Solve For X. -3(x+n)=x

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Understanding how to solve for an unknown variable in algebraic equations is a fundamental skill in mathematics. The equation *-3(x + n) = x* presents a straightforward yet insightful example of algebraic manipulation. In this comprehensive guide, we'll explore the step-by-step process to isolate and solve for \(x\), analyze the solution, and discuss common pitfalls and tips to master similar problems. Whether you're a beginner or looking to strengthen your algebra skills, this article will provide clarity and practical strategies.

Understanding the Equation: -3(x + n) = x

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

Equation Breakdown

- The equation involves a linear expression with an unknown \(x\) and a constant \(n\).
- The term \(-3(x + n)\) indicates multiplication of \(-3\) with the entire sum \((x + n)\).
- The right side is simply \(x\).

Goals of Solving

- To find the value of \(x\) in terms of \(n\).
- To understand the relationship between \(x\) and \(n\).
- To verify the solution by substitution.

Step-by-Step Solution Process

Let's walk through the process systematically.

Step 1: Expand the Equation

- Distribute \(-3\) across the parentheses:

```
-3(x + n) = x
```

```
=> -3  x - 3  n = x
=> -3x - 3n = x
```

Step 2: Collect Like Terms

- To isolate \(x\), bring all \(x\) terms to one side:

```
-3x - x = 3n
```

- Note: We add \(3x\) to both sides to move all \(x\)-terms to the same side.

Step 3: Simplify the Equation

- Combine the \(x\) terms:

```
(-3x - x) = -4x
=> -4x = 3n
```

Step 4: Solve for \(x\)

- Divide both sides by \(-4\):

```
x = \frac{3n}{-4}
=> x = -\frac{3n}{4}
```

Final Solution:

\[
x = -\frac{3n}{4}
\]

This expression represents \(x\) in terms of the constant \(n\).

Verifying the Solution

Verification ensures the solution is correct.

Substitute $x = -\frac{3n}{4}$ back into the original equation:

Original equation:
$$
-3(x + n) = x
$$

Substitute x:
$$
-3\left(-\frac{3n}{4} + n\right) = -\frac{3n}{4}
$$

Simplify inside parentheses:
$$
-\frac{3n}{4} + n = -\frac{3n}{4} + \frac{4n}{4} = \frac{1n}{4}
$$

Multiply:
$$
-3 \times \frac{n}{4} = -\frac{3n}{4}
$$

Check if both sides match:
$$
-\frac{3n}{4} = -\frac{3n}{4}
$$

Yes, the equality holds, confirming our solution is valid.

Understanding the Solution in Context

The solution $x = -\frac{3n}{4}$ indicates a linear relationship between x and n. For any given value of n, you can compute x directly.

Special Cases:

- When $n = 0$:

$$
x = -\frac{3 \times 0}{4} = 0
$$

- When n is positive:

$$
x = -\frac{3n}{4} \quad \text{(negative value)}
$$

- When n is negative:

$$
x = -\frac{3 \times (-|n|)}{4} = \frac{3|n|}{4} \quad \text{(positive value)}
$$

This demonstrates how changing n affects x.

Graphical Interpretation

Plotting the relationship between x and n helps visualize the solution.

Graph Characteristics:

- The equation $x = -\frac{3}{4} n$ is a straight line passing through the origin.
- The slope of the line is $-\frac{3}{4}$, indicating an inverse relationship.
- For every increase of 4 units in n, x decreases by 3 units.

Implications:

- The graph helps in understanding how x varies with n.
- Useful in real-world scenarios where such relationships model physical phenomena or data trends.

Common Mistakes and How to Avoid Them

While solving equations like $-3(x + n) = x$, beginners often encounter pitfalls.

Errors to Watch Out For:

1. **Incorrect distribution:** Forgetting to multiply -3 across both terms inside parentheses.

2. **Sign errors:** Mismanaging negative signs during distribution or algebraic manipulation.

3. **Incorrect combination of like terms:** Failing to combine x terms properly.
4. **Dividing by zero:** Ensuring the denominator isn't zero; in this case, since dividing by -4, always valid unless n is undefined.

Tips to Avoid Mistakes:

- Always perform distribution carefully, double-checking signs.
- Write each step explicitly to track signs and coefficients.
- Verify your solution by substitution.
- Practice similar problems to build confidence.

Additional Practice Problems

To reinforce understanding, try solving these:

1. Solve for x: $2(x - 3) = x + 4$
2. Solve for x: $-5(x + 2) = 3x - 7$
3. Find x when $-4(x + n) = 2x$
4. Express x in terms of n for the equation: $7(x - n) = 3x + 2$

Conclusion

Mastering the process of solving for x in linear equations like $-3(x + n) = x$ is a foundational skill in algebra. By understanding how to distribute, combine like terms, and isolate variables, you can solve a wide variety of equations efficiently. Remember to verify solutions through substitution and be mindful of signs and algebraic rules. With practice, these steps become second nature, paving the way for tackling more complex mathematical problems with confidence and precision.

Frequently Asked Questions

How do I solve the equation -3(x + n) = x for x?

First, distribute -3 to get -3x - 3n = x. Then, add 3x to both sides: -3x - 3n + 3x = x + 3x, simplifying to -3n = 4x. Finally, divide both sides by 4 to solve for x: x = -∓4n/4.

What is the value of x in the equation -3(x + n) = x?

The value of x is x = -∓4n/4.

If n = 2, what is the solution for x in -3(x + n) = x?

Substituting n = 2, x = -∓4 2 / 4 = -∓12 / 4 = -3/2.

Can I verify the solution x = -∓4n/4 by substitution?

Yes. Substitute x = -∓4n/4 into the original equation to verify both sides are equal.

What algebraic steps are involved in solving -3(x + n) = x?

