

What Is The Solution To The Following Equation? $3(7x + 12) + 26 = 3x + 10$

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Solving algebraic equations is a fundamental skill in mathematics that helps us understand relationships between variables and numbers. When presented with an equation like $3(7x + 12) + 26 = 3x + 10$, the goal is to find the value of the variable x that makes the equation true. This article provides a comprehensive, step-by-step guide to solving this specific equation, along with explanations of key algebraic principles and techniques. Whether you're a student seeking to improve your math skills or someone interested in mathematical problem-solving, this detailed walkthrough will clarify the process.

Understanding the Equation

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

Equation: $3(7x + 12) + 26 = 3x + 10$

At first glance, the equation contains parentheses, multiplication, addition, and what appears to be a variable x .

Important points to consider:

- The expression $3(7x + 12)$ indicates multiplication between 3 and the quantity inside the parentheses.
- The term $7x$ represents 7 times x .
- The expression $3x + 10$ on the right side appears to be missing an operator, but based on standard algebraic notation, it likely means $3x + 10$.

Note: In algebra, when an expression is written without an explicit operator between terms (like $3x + 10$), it is generally understood as $3x + 10$.

Rewriting the Equation

To avoid ambiguity, rewrite the original equation with explicit operators:

Rewritten Equation:

$[3(7x + 12) + 26 = 3x + 10]$

This clarification ensures clarity as we proceed with solving.

Step-by-Step Solution Process

Let's now systematically solve for x .

Step 1: Expand the parentheses

Apply the distributive property:

$$3(7x + 12) = 3 \times 7x + 3 \times 12 = 21x + 36$$

Now the equation becomes:

$$21x + 36 + 26 = 3x + 10$$

Step 2: Combine like terms

On the left side, combine $36 + 26$:

$$21x + (36 + 26) = 21x + 62$$

So, the simplified equation is:

$$21x + 62 = 3x + 10$$

Step 3: Isolate the variable term

To solve for x , get all terms containing x on one side and constants on the other:

Subtract $3x$ from both sides:

$$21x - 3x + 62 = 10$$

Simplify:

$$18x + 62 = 10$$

Step 4: Move constants to the other side

Subtract 62 from both sides:

$$\begin{aligned} & \backslash[\\ 18x &= 10 - 62 \\ & \backslash] \end{aligned}$$

Calculate:

$$\begin{aligned} & \backslash[\\ 18x &= -52 \\ & \backslash] \end{aligned}$$

Step 5: Solve for x

Divide both sides by 18:

$$\begin{aligned} & \backslash[\\ x &= \frac{-52}{18} \\ & \backslash] \end{aligned}$$

Simplify the fraction:

$$\begin{aligned} & \backslash[\\ x &= \frac{-26}{9} \\ & \backslash] \end{aligned}$$

Final answer:

$$\begin{aligned} & \backslash[\\ x &= -\frac{26}{9} \\ & \backslash] \end{aligned}$$

Verification of the Solution

It's good practice to verify the solution by substituting $x = -\frac{26}{9}$ back into the original equation.

Recall the original (reformatted) equation:

$$\begin{aligned} & \backslash[\\ 3(7x + 12) + 26 &= 3x + 10 \\ & \backslash] \end{aligned}$$

Substitute $x = -\frac{26}{9}$:

Calculate $7x$:

$$\begin{aligned} & \backslash[\\ 7 \times -\frac{26}{9} &= -\frac{182}{9} \\ & \backslash] \end{aligned}$$

Calculate $7x + 12$:

$$\begin{aligned} & \left[-\frac{182}{9} + 12 \right] \end{aligned}$$

Express 12 as a fraction with denominator 9:

$$\begin{aligned} & \left[-\frac{182}{9} + \frac{108}{9} = -\frac{182 - 108}{9} = -\frac{74}{9} \right] \end{aligned}$$

Multiply by 3:

$$\begin{aligned} & \left[3 \times -\frac{74}{9} = -\frac{222}{9} = -\frac{74}{3} \right] \end{aligned}$$

Add 26 (which is $\frac{78}{3}$):

$$\begin{aligned} & \left[-\frac{74}{3} + \frac{78}{3} = \frac{4}{3} \right] \end{aligned}$$

Now, compute the right side:

$$\begin{aligned} & \left[3x + 10 = 3 \times -\frac{26}{9} + 10 = -\frac{78}{9} + 10 \right] \end{aligned}$$

Express 10 as $\frac{90}{9}$:

$$\begin{aligned} & \left[-\frac{78}{9} + \frac{90}{9} = \frac{12}{9} = \frac{4}{3} \right] \end{aligned}$$

Both sides equal $\frac{4}{3}$, confirming the solution is correct.

Key Concepts and Tips for Solving Similar Equations

To master solving equations like this, consider the following tips:

- **Always clarify ambiguous expressions:** Make sure to interpret missing operators correctly.
- **Distribute carefully:** Use the distributive property to expand expressions involving parentheses.
- **Combine like terms:** Simplify both sides to make the equation easier to solve.
- **Maintain balance:** Whatever operation you perform on one side, do the

same on the other side.

