9z-(6-z) 12z-10 Solve For Z

9z-(6-z) 12z-10 Solve For Z: A Comprehensive Guide to Solving Algebraic Equations for Z

Are you struggling with solving algebraic expressions like 9z - (6 - z) 12z - 10 for the variable z? Understanding how to approach such problems is crucial for mastering algebra and advancing in mathematics. Whether you're a student preparing for exams or a math enthusiast seeking to refine your skills, this detailed guide will walk you through the process step-by-step. We'll explore the fundamental concepts, break down complex expressions, and provide practical tips to efficiently solve for z in similar equations.

Understanding the Equation: 9z - (6 - z) 12z - 10

Before diving into solutions, it's essential to interpret the equation correctly. The expression appears to be a combination of algebraic terms involving the variable z, along with constants and parentheses. The exact form can sometimes be confusing due to formatting, but based on standard algebraic notation, the expression likely represents:

Equation: $9z - (6 - z) 12z - 10 = 0$

This form assumes that the term (6 - z) is multiplied by 12z, which is a common interpretation in algebraic expressions. Our goal is to solve this equation for z, meaning we want to find all possible values of z that satisfy the equation.

Breaking Down the Equation

Let's analyze each component:

- First term: 9z
- Second term: (6 - z) 12z (product of a binomial and a term)
- Constant term: -10

Putting it all together, the equation becomes:

$9z - [(6 - z) 12z] - 10 = 0$

To solve for z, we need to:

1. Expand the multiplication
2. Combine like terms
3. Isolate z on one side of the equation

4. Solve the resulting algebraic equation

Step-by-Step Solution Process

Step 1: Expand the Product

Let's expand the term (6 - z) 12z:

$(6 - z) 12z = 6 12z - z 12z = 72z - 12z^2$

Now, rewrite the original equation with this expansion:

$9z - (72z - 12z^2) - 10 = 0$

Step 2: Distribute the Negative Sign

Distribute the negative across the parentheses:

$9z - 72z + 12z^2 - 10 = 0$

Step 3: Combine Like Terms

Combine the z terms:

$(9z - 72z) = -63z$

So, the equation simplifies to:

$12z^2 - 63z - 10 = 0$

Step 4: Recognize the Quadratic Equation

Now, the equation is in standard quadratic form:

$a z^2 + b z + c = 0$

where:

- a = 12

- $b = -63$
- $c = -10$

Step 5: Use the Quadratic Formula

The quadratic formula is:

$z = [-b \pm \sqrt{b^2 - 4ac}] / (2a)$

Calculate discriminant D:

$D = b^2 - 4ac$

Plugging in the values:

$D = (-63)^2 - 4 \cdot 12 \cdot (-10) = 3969 + 480 = 4449$

Since $D > 0$, there are two real solutions.

Calculate sqrt(D):

$\sqrt{4449} \approx 66.73$

Now, find the two solutions:

$z = [63 \pm 66.73] / (2 \cdot 12) = [63 \pm 66.73] / 24$

Final Solutions for Z

Calculate each:

1. $z = (63 + 66.73) / 24 \approx 129.73 / 24 \approx 5.41$
2. $z = (63 - 66.73) / 24 \approx (-3.73) / 24 \approx -0.155$

Therefore, the solutions are approximately:

- $z \approx 5.41$
- $z \approx -0.155$

Key Takeaways for Solving Algebraic Equations for Z

When tackling similar equations, keep these important points in mind:

- **Always carefully interpret the expression**: Clarify whether operations like multiplication are implied or explicitly stated.
- **Expand parentheses first**: Distribute factors before combining like terms.
- **Combine like terms**: Simplify the equation to quadratic, linear, or simpler form.
- **Identify the type of equation**: Quadratic, linear, or higher degree, and choose the appropriate solving method.
- **Use the quadratic formula when necessary**: For second-degree equations with coefficients that don't factor easily.
- **Calculate discriminant carefully**: Determines the nature and number of solutions.

Additional Tips for Solving Algebraic Equations for Z

To streamline your problem-solving process and improve accuracy, consider the following tips:

1. **Check your work at each step**: Confirm expansions and calculations to avoid errors.
2. **Use a calculator for complex roots**: Especially when discriminants are not perfect squares.
3. **Factor when possible**: Simplifies solving and provides exact solutions.
4. **Practice different types of equations**: Linear, quadratic, and higher-degree to build versatility.
5. **Understand the properties of equations**: For example, the significance of the discriminant in quadratic equations.