Distribute -3, combine like terms, isolate x, and divide to find the explicit formula for x.

Is the solution for x dependent on n?

Yes, the solution x = -∓4n/4 depends on the value of n.

How would the solution change if the equation was -3(x + n) = -x?

You would follow similar steps: distribute, then solve for x, which would lead to a different expression.

What type of equation is -3(x + n) = x?

It's a linear equation in terms of x.

Can I solve for x if n is a known constant, say 5?

Yes. Plug in n = 5 into x = -∓4n/4 to find x = -∓45/4 = -5/4.

What is the importance of distributing in solving -3(x + n) = x?

Distributing simplifies the equation and makes it easier to isolate and solve for x.

Additional Resources

Solve For X. -3(x + n) = x

In the realm of algebra, equations serve as the foundational language through which we understand relationships between variables. Among these, linear equations like -3(x + n) = x are fundamental, yet they often puzzle students and enthusiasts alike due to the process of isolating the variable of interest—commonly represented as 'x.' Solving for 'x' involves unraveling the equation to express the variable explicitly, providing insight into how variables interact within mathematical expressions. This article explores the step-by-step methodology to solve the equation -3(x + n) = x, delving into the principles of algebra, common pitfalls, and practical applications, all presented in a clear and accessible manner.

Understanding the Equation

Before diving into the solution process, it’s crucial to understand the structure of the equation itself.

The Components of the Equation

- Variables: The unknown quantity 'x' that we aim to find.
- Constants: The fixed number 'n,' which can be any real number and influences the value of 'x.'
- Coefficients: The numbers multiplying variables—in this case, '-3' is the coefficient of (x + n).

The equation is written as:

-3(x + n) = x

This setup indicates that the quantity '-3' is being multiplied by the entire binomial '(x + n),' and the result equals 'x.' Our goal is to manipulate this equation to express 'x' solely in terms of 'n.'

Step-by-Step Solution Process

To solve for 'x,' we need to isolate it on one side of the equation. The process involves expanding, simplifying, and rearranging algebraic terms.

Step 1: Expand the Equation

The first step is to distribute the '-3' across the parentheses:

-3 x + (-3) n = x

which simplifies to:

-3x - 3n = x

This expansion transforms the original equation into a linear form, making it easier to manipulate.

Step 2: Collect Like Terms

Our goal is to gather all 'x' terms on one side of the equation. Currently, we have:

-3x - 3n = x

To move all 'x' terms to one side, add '3x' to both sides:

-3x - 3n + 3x = x + 3x

which simplifies to:

0 - 3n = 4x

or simply:

-3n = 4x

Step 3: Isolate 'x'

Now, 'x' is multiplied by 4, and the other side is '-3n.' To solve for 'x,' divide both sides by 4:

x = (-3n) / 4

This is the solution expressed explicitly in terms of 'n.'

Interpreting the Solution

The final expression:

x = (-3n) / 4

provides a direct relationship between 'x' and 'n.' For any real value of 'n,' plug in the number to compute the corresponding 'x.' This demonstrates the linear dependency of 'x' on 'n,' scaled by a factor of '-3/4.'

Special Cases and Considerations

- When n = 0:
x = 0. The solution simplifies elegantly, indicating that 'x' is zero when 'n' is zero.

- When n is negative:
For example, if n = -4, then
x = (-3 -4)/4 = 12/4 = 3

- When n is positive:
If n = 8, then
x = (-3 8)/4 = -24/4 = -6

This flexibility illustrates how 'n' influences the value of 'x.'

Deeper Insights into the Equation

Understanding the solution process for -3(x + n) = x extends beyond mere algebraic manipulation; it offers insights into broader mathematical principles.

Linear Equations and Their Properties

This equation exemplifies a linear relationship, where the highest power of 'x' is one. The solution process involves:

- Distributive property
- Combining like terms
- Isolation of variables

These are fundamental skills applicable to more complex algebraic problems.

The Role of Coefficients and Constants

The coefficients (-3 and 4) and the constant 'n' dictate the slope and position of the solution line in a coordinate system. Variations in 'n' shift the solution along the x-axis, illustrating the parametric nature of linear equations.

Practical Applications of Solving for X

Mastering this type of algebraic problem has real-world implications across various fields:

- Economics: Calculating break-even points where costs and revenues relate linearly.

- Physics: Determining variables like velocity or force based on other parameters.
- Engineering: Designing systems where relationships between components are linear.
- Data Analysis: Fitting linear models to data points.

Understanding how to manipulate equations like -3(x + n) = x enables professionals and students to interpret and solve real-world problems efficiently.

Common Pitfalls and How to Avoid Them

While the steps seem straightforward, several pitfalls can trip up learners:

- Incorrect distribution: Forgetting to distribute '-3' across both 'x' and 'n' can lead to errors.
- Sign errors: Paying close attention to negative signs is crucial, especially when moving terms across the equation.
- Dividing by zero: Ensuring that the divisor (in this case, 4) is not zero—although here, it's always 4, so no issue arises.

To avoid these pitfalls:

- Double-check each step.
- Keep track of signs during distribution.
- Confirm the divisor is non-zero when dividing.

Conclusion

The equation -3(x + n) = x exemplifies the core techniques in algebra: expanding expressions, collecting like terms, and isolating variables. Its solution, x = (-3n)/4, offers a clear and concise expression of the relationship between 'x' and 'n.' This process underscores the importance of understanding fundamental algebraic principles, which serve as building blocks for more complex mathematical endeavors. Whether applied in academic contexts or real-world scenarios, mastering such equations enhances problem-solving skills and deepens comprehension of linear relationships. As with many algebraic challenges, patience, attention to detail, and systematic methodology are key to unlocking the solutions hidden within equations like -3(x + n) = x.

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