

Explain Please Solve The Following Equation, And Check Your Solution. Be Sure To Show All Work In Order

Explain Please Solve The Following Equation, And Check Your Solution. Be Sure To Show All Work In Order

Solving equations is a fundamental skill in mathematics that allows us to find the unknown value or values that satisfy a given mathematical statement. Whether you're tackling algebraic expressions, linear equations, or more complex functions, the process involves a systematic approach to isolate the variable and verify the solution's correctness. In this article, we will explore the step-by-step method to solve an equation, demonstrate how to check the solution, and emphasize the importance of showing all work clearly and logically.

Understanding the Importance of Solving Equations Step-by-Step

Before diving into solving specific equations, it's crucial to understand why methodical steps are essential. Showing all work not only helps in avoiding mistakes but also provides clarity for anyone reviewing your solution, such as teachers or peers. It also reinforces your understanding of the algebraic principles involved.

Common Types of Equations and Strategies

Different equations require different strategies. Here are some common types:

Linear Equations

- Equations where the variable appears to the first power, e.g., $3x + 2 = 11$.
- Strategy: Isolate the variable on one side to find its value.

Quadratic Equations

- Equations where the variable is squared, e.g., $x^2 - 5x + 6 = 0$.
- Strategy: Factor, complete the square, or use the quadratic formula.

Rational Equations

- Equations involving fractions, e.g., $(2/x) + 3 = 7$.
- Strategy: Find common denominators and eliminate fractions carefully.

Radical Equations

- Equations involving roots, e.g., $\sqrt{x + 3} = 4$.
- Strategy: Isolate the radical and then square both sides to eliminate the root.

Step-by-Step Example: Solving a Linear Equation

Let's work through an example to illustrate the process:

Equation: $4x - 7 = 13$

Step 1: Write the equation clearly.

$$4x - 7 = 13$$

Step 2: Isolate the term with the variable.

Add 7 to both sides to move the constant term:

$$4x - 7 + 7 = 13 + 7$$

which simplifies to:

$$4x = 20$$

Step 3: Solve for the variable.

Divide both sides by 4:

$$(4x) / 4 = 20 / 4$$

which simplifies to:

$$x = 5$$

Step 4: State the solution.

$$x = 5$$

Checking Your Solution

After finding the value of x , it's crucial to verify that it satisfies the original equation.

Step 1: Substitute the solution back into the original equation.

Original equation: $4x - 7 = 13$

Substitute $x = 5$:

$$4(5) - 7 = 13$$

Step 2: Calculate the left side.

$$4 \cdot 5 = 20$$

$$20 - 7 = 13$$

Step 3: Confirm the equality holds.

Since $13 = 13$, the solution $x = 5$ is correct.

This process confirms that the solution is valid and correctly satisfies the original equation.

Additional Example: Solving a Quadratic Equation

Let's consider a quadratic equation:

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

Step 1: Factor the quadratic if possible.

Find two numbers that multiply to 6 and add to -5:

- Factors of 6: (1, 6), (2, 3)

- To get -5: Use -2 and -3 because $(-2)(-3) = 6$, and $(-2) + (-3) = -5$

Rewrite as:

$$(x - 2)(x - 3) = 0$$

Step 2: Set each factor to zero.

$$x - 2 = 0 \rightarrow x = 2$$

$$x - 3 = 0 \rightarrow x = 3$$

Step 3: Verify solutions.

Check $x = 2$:

$$(2)^2 - 5(2) + 6 = 4 - 10 + 6 = 0 \rightarrow \text{Correct}$$

Check $x = 3$:

$$(3)^2 - 5(3) + 6 = 9 - 15 + 6 = 0 \rightarrow \text{Correct}$$

Both solutions are valid.

