

Solve The Following. Show All Work Possible. $2x - 6x + 5 = 0$

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Introduction to Solving Linear Equations

Mathematics is a universal language that helps us understand and interpret the world around us. One fundamental skill in algebra is solving linear equations, which are equations where the highest power of the variable (usually denoted as x) is one. These equations are crucial because they form the basis for many advanced topics in mathematics and are applicable in real-world scenarios such as budgeting, engineering, and physics.

In this comprehensive guide, we will explore how to solve the equation:

$$2x - 6x + 5 = 0$$

We will demonstrate each step involved in solving this equation, explaining the reasoning behind each move so that you can develop a clear understanding of the process.

Understanding the Given Equation

Before diving into solving, it's important to analyze the equation:

$$2x - 6x + 5 = 0$$

Let's break down what this equation represents:

- It is a linear equation because the variable x appears to the first power only.
- The coefficients of the variable are 2 and -6.
- The constant term is 5.
- Our goal is to find the value of x that makes the equation true.

Step-by-Step Solution Process

Step 1: Combine Like Terms

The first step is to simplify the equation by combining similar terms:

- The terms $2x$ and $-6x$ are both terms with the variable x .

Calculation:

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

Resulting Equation:

$$-4x + 5 = 0$$

Step 2: Isolate the Variable Term

Next, we want to get the term containing the variable x alone on one side of the equation.

Method:

- Subtract 5 from both sides to move the constant term to the right:

Calculation:

$$-4x + 5 - 5 = 0 - 5$$

Simplifies to:

$$-4x = -5$$

Step 3: Solve for x

Now, to find x , divide both sides of the equation by the coefficient of x , which is -4 :

Calculation:

$$x = (-5) \div (-4)$$

Dividing negatives:

$$x = 5/4$$

Simplified Result:

$$x = 1.25$$

or as a mixed fraction:

$$x = 1 \frac{1}{4}$$

Verification of the Solution

It's always a good practice to verify our solution by substituting the value of x back into the original equation.

Substitute $x = 5/4$ into the original equation:

Original equation:

$$2x - 6x + 5 = 0$$

Calculation:

$$2(5/4) - 6(5/4) + 5 = ?$$

$$- 2(5/4) = (2 \cdot 5) / 4 = 10/4 = 5/2$$

$$- 6(5/4) = (6 \cdot 5) / 4 = 30/4 = 15/2$$

Now, plug these into the equation:

$$(5/2) - (15/2) + 5$$

Combine fractions:

$$(5/2 - 15/2) + 5 = (-10/2) + 5 = -5 + 5 = 0$$

Since the left side equals the right side (0), the solution $x = 5/4$ is verified.

Understanding the Solutions and Their Significance

The solution $x = 5/4$ indicates the point at which the original linear equation balances. This specific value satisfies the equation, confirming that the algebraic manipulations are correct.

Why is this solution important?

- It helps in understanding how variables are linked through algebraic relationships.
- It demonstrates the importance of combining like terms and isolating variables.
- It provides a foundation for solving more complex equations involving multiple variables or higher powers.

Additional Tips for Solving Similar Equations

To become proficient at solving linear equations like the one above, consider the following tips:

1. **Always combine like terms first:** Simplify the equation as much as possible before solving.
2. **Maintain balance:** Whatever operation you perform on one side, do the same on the other side.
3. **Check your work:** Substitute the solution back into the original equation to verify accuracy.
4. **Practice with different coefficients:** Solving equations with various coefficients and constants enhances your problem-solving skills.
5. **Be cautious with signs:** Pay close attention to positive and negative signs during calculations.

Common Mistakes to Avoid

While solving linear equations, students often encounter some pitfalls. Being aware of these can improve accuracy and confidence:

- **Incorrectly combining like terms:** Ensure variables and constants are correctly grouped.
- **Dividing by zero:** Never divide both sides of an equation by zero; always check the coefficient.
- **Sign errors:** Double-check signs during addition, subtraction, multiplication, or division.
- **Skipping verification:** Always verify your solution by substitution.

Practical Applications of Solving Linear Equations

Understanding how to solve linear equations is essential across various fields:

- **Business and Finance:** Calculating profit, revenue, or costs based on linear relationships.
- **Physics:** Determining the speed or acceleration given linear equations of motion.
- **Engineering:** Analyzing electrical circuits or structural loads modeled by linear equations.
- **Statistics:** Fitting linear models to data for predictions and analysis.

Conclusion

Mastering the process of solving linear equations such as $2x - 6x + 5 = 0$ involves understanding algebraic principles, simplifying expressions, and verifying solutions. Through systematic steps—combining like terms, isolating the variable, and checking your work—you can confidently solve similar equations. Remember that practice is key; regularly working through various problems will strengthen your skills and deepen your understanding of algebraic concepts. Whether for academic pursuits or real-world applications, proficiency in solving linear equations is an invaluable mathematical skill.

that forms the foundation for many advanced topics.

