Solve For X. Show Each Step Of The Solution.5(2-x)-10=25-2(3x+40)

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When faced with algebraic equations like 5(2-x)-10=25-2(3x+40), the key is to systematically isolate the variable x. Solving such equations involves several steps: expanding expressions, combining like terms, and ultimately solving for x. This process not only enhances our problem-solving skills but also deepens our understanding of algebraic principles. In this article, we will walk through each step carefully, providing explanations and tips along the way to help you master solving similar equations.

Understanding the Equation

Before diving into the solution, let’s analyze the given equation:

5(2-x)-10=25-2(3x+40)

This is a linear equation involving parentheses, multiplication, and constants. The goal is to find the value of x that makes the equation true.

Step 1: Expand the Parentheses

The first step is to eliminate parentheses by distributing the multiplication across the terms inside each set of parentheses.

Apply distributive property:

- 5(2-x) becomes 5×2 - 5×x = 10 - 5x
- -2(3x+40) becomes -2×3x - 2×40 = -6x - 80

Rewrite the equation with expanded expressions:

10 - 5x - 10 = 25 - 6x - 80

Step 2: Simplify Both Sides

Now, combine like terms on each side to simplify the equation further.

Left side:

- 10 - 10 = 0
- So, the left side simplifies to -5x

Right side:

- 25 - 80 = -55
- So, the right side simplifies to -6x - 55

Updated equation:

-5x = -6x - 55

Step 3: Collect Variable Terms on One Side

To isolate x, we need to get all x terms on one side of the equation.

Choose to move all x terms to the left side:

- Add 6x to both sides:

$-5x + 6x = -6x + 6x - 55$

Simplify:

$x = -55$

Step 4: Verify the Solution

Always verify your solution by substituting x back into the original equation.

Substitute $x = -55$ into the original:

$5(2 - (-55)) - 10 = 25 - 2(3\times(-55) + 40)$

Calculate each side:

- Left side:
- $2 - (-55) = 2 + 55 = 57$
- $5 \times 57 = 285$
- $285 - 10 = 275$

- Right side:
- 3 × (-55) = -165
- -165 + 40 = -125
- 2 × (-125) = -250
- 25 - (-250) = 25 + 250 = 275

Compare both sides:

Left side = 275, Right side = 275

Since both sides are equal, x = -55 is the correct solution.

Summary of Steps

Here’s a quick recap of the process:

- Expand all parentheses using the distributive property.
- Combine like terms on each side to simplify the equation.
- Isolate the variable term by moving all x terms to one side.
- Solve for x by dividing or simplifying as needed.

- Verify the solution by substituting back into the original equation.

Additional Tips for Solving Algebraic Equations

- Always perform the same operation on both sides of the equation to maintain equality.
- Simplify expressions at each step to make the process manageable.
- Double-check your expansions to avoid mistakes.
- When in doubt, verify your solution by substitution.

Conclusion

Solving for x in equations like $5(2-x)-10=25-2(3x+40)$ may seem complex at first, but by following a structured approach, it becomes manageable. By expanding parentheses, combining like terms, and carefully isolating the variable, you can systematically find the solution. Remember to verify your answer to ensure accuracy. With practice, these steps will become second nature, empowering you to tackle a wide range of algebraic problems confidently.

Frequently Asked Questions

How do I start solving the equation 5(2 - x) - 10 = 25 - 2(3x + 40)?

Begin by distributing the numbers outside the parentheses: 5 2 and 5 -x on the left, and -2 3x and -2 40 on the right. This simplifies the equation to 10 - 5x - 10 = 25 - 6x - 80.

What is the next step after distributing in the equation 10 - 5x - 10 = 25 - 6x - 80?

Combine like terms on each side: 10 - 10 cancels out to 0 on the left, and 25 - 80 simplifies to -55 on the right. The simplified equation becomes -5x = -55 + 6x.

How do I isolate the variable x in the equation -5x = -55 + 6x?

Subtract 6x from both sides to gather all x terms on one side: -5x - 6x = -55. This simplifies to -11x = -55.