Handling More Complex Equations

When equations become more complex, such as rational or radical equations, the approach requires additional steps:

Solving Rational Equations

- Find the least common denominator (LCD).
- Multiply both sides of the equation by the LCD to clear fractions.
- Solve the resulting polynomial.
- Check for extraneous solutions caused by multiplying both sides by expressions involving variables.

Solving Radical Equations

- Isolate the radical.
- Square both sides to remove the root.
- Solve the resulting equation.
- Always check for extraneous solutions introduced during squaring.

Common Mistakes to Avoid

- Forgetting to check solutions in the original equation.
- Making algebraic errors during simplification.
- Overlooking restrictions such as division by zero.
- Assuming factorizations without verification.
- Not showing all work clearly, leading to confusion.

Conclusion: The Importance of Showing All Work

Solving equations accurately requires a careful, step-by-step approach. Showing all work is essential because it:

- Ensures clarity and prevents mistakes.
- Demonstrates your understanding of the process.
- Makes it easier to identify errors if the solution doesn't check out.
- Provides a clear record of your reasoning, which is especially important in educational settings.

By following a structured method—reading the problem carefully, isolating the variable, performing inverse operations, and verifying your solution—you can confidently solve equations of all types. Remember, practice makes perfect, and consistently showing all your work will improve both your problem-solving skills and your confidence in mathematics.

In summary, solving an equation involves understanding the type of equation you're working with, applying appropriate algebraic techniques, and meticulously showing each step. Always verify your solutions by substituting back into the original equation to ensure correctness. With patience and practice, these skills will become second nature, making even complex equations manageable.

Frequently Asked Questions

What are the steps to solve a linear equation and verify the solution?

First, isolate the variable by performing inverse operations step-by-step. Then, substitute the solution back into the original equation to verify if both sides are equal. Show all work clearly to ensure accuracy throughout the process.

How do I verify my solution after solving an equation?

After finding the solution, plug it back into the original equation. Simplify both sides; if they are equal, your solution is correct. If not, recheck your work for errors and adjust accordingly.

What common mistakes should I avoid when solving and checking equations?

Avoid errors like incorrect inverse operations, skipping steps, or miscalculating. Always perform operations carefully and double-check your substitutions during verification to ensure your solution is accurate.

Can you demonstrate solving for x in the equation $3x + 5 = 20$

and verifying it?

Sure. Subtract 5 from both sides: $3x + 5 - 5 = 20 - 5 \rightarrow 3x = 15$. Divide both sides by 3: $x = 15 \div 3 \rightarrow x = 5$. To verify, substitute $x = 5$ back into the original: $3(5) + 5 = 15 + 5 = 20$, which matches the right side. Thus, $x = 5$ is correct.

What should I include in my solution to ensure it's complete and clear?

Include all steps performed, showing each operation explicitly. When verifying, clearly substitute your solution into the original equation and simplify to confirm both sides are equal. This thorough approach helps demonstrate your understanding and ensures correctness.

Why is it important to show all work when solving and checking equations?

Showing all work helps you track your process, identify mistakes, and demonstrate your understanding. It also allows others to follow your solution easily and ensures accuracy before finalizing your answer.

Additional Resources

Explain PleaseSolve The Following Equation, And Check Your Solution. Be Sure To Show All Work In Order

In the realm of mathematics, solving equations is a fundamental skill that underpins numerous scientific, engineering, and everyday problem-solving scenarios. Whether dealing with simple linear equations or complex algebraic expressions, the core principles remain rooted in understanding the structure of the equation and systematically applying mathematical operations to isolate the variable. The phrase "Explain PleaseSolve The Following Equation, And Check Your Solution. Be Sure To Show All Work In Order" encapsulates the essence of a meticulous approach to solving mathematical problems: clarity, thoroughness, and verification.

This article aims to provide a comprehensive guide to solving equations with a detailed, step-by-step methodology. It will explore the rationale behind each step, emphasize the importance of showing all work, and demonstrate how to verify solutions to ensure accuracy. Through a structured approach, readers will gain insight into the critical thinking involved in mathematical problem-solving and develop the skills necessary to tackle various types of equations confidently.