Additional Resources for Learning

- Algebra Tutorials and Practice Problems: Websites like Khan Academy, Mathway, and Purplemath offer free lessons and exercises.
- Algebra Textbooks: Standard textbooks provide detailed explanations and numerous practice questions.
- Online Calculators: Use algebra calculators to verify your solutions and understand different solving methods.

By consistently practicing and applying these techniques, you'll develop a solid grasp of algebra that will serve you well in further studies and everyday problem-solving scenarios.

Frequently Asked Questions

How do you simplify the equation $2x - 6x + 5 = 0$ before solving for x ?

Combine like terms: $2x - 6x = -4x$. The simplified equation is $-4x + 5 = 0$.

What is the first step to isolate the variable x in the equation $-4x + 5 = 0$?

Subtract 5 from both sides to get $-4x = -5$.

How do you solve for x after isolating the term $-4x = -5$?

Divide both sides by -4: $x = (-5)/(-4) = 5/4$.

What is the solution to the equation $2x - 6x + 5 = 0$?

The solution is $x = 5/4$.

Can you verify the solution $x = 5/4$ by substituting it back into the original equation?

Yes. Substitute $x = 5/4$: $2(5/4) - 6(5/4) + 5 = (10/4) - (30/4) + 5 = (10/4) - (30/4) + (20/4) = (10 - 30 + 20)/4 = 0/4 = 0$. The solution is verified.

What are common mistakes to avoid when solving this type of linear equation?

Common mistakes include incorrect combination of like terms, improper subtraction or addition of constants, and dividing by a negative number without changing the inequality sign (more relevant in inequalities). Always double-check each step for accuracy.

Additional Resources

Understanding and Solving the Equation: $2x - 6x + 5 = 0$

Solving algebraic equations is a fundamental skill in mathematics, essential for understanding relationships between variables and for applying mathematical concepts in real-world scenarios. The equation $2x - 6x + 5 = 0$ is a linear algebraic equation that can be approached systematically to find the value(s) of x that satisfy it. In this comprehensive guide, we will explore the problem in detail, covering the principles behind algebraic simplification, methods of solving linear equations, step-by-step solutions, common pitfalls, and broader applications.

Understanding the Equation and Its Components

Before diving into the solution, it's important to interpret the structure of the equation:

$$\begin{array}{l} \backslash \\ 2x - 6x + 5 = 0 \\ \backslash \end{array}$$

Key Components:

- Variables: The variable x appears twice in the expression.
- Constants: The number 5 is a constant term.
- Operators: The '+' and '-' signs indicate addition and subtraction operations.

Objective:

Find the value(s) of x that make the entire equation true, i.e., when the left side equals zero.

Step-by-Step Approach to Solving the Equation

To solve $2x - 6x + 5 = 0$, follow these systematic steps:

Step 1: Combine Like Terms

Identify terms involving x:

- 2x and -6x are like terms because they both contain x.

Combine them:

$$\begin{aligned} & \backslash \\ & 2x - 6x = -4x \\ & \backslash \end{aligned}$$

Now, rewrite the original equation with combined terms:

$$\begin{aligned} & \backslash \\ & -4x + 5 = 0 \\ & \backslash \end{aligned}$$

Step 2: Isolate the Variable Term

Subtract 5 from both sides to move the constant to the right:

$$\begin{aligned} & \backslash \\ & -4x + 5 - 5 = 0 - 5 \\ & \backslash \end{aligned}$$

Simplify:

$$\begin{aligned} & \backslash \\ & -4x = -5 \\ & \backslash \end{aligned}$$

Step 3: Solve for x

Divide both sides by the coefficient of x, which is -4:

$$\begin{aligned} & \backslash \\ & x = \frac{-5}{-4} \\ & \backslash \end{aligned}$$

Simplify the fraction:

$$\begin{aligned} & \backslash \\ & x = \frac{5}{4} \\ & \backslash \end{aligned}$$

Step 4: Verify the Solution

Substitute $x = \frac{5}{4}$ back into the original equation to verify:

$$\begin{aligned} & \backslash \end{aligned}$$

$$2 \times \frac{5}{4} - 6 \times \frac{5}{4} + 5 = 0$$

Calculate each term:

- $(2 \times \frac{5}{4} = \frac{10}{4} = \frac{5}{2})$
- $(-6 \times \frac{5}{4} = -\frac{30}{4} = -\frac{15}{2})$
- The constant remains 5.

Now, sum all:

$$\frac{5}{2} - \frac{15}{2} + 5$$

Express 5 as a fraction with denominator 2:

$$\frac{10}{2}$$

Add the fractions:

$$\left(\frac{5}{2} - \frac{15}{2}\right) + \frac{10}{2} = \left(-\frac{10}{2}\right) + \frac{10}{2} = -5 + 5 = 0$$

Since the sum equals zero, $x = (\frac{5}{4})$ is indeed the solution.

