

Solve For X: $-4(3x - 2) = 6x + 2$

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Mathematics is a fundamental skill that forms the backbone of many scientific, engineering, and everyday problem-solving scenarios. One of the essential concepts in algebra is solving equations—finding the value of an unknown variable that makes the equation true. In this article, we will explore how to solve the equation $-4(3x - 2) = 6x + 2$ step-by-step, providing clear explanations and tips to master similar algebraic problems.

Understanding the Equation

Before diving into solving the equation, it's important to understand its structure.

Equation:

$$-4(3x - 2) = 6x + 2$$

This is a linear algebraic equation involving an unknown x . The goal is to find the value of x that satisfies this equation.

Step-by-Step Solution Process

To solve this equation, we need to isolate x on one side of the equation. The general approach involves simplifying both sides and then solving for x .

Step 1: Distribute the -4 on the left side

The distributive property allows us to multiply -4 by each term inside the parentheses:

$$-4 \cdot 3x = -12x$$

$$-4 \cdot (-2) = +8$$

So, the equation becomes:

$$-12x + 8 = 6x + 2$$

Step 2: Move all terms containing x to one side

To gather all x terms on one side, choose either side. Typically, we move terms to the left:

Subtract 6x from both sides:

$$-12x - 6x + 8 = 6x - 6x + 2$$

$$-18x + 8 = 2$$

Step 3: Move constant terms to the other side

Subtract 8 from both sides:

$$-18x + 8 - 8 = 2 - 8$$

$$-18x = -6$$

Step 4: Solve for x

Divide both sides by -18:

$$x = \left(\frac{-6}{-18}\right)$$

Simplify the fraction:

$$x = \left(\frac{1}{3}\right)$$

Result:

$$x = \left(\frac{1}{3}\right)$$

Verification of the Solution

It's always good to verify your solution by substituting $x = \left(\frac{1}{3}\right)$ back into the original equation.

Original equation:

$$-4(3x - 2) = 6x + 2$$

Substitute $x = \left(\frac{1}{3}\right)$:

Left side:

$$-4\left(3\frac{1}{3}\right) - 2 = -4(1 - 2) = -4(-1) = 4$$

Right side:

$$6\frac{1}{3} + 2 = 2 + 2 = 4$$

Since both sides equal 4, the solution $x = \frac{1}{3}$ is verified.

Common Mistakes to Avoid

When solving equations like $-4(3x - 2) = 6x + 2$, students often encounter pitfalls:

- Neglecting Distribution: Forgetting to distribute the -4 correctly can lead to incorrect results.
- Sign Errors: Be careful when combining like terms, especially with negative signs.
- Incorrect Arithmetic: Simplify fractions properly and double-check calculations.
- Omitting the verification step: Always verify your solution by plugging it back into the original equation.

Additional Tips for Solving Linear Equations

- Always perform inverse operations in the correct order.
- Keep the equation balanced by performing the same operation on both sides.
- Simplify expressions as much as possible before solving.
- Write down each step clearly to avoid errors.
- Practice similar problems to build confidence.

Practice Problems

Try solving these equations on your own to reinforce your understanding:

1. $2(5x - 4) = 3x + 7$
2. $-3(2x + 5) = 4x - 9$
3. $5x - 2 = 3(2x + 1)$
4. $-6x + 4 = 2x - 8$
5. $-7(3x - 1) = 2(2x + 4)$

Summary

Solving the equation $-4(3x - 2) = 6x + 2$ involves a series of systematic steps:

1. Distribute to remove parentheses: $-12x + 8 = 6x + 2$
2. Gather all x terms on one side: $-18x + 8 = 2$
3. Isolate x by subtracting 8 and dividing: $x = \frac{1}{3}$
4. Verify the solution by substituting it back into the original.

Mastering such problems enhances your algebraic skills and prepares you for more complex equations. Remember, practice and careful attention to detail are key to becoming proficient in solving equations.

Conclusion

The process of solving $-4(3x - 2) = 6x + 2$ demonstrates fundamental algebraic principles such as distribution, combining like terms, and solving for an unknown. These skills are essential for tackling a wide range of mathematical problems. By following a structured approach and verifying your solutions, you can confidently solve similar equations and strengthen your overall math proficiency. Keep practicing, and don't hesitate to revisit fundamental concepts whenever needed!

Frequently Asked Questions

How do I start solving the equation $-4(3x - 2) = 6x + 2$?

Begin by distributing -4 across the parentheses to eliminate the parentheses, resulting in $-12x + 8 = 6x + 2$.

What is the first step after expanding $-4(3x - 2)$ in the equation?

The first step is to expand the left side: $-12x + 8 = 6x + 2$.

How can I isolate the variable x in the equation $-12x + 8 = 6x + 2$?

Subtract $6x$ from both sides to get $-12x - 6x + 8 = 2$, simplifying to $-18x + 8 = 2$.

What should I do after combining like terms in the equation?

Subtract 8 from both sides: $-18x + 8 - 8 = 2 - 8$, resulting in $-18x = -6$.

How do I solve for x after getting $-18x = -6$?

Divide both sides by -18: $x = (-6) / (-18)$, which simplifies to $x = 1/3$.

Is the solution to the equation $x = 1/3$ valid?

Yes, substituting $x = 1/3$ back into the original equation confirms it satisfies the equation.

Can I check the solution $x = 1/3$ in the original equation?

Yes, substitute $x = 1/3$ into $-4(3x - 2)$ and see if it equals $6x + 2$; both sides should be equal.