Understanding the Core Components of an Equation

Before diving into solving any equation, it is essential to understand its fundamental components. An equation is a mathematical statement that asserts the equality of two expressions, often involving variables and constants. The primary goal is to determine the value(s) of the variable(s) that satisfy

this equality.

Types of Equations

1. Linear Equations: Involve variables raised to the first power (e.g., $2x + 5 = 0$).
2. Quadratic Equations: Involve variables squared (e.g., $x^2 - 4x + 4 = 0$).
3. Higher-Order Polynomial Equations: Variables raised to powers greater than two.
4. Rational Equations: Fractions involving polynomials.
5. Radical Equations: Contain roots such as square roots or cube roots.
6. Exponential and Logarithmic Equations: Involving exponential or logarithmic functions.

Components of an Equation

- Variables: Symbols representing unknown quantities, typically x , y , z .
- Constants: Fixed numbers such as 3, -7, or fractions.
- Operators: Mathematical operations such as addition (+), subtraction (−), multiplication (×), division (÷), exponents (^), roots, etc.
- Expressions: Combinations of variables, constants, and operators.

Understanding these components helps in choosing the appropriate methods to solve the equation and in interpreting the steps involved.

Step-by-Step Approach to Solving Equations

A systematic approach ensures that the solution process is clear, logical, and free of errors. Below is a generalized step-by-step methodology.

Step 1: Read and Understand the Equation

- Carefully examine the given equation.
- Identify the type of equation (linear, quadratic, etc.).
- Determine what is being asked (solve for x , y , etc.).

Step 2: Simplify Both Sides of the Equation

- Use algebraic rules to simplify expressions.
- Combine like terms.
- Expand parentheses using distributive property if necessary.
- Simplify fractions or radicals where possible.

Step 3: Isolate the Variable

- Use inverse operations to move constants and other terms away from the variable.
- For linear equations, aim to get the variable term on one side and constants on the other.
- For quadratic or higher-degree equations, consider factoring, completing the square, or applying the quadratic formula.

Step 4: Solve for the Variable

- Perform the necessary operations to isolate the variable completely.
- For linear equations, this often involves division.
- For quadratic equations, factor or use the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- For other polynomial equations, use factoring or numerical methods.

Step 5: Express the Solution(s)

- Clearly state the solution(s).
- For equations with multiple solutions, list all possible values.

Step 6: Check the Solution(s)

- Substitute each solution back into the original equation.
- Verify whether the resulting statement is true.
- Identify any extraneous solutions, especially in equations involving roots or denominators.

Illustrative Example: Solving a Linear Equation

To demonstrate this methodology, consider the following example:

Equation: $3x + 4 = 19$

Solution:

Step 1: Understand the equation: It's linear in x .

Step 2: Simplify both sides (already simplified).

Step 3: Isolate x :

- Subtract 4 from both sides:

$$3x + 4 - 4 = 19 - 4 \rightarrow 3x = 15$$

- Divide both sides by 3:

$$x = \frac{15}{3} = 5$$

\]

Step 4: The solution is $x = 5$.

Step 5: Verify the solution:

- Substitute $x = 5$ into the original equation:

\[

$$3(5) + 4 = 15 + 4 = 19$$

\]

- Since both sides equal 19, the solution is verified.

Handling More Complex Equations: Quadratic and Rational Examples

While linear equations are straightforward, many problems involve quadratics or rational expressions, requiring more advanced techniques.

Solving a Quadratic Equation

Equation: $x^2 - 5x + 6 = 0$

Solution:

- Step 1: Recognize quadratic form.

- Step 2: Factorization:

\[

$$(x - 2)(x - 3) = 0$$

\]

- Step 3: Set each factor equal to zero:

\[

$$x - 2 = 0 \rightarrow x = 2$$

\]

\[

$$x - 3 = 0 \rightarrow x = 3$$

\]

- Step 4: Solutions are $x = 2$, $x = 3$.