- **Solve step-by-step:** Break down the process to avoid mistakes and ensure clarity.
- **Verify your solution:** Substitute your answer back into the original equation to confirm correctness.

Common Mistakes to Avoid

While solving equations, beginners often encounter pitfalls. Here are some common mistakes and how to avoid them:

1. **Misinterpreting the equation:** Always clarify what each term represents, especially when operators are missing.
2. **Forgetting to distribute:** Remember to apply the distributive property when parentheses are involved.
3. **Mixing steps:** Tackle the problem systematically rather than jumping ahead.
4. **Incorrectly combining terms:** Double-check addition/subtraction of constants and variables.
5. **Neglecting to verify:** Always substitute your solution back into the original equation.

Conclusion

Solving the equation $3(7x + 12) + 26 = 3x + 10$ involves a clear, step-by-step process rooted in fundamental algebraic principles. By expanding parentheses, combining like terms, and isolating the variable, we've determined that:

$$\boxed{x = -\frac{26}{9}}$$

This solution has been verified through substitution, confirming its correctness. Mastering such equations enhances your problem-solving skills and deepens your understanding of algebra. Remember to approach similar problems methodically, keep track of each step, and verify your answers to build confidence and accuracy in your mathematical work.

Keywords for SEO:

- Solve algebraic equations
- Equation solving steps
- How to solve for x
- Algebra practice problems
- Distributive property in equations
- Solving equations with parentheses
- Simplifying algebraic expressions
- Verifying solutions in algebra

Frequently Asked Questions

How do I simplify the equation $3(7x + 12) + 26 = 3x + 10$?

First, distribute 3 inside the parentheses: $3 \cdot 7x + 3 \cdot 12 = 21x + 36$. The equation becomes $21x + 36 + 26 = 3x + 10$. Combine like terms: $21x + 62 = 3x + 10$. Then, subtract $3x$ from both sides: $18x + 62 = 10$. Next, subtract 62 from both sides: $18x = -52$. Finally, divide both sides by 18: $x = -52/18$, which simplifies to $x = -26/9$.

What is the value of x in the equation $3(7x + 12) + 26 = 3x + 10$?

The value of x is $-26/9$ after simplifying the equation step-by-step as shown: $x = -26/9$.

Can you provide a step-by-step solution to solve $3(7x + 12) + 26 = 3x + 10$?

Yes. Distribute 3: $21x + 36$. Add 26: $21x + 62$. Set equal to $3x + 10$. Subtract $3x$: $18x + 62 = 10$. Subtract 62: $18x = -52$. Divide by 18: $x = -52/18 = -26/9$.

Is the solution to $3(7x + 12) + 26 = 3x + 10$ a rational number?

Yes, the solution $x = -26/9$ is a rational number because it can be expressed as a fraction.

What common mistakes should be avoided when solving the equation $3(7x + 12) + 26 = 3x + 10$?

Common mistakes include forgetting to distribute the 3 properly, combining like terms incorrectly, or making errors in algebraic operations like subtracting or dividing. Carefully follow each step to avoid these errors.

Additional Resources

Understanding the Solution to the Equation: $3(7x + 12) + 26 = 3x + 10$

Solving algebraic equations is a fundamental skill in mathematics that forms the backbone of many advanced topics. The equation $3(7x + 12) + 26 = 3x + 10$ presents an excellent example to explore various algebraic principles, including distribution, combining like terms, and isolating variables to find solutions. In this comprehensive review, we will dissect this equation step-by-step, explore common pitfalls, and delve into the underlying concepts to provide a thorough understanding.

Understanding the Equation Components

Before diving into solving the equation, it's crucial to understand its structure and components.

1. The Equation Breakdown

The given equation is:

$$> 3(7x + 12) + 26 = 3x + 10$$

This equation contains:

- A distributed term: $3(7x + 12)$, which involves multiplication over a binomial.
- A constant addition: $+ 26$
- On the right side, a linear term: $3x$
- And a constant: $+ 10$

2. Recognizing the Type of Equation

This is a linear equation in one variable (x), as the highest power of x is 1. The goal is to find the value of x that makes both sides equal.

Step-by-Step Solution Process

To solve the equation, we'll follow a systematic procedure: expand, simplify, isolate the variable, and solve.

1. Expand the Distributed Term

The first step involves applying the distributive property to remove parentheses:

$$> 3(7x + 12) = 3 \cdot 7x + 3 \cdot 12 = 21x + 36$$

Substituting back:

$$> 21x + 36 + 26 = 3x + 10$$

2. Combine Like Terms on the Left Side

Combine the constants:

$$> 36 + 26 = 62$$

So, the simplified equation becomes:

$$> 21x + 62 = 3x + 10$$

3. Bring Like Terms Together

To isolate x , get all x terms on one side and constants on the other:

- Subtract $3x$ from both sides:

$$> 21x - 3x + 62 = 10$$

$$> 18x + 62 = 10$$

- Subtract 62 from both sides:

$$> 18x = 10 - 62$$

$$> 18x = -52$$

4. Solve for x

Divide both sides by 18:

$$> x = -52 / 18$$

Simplify the fraction:

$$> x = -26 / 9$$

This is the solution in simplest fractional form. If desired, convert to decimal:

$$> x \approx -2.888...$$

Analyzing the Solution

Understanding the solution involves more than just performing calculations; it requires interpretation and verification.