What is the value of x after simplifying -11x = -55?

Divide both sides by -11 to solve for x: x = -55 / -11, which simplifies to x = 5.

Can you verify the solution x = 5 in the original equation?

Yes. Substitute x = 5 into the original equation: 5(2 - 5) - 10 = 25 - 2(35 + 40). Calculate each side: 5(-3) - 10 = 25 - 2(15 + 40). Simplify: -15 - 10 = 25 - 2(55). So, -25 = 25 - 110, which simplifies to -25 = -85. Since both sides are not equal, check for calculation errors.

Is there a mistake in my verification step for x = 5?

Yes. Let's re-evaluate the substitution carefully. Original: 5(2 - x) - 10 = 25 - 2(3x + 40). Substitute x = 5: 5(2 - 5) - 10 = 25 - 2(35 + 40). Simplify inside parentheses: 5(-3) - 10 = 25 - 2(15 + 40). Calculate: -15 - 10 = 25 - 2(55). Simplify right side: 25 - 110 = -85. Left side: -25. Since -25 ≠ -85, x = 5 is not the correct solution. There was an error earlier.

How do I correctly solve for x given the mistake in the previous step?

Let's revisit the steps: starting from the original equation 5(2 - x) - 10 = 25 - 2(3x + 40). Distribute: 10 - 5x - 10 = 25 - 6x - 80. Combine like terms: 0 - 5x = -55 - 6x. Simplify to -5x = -55 - 6x. Add 6x to both sides: -5x + 6x = -55. Simplify: x = -55.

What is the correct value of x after re-solving?

The correct solution is x = -55. To verify, substitute x = -55 into the original equation and check if both sides are equal.

Additional Resources

Comprehensive Solution Analysis of the Equation 5(2 - x) - 10 = 25 - 2(3x + 40)

Introduction

Mathematics, especially algebra, forms the backbone of problem-solving skills that are essential in various fields such as engineering, data science, economics, and everyday logical reasoning. One of the foundational skills in algebra involves solving linear equations, which are equations where the variable appears to the first power and can be manipulated using basic arithmetic operations to find its value.

The equation $5(2 - x) - 10 = 25 - 2(3x + 40)$ is a classic example that demonstrates multiple algebraic concepts like distributing, combining like terms, and isolating variables to find solutions. This detailed analysis will guide you through each step involved in solving this equation, emphasizing clarity, correctness, and understanding.

Understanding the Equation

The given equation is:

$$5(2 - x) - 10 = 25 - 2(3x + 40)$$

Before jumping into the solution, let's break down what this equation represents and identify the key algebraic principles involved.

- Distributive Property: Both sides contain parentheses multiplied by a coefficient, which means we'll need to expand these expressions.
- Combining Like Terms: After expansion, similar terms (constants and terms with x) will be combined to simplify the equation.
- Isolating the Variable: The goal is to get x on one side of the equation and constants on the other, enabling us to solve for x.

Step 1: Expand Both Sides of the Equation

To simplify the equation, we begin by distributing the coefficients across the parentheses.

Left Side:

- 5(2 - x) becomes 5 2 - 5 x = 10 - 5x
- The remaining term is -10, which is a constant and stays as is.

So, the left side simplifies to:

10 - 5x - 10

Right Side:

- -2(3x + 40) becomes -2 3x + (-2) 40 = -6x - 80
- The constant 25 remains as is.

Thus, the right side simplifies to:

25 - 6x - 80

Step 2: Combine Like Terms

Now, let's combine the constants on both sides to further simplify.

Left Side:

10 - 10 = 0

So, the left side reduces to:

-5x

Right Side:

25 - 80 = -55

So, the right side reduces to:

-6x - 55

Updated Equation:

-5x = -6x - 55

Step 3: Isolate the Variable x

Our goal is to solve for x. Currently, x appears on both sides with different coefficients. To isolate it, we need to collect all x terms on one side and constants on the other.

Add 6x to both sides:

-5x + 6x = -6x + 6x - 55

Simplifies to:

x = -55

This step is crucial because it clears x from the right side, leaving only the constant on the right.

