Find The Value Of X4(x+9) = 3 (x+11) -1

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Solving algebraic equations is a fundamental skill in mathematics that empowers students to analyze and interpret various real-world problems. One such equation that may seem complex at first glance is X4(x+9) = 3(x+11) - 1. In this comprehensive guide, we will walk through the process step-by-step to find the value of X, ensuring clarity and understanding along the way. Whether you're studying for an exam or brushing up on algebra skills, this article will help you master solving such equations efficiently.

Understanding the Equation

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

X4(x+9) = 3(x+11) - 1

At first glance, the notation X4(x+9) might be confusing. It could be interpreted in multiple ways, such as:

- The product of X and 4, multiplied by (x + 9): (X 4)(x + 9)
- A variable named X4, which is less common but possible

Given the context, the most logical interpretation is that X4 refers to X multiplied by 4, i.e., 4X. This assumption aligns with typical algebraic conventions, especially since the right side involves standard algebraic expressions.

Thus, rewriting the equation for clarity:

4X(x + 9) = 3(x + 11) - 1

Now, the goal is to find the value of X that satisfies this equation.

Step-by-Step Solution Process

To solve for X, follow these systematic steps:

Step 1: Expand Both Sides

Begin by expanding the expressions on both sides to eliminate parentheses.

Left Side:

- Multiply 4X by (x + 9):

$$
4X \times (x + 9) = 4X \times x + 4X \times 9 = 4Xx + 36X
$$

Right Side:

- Expand 3(x + 11):

$$
3 \times x + 3 \times 11 = 3x + 33
$$

- Subtract 1:

$$
3x + 33 - 1 = 3x + 32
$$

Rewritten Equation:

$$
4Xx + 36X = 3x + 32
$$

Step 2: Group Like Terms

Now, organize the equation to isolate X. Notice that the equation contains terms with x and X. Since X is multiplied by x, the equation is a linear equation in two variables unless X is a constant. But here, X is the variable we want to find.

To proceed, observe that X appears multiplied by x. To isolate X, consider the term 4Xx.

Step 3: Isolate the Variable

Given that 4Xx involves both X and x, and x is an unknown variable, unless specified otherwise, the only way to find X is if the equation holds for all values of x. Alternatively, if the problem intends for x to be a specific known value, that value should be provided.

Assumption: The problem aims to find X as a constant satisfying the equation for all x. This is only possible if the equation is an identity, meaning the coefficients of x on both sides are equal, and the constant terms are equal.

Solving for X as a Constant

Given the structure, the only way for the equation to hold for all x is if the coefficients of x on both sides are equal, and the constant terms are equal.

This leads us to set up a system:

- Coefficient of x on the left: 4X
- Coefficient of x on the right: 3

Similarly for constants:

- Left constant term: 36X
- Right constant term: 32

Now, equate the coefficients:

$$
4X = 3
$$

And the constants:

$$
36X = 32
$$

Step 4: Solve for X from the Coefficient Equation

$$
4X = 3 \implies X = \frac{3}{4}
$$

Step 5: Verify with the Constant Terms

Substitute X = $\frac{3}{4}$ into the constant term equation:

$$
36X = 32
$$

\[

$$
36 \times \frac{3}{4} = 32
$$

Calculate:

$$
36 \times \frac{3}{4} = \frac{36 \times 3}{4} = \frac{108}{4} = 27
$$

But 27 ≠ 32, indicating inconsistency. This suggests that the initial assumption—that X is a constant satisfying the equation for all x—may not hold unless the equation is specific for a particular x.

Alternative Approach: Solving for X with a specific value of x

Suppose the problem expects us to find X for a specific known value of x. In that case, x is treated as a known constant, and the equation becomes a linear algebraic equation in X.

For illustration, assume x is known, say, x = 5.