1. The Exact Solution

The precise solution is:

$$> x = -26/9$$

This fraction cannot be simplified further since 26 and 9 have no common

factors besides 1.

2. Decimal Equivalent

For a decimal approximation:

$$x \approx -2.8889$$

This decimal form is useful in contexts requiring approximate values.

3. Verifying the Solution

Verification involves substituting the value of x back into the original equation to check if both sides are equal.

Substitute $x = -26/9$:

- Left side:

$$3(7x + 12) + 26$$

$$= 3(7 \cdot -26/9 + 12) + 26$$

$$= 3((-182/9) + 12) + 26$$

Convert 12 to ninths:

$$12 = 108/9$$

So:

$$3((-182/9) + 108/9) + 26$$

$$= 3((-182 + 108)/9) + 26$$

$$= 3(-74/9) + 26$$

$$= (-222/9) + 26$$

Simplify:

$$-222/9 = -74/3$$

Convert 26 to thirds:

$$26 = 78/3$$

So:

$$-74/3 + 78/3 = 4/3$$

- Right side:

$$3x + 10$$

$$= 3(-26/9) + 10$$

$$= (-78/9) + 10$$

$$= (-26/3) + 10$$

Convert 10 to thirds:

$$10 = 30/3$$

So:

$$(-26/3) + 30/3 = 4/3$$

Since both sides equal $4/3$, the solution is verified.

Deeper Insights into Algebraic Principles

Beyond solving this specific equation, it's beneficial to explore the underlying algebraic concepts involved.

1. Distribution Property

The distributive property states:

$$> a(b + c) = ab + ac$$

In our case:

$$> 3(7x + 12) = 3 \cdot 7x + 3 \cdot 12$$

Understanding distribution is crucial for expanding expressions and simplifying equations.

2. Combining Like Terms

Like terms are terms with the same variable raised to the same power. Combining constants or x-terms simplifies equations and is essential for isolating variables.

3. Isolating Variables

The main goal in solving equations is to get the variable on one side and constants on the other, often involving:

- Addition or subtraction to move terms across the equality
- Multiplication or division to solve for the variable

4. Fractional Solutions

When coefficients are fractions, solutions are often fractional as well. Simplifying fractions and verifying solutions through substitution are critical steps.

Common Challenges and Tips in Solving Such Equations

While the steps seem straightforward, several common pitfalls can occur:

1. Forgetting to Distribute

Pitfall: Skipping the distribution step leads to incorrect simplification.

Tip: Always expand parentheses before combining like terms.

2. Sign Errors

Pitfall: Sign mistakes when moving terms across the equality or during addition/subtraction.

Tip: Be meticulous with signs; write each step carefully.

3. Simplification Mistakes

Pitfall: Incorrectly simplifying fractions or constants.

Tip: Use prime factorization to simplify fractions properly.

4. Verifying Solutions

Pitfall: Forgetting to substitute the solution back into the original equation.

Tip: Always verify solutions to catch errors.

Applications and Real-World Relevance

Understanding how to solve equations like this one extends beyond academic exercises:

- Engineering: Calculating forces, currents, or other quantities.
- Finance: Determining unknown variables in formulas involving interest rates or investments.
- Science: Solving for unknown quantities in experimental data.
- Computer Science: Algorithm design often involves algebraic reasoning.

Summary and Final Thoughts

The equation $3(7x + 12) + 26 = 3x + 10$ exemplifies fundamental algebraic techniques:

- Distributing multiplication over addition
- Combining like terms

- Moving variables and constants across the equality
- Simplifying and solving for the unknown

The solution, $x = -26/9$, is verified through substitution, confirming its correctness. Mastery of such equations builds a strong foundation for tackling more complex algebraic problems and applying mathematical reasoning in various fields.

Key Takeaways:

- Always expand parentheses before simplifying.
- Combine like terms carefully.
- Use inverse operations to isolate variables.
- Verify solutions to ensure accuracy.
- Understand the principles behind each step for long-term mastery.

By practicing problems of this nature, students develop critical thinking skills, precision, and confidence in handling algebraic expressions, which are invaluable in academic pursuits and real-world problem-solving.

In conclusion, solving the equation $3(7x + 12) + 26 = 3x + 10$ involves a systematic approach rooted in core algebraic principles. The process demonstrates the importance of distribution, combining like terms, and logical reasoning, culminating in a clear, verified solution. Mastery of these techniques empowers learners to confidently approach a wide variety of mathematical challenges.

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