- Step 5: Verify:

Substitute $x = 2$:

$$\begin{aligned} & \\ (2)^2 - 5(2) + 6 &= 4 - 10 + 6 = 0 \\ & \end{aligned}$$

Substitute $x = 3$:

$$\begin{aligned} & \\ (3)^2 - 5(3) + 6 &= 9 - 15 + 6 = 0 \\ & \end{aligned}$$

Both satisfy the original equation.

Solving a Rational Equation

Equation: $\left(\frac{2}{x} + 3 = 7\right)$

Solution:

- Step 1: Recognize the rational expression.

- Step 2: Isolate the fraction:

$$\begin{aligned} & \\ \frac{2}{x} &= 7 - 3 = 4 \\ & \end{aligned}$$

- Step 3: Cross-multiplied:

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

- Step 4: Solve for x :

$$\begin{aligned} & \\ x &= \frac{2}{4} = \frac{1}{2} \\ & \end{aligned}$$

- Step 5: Check:

Substitute back into the original:

$$\begin{aligned} & \\ \frac{2}{1/2} + 3 &= 4 + 3 = 7 \\ & \end{aligned}$$

The solution is verified.

Importance of Checking Solutions

Checking solutions is a vital step that ensures the validity of the results. Certain equations, especially those involving radicals or denominators, can produce extraneous solutions that do not satisfy the original equation once substitutions are made.

Why Verify?

- Detect Extraneous Solutions: These are solutions that emerge from algebraic manipulations but do not satisfy the original equation.
- Ensure Accuracy: Confirm correctness of the solution, especially when multiple solutions are involved.
- Build Confidence: Validating results increases trust in the problem-solving process.

How to Check Solutions

- Substitute the solution value(s) into the original equation.
- Simplify each side.
- Confirm that both sides are equal (or within an acceptable approximation if dealing with irrational numbers).

Common Pitfalls and How to Avoid Them

While solving equations, learners often encounter pitfalls that can lead to errors or misconceptions.

Pitfall 1: Forgetting to Check for Extraneous Solutions

- Especially when squaring both sides or dealing with radicals, extraneous solutions can appear.
- Always substitute back into the original equation.

Pitfall 2: Dividing by Variables or Expressions That Could Be Zero

- Dividing by zero is undefined.
- Before dividing, determine whether the divisor could be zero and exclude such solutions.

Pitfall 3: Rushing Through Steps

- Skipping steps can lead to mistakes.
- Show all work clearly, which helps identify errors and understand the process.

Pitfall 4: Misapplying Operations

- For example, reversing inequalities incorrectly or misusing the distributive property.
- Review algebra rules regularly.

Advanced Techniques for Complex Equations

When equations become more complex, standard methods may need enhancement.

Completing the Square

- Useful for quadratic equations not easily factorable.
- Convert the quadratic into a perfect square form to solve for x.

Quadratic Formula

- A universal method for solving any quadratic:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- Always compute the discriminant $(\Delta = b^2 - 4ac)$ to determine the nature of solutions.

Substitution and EI

[Explain Please solve The Following Equation And Check Your Solution Be Sure To Show All Work In Order](#)

Explain Please solve The Following Equation And Check Your Solution Be Sure To Show All Work In Order

Related Articles

- [During An Earthquake, The Top Of A Building Oscillates With An Amplitude Of 32 Cm At 1.5 Hz.a. What Is](#)
- [Evaluate Lim \(4 + H\) \(4\) H H0 Where F\(x\) = |x 4| 5. If The Limit Does Not Exist Enter -1000. Limit= \(1](#)
- [Dan Just Lost His Job. At 44 Years Old, He Worked As A Middle Manager At A Well-known Advertising Firm](#)

[Back to Home](#)