Original expanded equation:

$$
4X \times x + 36X = 3x + 32
$$

Plugging in x=5:

$$
4X \times 5 + 36X = 3 \times 5 + 32
$$

Simplify:

$$
20X + 36X = 15 + 32
$$

$$
56X = 47
$$

Solve for X:

$$
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$$
X = \frac{47}{56}
$$

Similarly, if x=7:

$$
4X \times 7 + 36X = 3 \times 7 + 32
$$

$$
28X + 36X = 21 + 32
$$

$$
64X = 53
$$

$$
X = \frac{53}{64}
$$

This indicates that X depends on the specific x value, which means the original equation represents a relationship between X and x.

Conclusion: Interpreting the Solution

Based on the analysis above, the key takeaways are:

- If the problem is to find a value of X that satisfies the equation for all x, then the only solution is when the coefficients of x on both sides are equal, which gives X = 3/4. However, this leads to inconsistency unless the constants align, which they do not in this case.

- If x is a specific known value, then X can be calculated directly. For example, at x=5, X=47/56.

- Therefore, the most accurate interpretation depends on the context provided by the problem statement. Since no specific x is given, and the equation involves both X and x, it suggests that X is a parameter dependent on x.

Practical Tips for Solving Similar Equations

When encountering equations like X4(x+9) = 3(x+11) - 1, keep these tips in mind:

1. **Clarify notation:** Understand whether variables are multiplied, combined, or represent different entities.
2. **Expand expressions:** Eliminate parentheses to simplify the equation.
3. **Identify whether the equation holds for all values or specific values:** This determines if you solve for a constant or a variable dependent on others.
4. **Isolate the variable:** Use algebraic operations to solve for the unknown.
5. **Check the solution:** Substitute back into the original equation to verify correctness.

Summary of Key Steps

To summarize, solving X4(x+9) = 3(x+11) - 1 involves:

- Interpreting the notation correctly (assumed to be 4X times (x+9)).
- Expanding both sides to simplify.
- Recognizing that the equation involves both X and x, and understanding whether you are solving for X as a constant or a variable depending on x.
- Solving the resulting linear equations accordingly.

Final Thoughts

Understanding algebraic equations requires careful reading and interpretation of notation. The equation X4(x+9) = 3(x+11) - 1 demonstrates the importance of clarifying assumptions and systematically applying algebraic principles. Whether you're solving for a constant X or a variable dependent on x, practicing such problems enhances your problem-solving skills and prepares you for more complex equations.

Always double-check your work

Frequently Asked Questions

How do I start solving the equation 4(x + 9) = 3(x + 11) - 1?

Begin by expanding both sides: 4x + 36 = 3x + 33 - 1, then simplify the right side to 3x + 32.

What is the next step after expanding both sides of the equation?

Subtract 3x from both sides to gather x terms on one side: 4x - 3x + 36 = 32, which simplifies to x + 36 = 32.

How do I isolate x in the equation x + 36 = 32?

Subtract 36 from both sides to find x: x = 32 - 36, so x = -4.

What is the solution to the equation 4(x + 9) = 3(x + 11) - 1?

The solution is x = -4.

Are there alternative methods to solve this type of linear equation?

Yes, you can also use substitution or the elimination method in more complex equations, but expanding and simplifying is most straightforward here.

How can I verify that x = -4 is the correct solution?

Substitute x = -4 back into the original equation: 4(-4 + 9) = 3(-4 + 11) - 1, which simplifies to 4(5) = 3(7) - 1, resulting in 20 = 21 - 1, confirming the solution is correct.

Additional Resources

Mathematics Problem Solving

Introduction

Mathematics often presents us with intriguing equations that challenge our understanding and problem-solving skills. One such problem is:

Find the value of x in the equation:

$$ 4(x + 9) = 3(x + 11) - 1 $$

At first glance, this equation appears straightforward, but it offers a rich opportunity to explore algebraic principles, including applying the distributive property, combining like terms, and isolating the variable. Whether you're a student brushing up on algebra or an enthusiast honing problem-solving techniques, dissecting this equation provides valuable insights into fundamental mathematical operations.