Step 4: Verify the Solution

Before finalizing, it's good practice to verify the solution by substituting x = -55 back into the original equation.

Original Equation:

$5(2 - x) - 10 = 25 - 2(3x + 40)$

Substitute x = -55:

Left Side:

- $5(2 - (-55)) - 10$

- $5(2 + 55) - 10$

- $5(57) - 10$

- 285 - 10 = 275

Right Side:

- 25 - 2(3 -55 + 40)

- 25 - 2(-165 + 40)

- 25 - 2(-125)

- 25 + 250 = 275

Since both sides equal 275, the solution x = -55 is verified.

In-Depth Conceptual Explanation

To deepen understanding, let's explore the algebraic principles and reasoning behind each step.

Distributive Property

- The distributive property states that a(b +

c) = ab + ac.
- In our case, it allowed us to expand 5(2 - x) into 10 - 5x, and similarly for -2(3x + 40).

Combining Like Terms

- After expansion, constants like 10 and -10, and 25 and -80, were combined to simplify the expressions.
- This step reduces the complexity of the equation, making it easier to solve.

Goal of Isolation

- The ultimate goal in solving for x is to get x alone on one side.
- To do this, we perform inverse operations (adding, subtracting, etc.) to both sides to maintain equality.

Why Add 6x?

- Moving all x terms to the left side helps isolate x.

- Since the right side has -6x, adding 6x to both sides cancels x on the right, leaving only x on the left.

Verification

- Plugging the solution back into the original equation ensures that the solution satisfies the original problem, not just the simplified version.

Additional Considerations and Common Mistakes

While this problem appears straightforward, awareness of common pitfalls enhances problem-solving skills:

- Misdistribution: Forgetting to distribute the coefficients correctly can lead to incorrect solutions.
- Sign Errors: Pay close attention to signs, especially with negative coefficients and subtraction.
- Combining Constants: Always double-check the

arithmetic when combining constants.
- Incorrect Variable Moves: Remember to perform the same operation on both sides to maintain equality.
- Verification: Always verify solutions to catch any algebraic mistakes.

Alternative Methods and Approaches

While straightforward algebraic manipulation works well here, alternative approaches or tools can sometimes be helpful:

- Graphical Method: Plot both sides as functions and find their intersection point.
- Using Algebraic Software: Tools like WolframAlpha or graphing calculators can verify solutions quickly.
- Step-by-step Breakdown: For complex equations, breaking steps into smaller parts aids in understanding.

Summary and Final Thoughts

In conclusion, solving the equation 5(2 - x) - 10 = 25 - 2(3x + 40) involves a systematic approach rooted in fundamental algebraic principles. Here's a quick recap:

1. Distribute coefficients across parentheses.
2. Combine like terms to simplify both sides.
3. Rearrange the equation to bring all x terms to one side.
4. Solve for x by performing inverse operations.
5. Verify the solution by substitution.

The solution x = -55 is correct and consistent with the original equation, demonstrating the effectiveness of algebraic manipulation.

Practical Applications

Understanding how to solve such equations has numerous real-world applications:

- Financial Modeling: Calculating unknowns like interest rates or investment returns.
- Physics: Determining unknown quantities like velocity or acceleration.

- Engineering: Solving for unknown parameters in system equations.
- Data Analysis: Fitting models where variables are related linearly.

Mastery of solving linear equations like this forms a foundation for tackling more complex mathematical problems, including systems of equations, quadratic equations, and calculus-based problems.

Conclusion

The detailed step-by-step solution process for the equation $5(2 - x) - 10 = 25 - 2(3x + 40)$ exemplifies the logical structure and procedural clarity needed in algebra. By methodically expanding, simplifying, isolating, and verifying, you not only arrive at the correct solution but also develop a deeper understanding of algebraic principles that are universally applicable across mathematics and science disciplines. Whether you're a student, educator, or lifelong learner, mastering such problem-solving techniques enhances analytical thinking and confidence in mathematical reasoning.

End of Analysis

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