Deep Dive into the Methods of Solving Linear Equations

While the above steps are straightforward, understanding the underlying methods enhances problem-solving skills and prepares you for more complex equations.

1. Combining Like Terms

- The first step always involves simplifying the equation by combining like terms.
- This reduces the equation to a simpler form, making it easier to isolate the variable.

2. Using Addition or Subtraction

- Move constant terms to the other side to isolate the variable term.
- Always perform inverse operations to maintain equality.

3. Division or Multiplication

- Divide or multiply both sides by the coefficient of the variable to solve for it.
- Remember to check for zero coefficients, which may lead to special cases.

4. Verification

- Substitute the solution back into the original equation to ensure it satisfies the equation.
- This step confirms the correctness of your solution and helps catch arithmetic errors.

Broader Concepts and Variations

Understanding the general approach to solving linear equations allows you to handle a variety of similar problems.

Linear Equations in One Variable

- Equations like $ax + b = 0$, where a and b are constants.
- General solutions involve isolating x :

$$x = -\frac{b}{a}$$

- Conditions:
- If $a \neq 0$, the solution is unique.
- If $a = 0$:
- If $b = 0$, the equation has infinitely many solutions.
- If $b \neq 0$, the equation has no solution.

Equations with Like Terms

- When multiple like terms are present, always combine them first to simplify the process.
- For example:

$$3x + 2x - 4 + 7 = 0$$

Simplify:

$$5x + 3 = 0$$

Solve:

$$\backslash$$

$$x = -\frac{3}{5}$$

$$\backslash$$

Equations with Variables on Both Sides

- Example:

$$\backslash$$

$$2x + 3 = x - 4$$

$$\backslash$$

Solution steps:

- Subtract x from both sides:

$$\backslash$$

$$2x - x + 3 = -4$$

$$\backslash$$

- Simplify:

$$\backslash$$

$$x + 3 = -4$$

$$\backslash$$

- Subtract 3:

$$\backslash$$

$$x = -4 - 3 = -7$$

$$\backslash$$

Common Mistakes and How to Avoid Them

When solving equations, certain pitfalls can lead to incorrect solutions or misconceptions.

1. Forgetting to Simplify

- Always combine like terms before proceeding.
- Overlooking this step can complicate the problem or produce errors.

2. Sign Errors

- Be careful with addition and subtraction, especially when dealing with negative numbers.
- Maintain a clear notation, and double-check each step.

3. Division by Zero

- Never divide both sides of an equation by a variable expression that could be zero.
- For example, avoid dividing by x when you're not sure if $x \neq 0$.

4. Overlooking Multiple Solutions

- Some equations may have no solution or infinitely many solutions.
- Always verify solutions and consider special cases.

Applications and Real-World Contexts

Linear equations like $2x - 6x + 5 = 0$ are not just academic exercises—they have numerous real-world applications.

1. Financial Calculations

- Calculating profit, loss, or interest rates often involves solving linear equations.
- Example: Finding the break-even point where revenue equals costs.

2. Engineering and Physics

- Determining forces, velocities, or other quantities that depend linearly on variables.

3. Business and Economics

- Analyzing supply and demand equations to find equilibrium prices.

4. Computing and Programming

- Algorithm development sometimes requires solving linear equations to optimize solutions.

Advanced Topics and Extensions

While solving simple linear equations is foundational, more advanced topics include:

1. Systems of Equations

- Solving multiple equations simultaneously to find common solutions.

2. Quadratic and Higher-Degree Equations

- When equations involve powers higher than one, different methods like factoring,

completing the square, or quadratic formulas are used.

3. Inequalities

- Equations can be extended to inequalities, requiring different solution strategies.

4. Matrices and Linear Algebra

- For large systems, matrix operations provide systematic methods for solutions.

Summary and Key Takeaways

- The original equation $2x - 6x + 5 = 0$ simplifies to $-4x + 5 = 0$.
- Solving involves combining like terms, isolating the variable, and dividing by the coefficient.
- The solution is $x = \frac{5}{4}$, verified by substitution.
- Understanding the principles behind solving linear equations enables tackling more complex problems.
- Always verify solutions and be cautious of common pitfalls.

Final Reflection

Mastering the process of solving equations like $2x - 6x + 5 = 0$ forms the backbone of algebraic literacy. It develops critical thinking skills, logical reasoning, and problem-solving capabilities. By systematically simplifying expressions, applying inverse operations, and verifying solutions, you establish a robust foundation that extends to advanced mathematics and practical applications. Remember, each problem is an opportunity to deepen your understanding, refine your techniques, and develop confidence in mathematical reasoning.

In conclusion, solving $2x - 6x + 5 = 0$ demonstrates the elegance and power of algebra. Through careful step-by-step work, understanding the underlying principles, and verification, you can confidently approach similar equations and extend these skills

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