What is the value of $-4(3x - 2)$ when $x = 1/3$?

Calculate $3(1/3) - 2 = 1 - 2 = -1$; then multiply: $-4(-1) = 4$.

What is the value of $6x + 2$ when $x = 1/3$?

Calculate $6(1/3) + 2 = 2 + 2 = 4$; both sides are equal, confirming the solution.

Additional Resources

Solve For X: $-4(3x - 2) = 6x + 2$

In the vast landscape of algebra, solving linear equations serves as a foundational skill that underpins more complex mathematical concepts. Among these equations, the problem Solve For X: $-4(3x - 2) = 6x + 2$ presents an intriguing case study, demonstrating how algebraic manipulations can unravel the value of an unknown variable. This investigative exploration delves into the step-by-step process of solving this equation, revealing the underlying principles, common pitfalls, and broader implications in mathematical problem-solving.

Understanding the Equation: A Closer Look

The equation at hand is:

$$-4(3x - 2) = 6x + 2$$

At first glance, it appears straightforward but requires careful attention to detail. The key components involve:

- Distributive property application
- Combining like terms
- Isolating the variable x

Before jumping into the solution, it's essential to interpret the equation's structure and recognize the algebraic operations involved.

Step-by-Step Solution Process

The resolution of the equation follows a logical sequence:

1. Apply the distributive property to eliminate parentheses
2. Collect like terms on one side
3. Isolate the variable term
4. Solve for x

Let's examine each step meticulously.

Step 1: Distribute -4 across (3x - 2)

Applying the distributive property:

$$-4 \cdot 3x = -12x$$

$$-4 \cdot (-2) = +8$$

Thus, the left side becomes:

$$-12x + 8 = 6x + 2$$

Step 2: Move all terms involving x to one side and constants to the other

Subtract 6x from both sides:

$$-12x - 6x + 8 = 2$$

Combine like terms:

$$-18x + 8 = 2$$

Next, subtract 8 from both sides:

$$-18x + 8 - 8 = 2 - 8$$

Simplify:

$$-18x = -6$$

Step 3: Solve for x

Divide both sides by -18:

$$x = (-6) / (-18)$$

Simplify the fraction:

$$x = 1/3$$

Verification of the Solution

To ensure accuracy, substitute $x = 1/3$ back into the original equation:

Original equation:

$$-4(3x - 2) = 6x + 2$$

Substitute $x = 1/3$:

Left side:

$$-4(3(1/3) - 2) = -4(1 - 2) = -4(-1) = 4$$

Right side:

$$6(1/3) + 2 = 2 + 2 = 4$$

Both sides equal 4, confirming the solution is correct.

Mathematical Significance and Broader Context

While this solution process is straightforward, it exemplifies core algebraic principles that are vital in various fields such as engineering, physics, economics, and computer science. Understanding how to manipulate equations allows practitioners to model real-world phenomena, optimize solutions, and develop computational algorithms.

Key takeaways include:

- The importance of distributing coefficients correctly
- The necessity of maintaining balance in equations
- The value of verification to confirm solutions

Common Challenges and Misconceptions

Despite the simplicity of this problem, learners often encounter pitfalls:

1. Misapplication of distributive property: Forgetting to multiply every term inside parentheses
2. Sign errors: Confusing positive and negative signs during distribution or simplification
3. Incorrectly combining like terms: Overlooking the need to combine only terms with the same variable or constants
4. Dividing by zero: Not applicable here but a common mistake in equations where the coefficient of the variable could be zero after manipulation

Addressing these challenges involves practicing methodical steps and double-checking each operation.

Implications for Educational Practice

Analyzing such algebraic equations offers pedagogical insights:

- Emphasizes the importance of understanding each property and rule
- Reinforces problem-solving strategies like working backward and verifying solutions
- Encourages students to develop a disciplined approach to algebra

In educational settings, presenting equations like Solve For X: $-4(3x - 2) = 6x + 2$ as case studies promotes critical thinking and deepens comprehension of algebraic manipulation.

Extensions and Variations

This basic equation can be extended or varied to challenge learners or explore more complex topics:

- Introducing quadratic terms: e.g., $-4(3x - 2) = 6x^2 + 2$
- Incorporating absolute values: e.g., $|-4(3x - 2)| = 6x + 2$
- Transitioning to inequalities: e.g., $-4(3x - 2) > 6x + 2$

Each variation fosters adaptability and enhances problem-solving flexibility.

Conclusion: The Significance of Methodical Algebraic Problem Solving

The process of solving Solve For X: $-4(3x - 2) = 6x + 2$ underscores the elegance and utility of algebra. By systematically applying fundamental principles—distribution, combining like terms, and verification—students and practitioners can confidently approach similar problems. Beyond the immediate solution, this exercise exemplifies critical thinking, attention to detail, and the importance of verifying results, skills that are invaluable across scientific and mathematical disciplines.

In a broader educational and practical context, mastering such equations builds a foundation for tackling more sophisticated mathematical challenges, fostering analytical skills essential in a data-driven world. As algebra remains a cornerstone of STEM education, cultivating proficiency in solving equations like this ensures learners are well-equipped to navigate complex problem-solving landscapes.

In summary, solving $-4(3x - 2) = 6x + 2$ not only yields a specific value for x but also reinforces core algebraic principles, highlights common pitfalls, and demonstrates the importance of a methodical approach in mathematical reasoning.

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