This article aims to guide you through this problem comprehensively, breaking down each step with clarity and precision, ensuring you grasp the underlying concepts and can confidently approach similar equations in the future.

Understanding the Equation

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

$$ 4(x + 9) = 3(x + 11) - 1 $$

Notice that this is a linear equation involving the variable x, with coefficients and constants. The key components are:

- Distributive terms: $4(x + 9)$ and $3(x + 11)$
- Constants: -1

The goal is to find the value of x that makes both sides of the equation equal.

Step 1: Apply the Distributive Property

The distributive property allows us to eliminate parentheses by multiplying each term inside the parentheses by the coefficient outside.

Distribute on the Left Side:

$$
4(x + 9) = 4 \times x + 4 \times 9 = 4x + 36
$$

Distribute on the Right Side:

$$
3(x + 11) = 3 \times x + 3 \times 11 = 3x + 33
$$

Now, rewrite the original equation with these expanded expressions:

$$
4x + 36 = 3x + 33 - 1
$$

Step 2: Simplify the Right Side

Combine like terms on the right:

$$
3x + 33 - 1 = 3x + 32
$$

The equation now simplifies to:

$$
4x + 36 = 3x + 32
$$

Step 3: Isolate the Variable

To find x, we need to gather all x-terms on one side and constants on the other.

Subtract $3x$ from both sides:

$$
4x - 3x + 36 = 3x - 3x + 32
$$

$$
x + 36 = 32
$$

Subtract 36 from both sides:

$$
x + 36 - 36 = 32 - 36
$$

$$
x = -4
$$

Final Result: The Value of x

The solution to the equation is:

$$
\boxed{x = -4}
$$

This means that when x equals -4, both sides of the original equation are equal, satisfying the equation.

Verification: Double-Check Your Solution

Always verify your solution by substituting $x = -4$ back into the original equation.

Original Equation:

$$
4(x + 9) = 3(x + 11) - 1
$$

Substitute $x = -4$:

$$
4(-4 + 9) = 3(-4 + 11) - 1
$$

Calculate inside parentheses:

$$
4(5) = 3(7) - 1
$$

Simplify both sides:

$$
20 = 21 - 1
$$

$$
20 = 20
$$

Since both sides are equal, the solution $x = -4$ is verified and correct.

Additional Insights and Tips

Key Takeaways:

- Always apply the distributive property first to eliminate parentheses.
- Combine like terms to simplify the equation.
- Maintain balance by performing the same operation on both sides.
- Verify your solutions by substitution.

Common Mistakes to Avoid:

- Forgetting to distribute properly.
- Making arithmetic errors during combination.
- Confusing the order of operations, especially when dealing with multiple steps.
- Forgetting to check the solution in the original equation.

Broader Context: Why This Equation Matters

While this particular problem appears simple, mastering such equations forms the foundation for more complex algebraic concepts. These skills are essential in fields like engineering, computer science, physics, and economics, where modeling and solving equations are daily tasks.

Understanding equations like $4(x + 9) = 3(x + 11) - 1$ develops problem-solving agility, critical thinking, and logical reasoning—skills valuable beyond mathematics.

Summary

In this comprehensive exploration, we've:

- Dissected the algebraic structure of the equation.
- Applied the distributive property to expand expressions.
- Simplified the equation step-by-step.
- Isolated the variable x through inverse operations.
- Verified the solution for accuracy.

The key takeaway is that the value of x satisfying the equation is -4.

Mastering these steps not only helps solve this particular problem but also equips you with the essential tools to tackle a wide array of algebraic equations confidently.

Final Thoughts

Mathematics is a language of logic and structure. By breaking down problems systematically, as demonstrated here, you develop clarity and confidence. Whether you're solving equations in academic settings or applying mathematical reasoning in real-world scenarios, mastering foundational techniques like these ensures success.

Keep practicing with different types of equations, and over time, you'll find solving complex problems becomes more intuitive and rewarding.

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