2x$?

Multiply both sides of the equation by 5 to get rid of the denominator: $5(3x + 4/5) = 5(7 - 2x)$.

After clearing the fractions, how do I solve for x in

this equation?

Expand both sides, combine like terms, and then isolate x by moving all x terms to one side and constants to the other.

Can you show the detailed steps to solve $3x + 4/5 = 7 - 2x$?

Yes. Multiply both sides by 5: $53x + 4 = 57 - 52x$, which simplifies to $15x + 4 = 35 - 10x$. Then, add 10x to both sides: $25x + 4 = 35$. Subtract 4 from both sides: $25x = 31$. Finally, divide both sides by 25: $x = 31/25$.

What is the solution to the equation $3x + 4/5 = 7 - 2x$?

The solution is $x = 31/25$.

Is the solution to the equation a fraction or a decimal?

The solution $x = 31/25$ is a fraction, which is equivalent to 1.24 in decimal form.

How can I check if my solution $x = 31/25$ is correct?

Substitute $x = 31/25$ back into the original equation and verify both sides are equal.

What key algebraic concept is important when solving equations like $3x + 4/5 = 7 - 2x$?

Understanding how to eliminate fractions and combine like terms is essential for solving such linear equations.

Additional Resources

$3x + 4/5 = 7 - 2x$: What Is The Solution To The Equation?

In the realm of algebra, equations serve as the foundational language that helps us understand relationships between variables and constants. Among these, linear equations—those involving variables raised to the first power—are particularly pivotal due to their simplicity and widespread applicability. One such algebraic expression that often appears in educational settings and real-world problem-solving is:

$3x + 4/5 = 7 - 2x$

This equation encapsulates a straightforward yet instructive example of how algebraic manipulation can lead us to the solution. Understanding its solution process not only enhances mathematical literacy but also reinforces critical thinking skills necessary for tackling more complex problems. This article aims to explore this equation comprehensively, elucidating each step with clarity and depth, ensuring readers develop a robust understanding of linear equations and their solutions.

Understanding the Equation: Structure and Components

Before delving into solving the equation, it's essential to dissect its structure to grasp the roles of each component.

Breaking Down the Equation

The given equation is:

3x + 4/5 = 7 - 2x

- Variables: The sole variable here is x, representing an unknown value we aim to find.
- Constants: The numbers 4/5 and 7 are constants; they do not change and serve as fixed points in the equation.
- Operators: The plus (+), minus (-), and division (/) operators perform operations on the variables and constants.
- Linear Form: The equation is linear because the variable x appears to the first power and the equation can be rearranged into the form ax + b = cx + d, where a, b, c, and d are constants.

Mathematical Significance

The equation models a relationship where a scaled variable (3x) combined with a fractional constant (4/5) equates to a constant value (7) decreased by twice the variable (-2x). Solving such an equation involves isolating x to determine its value that satisfies the equality.

Step-by-Step Solution Process

The core task in solving the equation is to manipulate it algebraically so that x stands alone on one side. Let's explore this process methodically.

Step 1: Eliminate the Fraction

The term 4/5 is a fraction, and handling fractions directly can sometimes complicate calculations. To make the equation more manageable, we can eliminate the fraction by multiplying every term by the denominator, which is 5.

Multiplying both sides by 5:

$5 (3x + 4/5) = 5 (7 - 2x)$

Simplifying each side:

- Left side: $5 3x + 5 (4/5) = 15x + 4$
- Right side: $5 7 - 5 2x = 35 - 10x$

Now the equation becomes:

$15x + 4 = 35 - 10x$

Step 2: Move All Variable Terms to One Side

The goal is to gather all terms containing x on one side and constants on the other.

Add 10x to both sides:

$15x + 10x + 4 = 35 - 10x + 10x$

Simplifies to:

$25x + 4 = 35$

Step 3: Isolate the Variable Term

Subtract 4 from both sides:

$25x + 4 - 4 = 35 - 4$

Simplifies to:

$25x = 31$

Step 4: Solve for x

Divide both sides by 25:

$x = 31 / 25$

Expressed as a decimal, this is:

$x = 1.24$

or as a fraction:

$x = 31/25$

Verification of the Solution

Simply finding x is not sufficient; verifying the solution ensures accuracy.

Substitute x = 31/25 into the original equation:

Original equation:

3x + 4/5 = 7 - 2x

Calculate each side:

- Left side:

3 (31/25) + 4/5

= (93/25) + (4/5)

Express 4/5 as a fraction with denominator 25:

4/5 = (4 5) / (5 5) = 20/25

Now, sum:

93/25 + 20/25 = (93 + 20) / 25 = 113/25

- Right side:

7 - 2 (31/25)

= 7 - (62/25)

Express 7 as a fraction with denominator 25:

7 = 175/25

Subtract:

175/25 - 62/25 = (175 - 62)/25 = 113/25

Since both sides equal 113/25, the solution x = 31/25 is verified.

Implications and Broader Context

Understanding how to solve equations like 3x + 4/5 = 7 - 2x is fundamental for several reasons:

Educational Significance

- It reinforces algebraic manipulation skills, including clearing fractions, grouping like terms, and isolating variables.
- It provides a foundation for solving more complex equations, including

quadratic and rational equations.
- It highlights the importance of verification, ensuring that solutions are valid within the original context.

Real-World Applications

Linear equations model countless real-world phenomena:

- Financial calculations, such as determining interest or loan payments.
- Engineering problems involving proportional relationships.
- Scientific data analysis where variables relate linearly.

Mastering such equations equips students and professionals to analyze and interpret real data effectively.

Common Challenges and Misconceptions

- Fraction Handling: Many learners struggle with fractions; multiplying through by the denominator simplifies the process.
- Sign Errors: Care must be taken when moving terms across the equality sign, especially with negative signs.
- Verification: It’s crucial to substitute solutions back into the original equation to confirm correctness.

Conclusion: The Path to the Solution

The equation $3x + 4/5 = 7 - 2x$ exemplifies a fundamental algebraic problem—solving for an unknown variable within a linear context. The step-by-step process involves eliminating fractions, consolidating like terms, and isolating x to find its value. The solution, $x = 31/25$, or approximately 1.24, not only satisfies the equation but also demonstrates the power of systematic algebraic manipulation.

This exercise underscores the importance of understanding fundamental algebraic principles, which serve as building blocks for more advanced mathematical concepts. Whether in academic settings or practical applications, mastering such equations enhances critical thinking and problem-solving capabilities. As mathematics continues to underpin various scientific and technological advances, proficiency in solving equations like this remains an essential skill for students and professionals alike.

In the broader scope of mathematics education, equations of this nature serve as stepping stones toward more complex analytical techniques, fostering a mindset of logical reasoning and precision. By breaking down the problem methodically and verifying results, learners develop confidence and competence that extend well beyond the confines of the classroom.

In summary, the solution to the equation $3x + 4/5 = 7 - 2x$ is:

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\boxed{
x = \frac{31}{25} \approx 1.24
}
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This result emerges from a systematic process of eliminating fractions,
consolidating like terms, and verifying the solution—an approach that
exemplifies the core principles of algebraic problem-solving.
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3x 4 5 7 2x What Is The Solution To The Equation

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