Common Mistakes to Avoid

Avoid these pitfalls when solving for z:

- **Misinterpreting the expression**: Confusing multiplication or missing parentheses can lead to incorrect solutions.
- **Forgetting to distribute negative signs**: Which alters the signs of terms and affects the final answer.
- **Neglecting to simplify fully**: Leaving equations in complicated forms makes solving harder.
- **Ignoring the discriminant**: Not checking it can result in missing complex solutions or misjudging the number of real solutions.
- **Rounding errors**: When approximating square roots, ensure precision for reliable answers.

Practical Applications of Solving for Z

Understanding how to solve equations like 9z - (6 - z) 12z - 10 extends beyond pure mathematics. Here are some real-world applications:

1. Engineering Design: Calculating variables in systems involving forces or electrical circuits.
2. Physics Problems: Solving for unknown quantities like velocity, acceleration, or energy.
3. Economic Modeling: Determining optimal prices or quantities in supply-demand equations.
4. Data Analysis: Fitting models where variables are interconnected via algebraic relations.
5. Computer Science: Algorithm development involving algebraic computations.

Mastering these problem-solving techniques enhances your analytical skills across various fields.

Conclusion

Solving for z in equations like 9z - (6 - z) 12z - 10 might initially seem complex but becomes manageable once you follow a systematic approach. Expand, simplify, identify the type of equation, and apply the appropriate solution method—most notably, the quadratic formula. Remember to double-check your calculations and understand the underlying concepts to build confidence and accuracy in algebra.

With consistent practice and attention to detail, you'll be able to tackle a wide range of algebraic equations with ease. Keep practicing different problem types, and don't hesitate to revisit foundational concepts when needed. Mastery of solving for variables like z opens doors to advanced mathematics, physics, engineering, and beyond.

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Frequently Asked Questions

How do I simplify the expression 9z - (6 - z) + 12z - 10 to solve for z?

First, distribute the negative sign in the parentheses: 9z - 6 + z + 12z - 10. Then combine like terms: (9z + z + 12z) - (6 + 10) = 22z - 16.

What is the first step to solve the equation 9z - (6 - z) + 12z - 10 = 0 for z?

The first step is to simplify the expression by removing parentheses: 9z - 6 + z + 12z - 10, then combine like terms to get 22z - 16 = 0.

How do I isolate z in the equation 22z - 16 = 0?

Add 16 to both sides to get 22z = 16, then divide both sides by 22 to find z = 16/22, which simplifies to z = 8/11.

What is the simplified form of the expression 9z - (6 - z) + 12z - 10 before solving for z?

The simplified form is 22z - 16 after distributing and combining like terms.

Is the solution to the equation 9z - (6 - z) + 12z - 10 = 0 unique?

Yes, solving the simplified equation 22z - 16 = 0 yields a unique solution z = 8/11.

Can I verify the solution z = 8/11 in the original expression?

Yes, substitute z = 8/11 into the original expression to verify it satisfies the equation, confirming the solution's correctness.

Additional Resources

Solving for Z in the Equation 9z - (6 - z) = 12z - 10

When it comes to algebraic equations, especially those involving multiple variables and constants, mastering the art of solving for a specific variable is fundamental. The equation 9z - (6 - z) = 12z - 10 is a classic example that exemplifies key algebraic manipulation techniques, such as distribution, combining like terms, and isolating the variable. In this comprehensive review, we will explore the step-by-step process of solving this equation, analyze common pitfalls, and provide insights into the underlying principles that make such problems approachable.

Understanding the Equation: Components and Structure

Before diving into the solution, it’s crucial to understand the components of the equation:

- Left Side: 9z - (6 - z)
- Right Side: 12z - 10

The equation involves:

- Variables: z (the unknown we need to solve for)
- Constants: 6 and 10
- Operations: Addition, subtraction, distribution

The primary goal is to find the value of z that makes both sides equal, i.e., satisfy the equation.

Step-by-Step Solution Process

1. Remove Parentheses via Distribution

The first step is to expand the left side, particularly the term involving parentheses:

- The expression is 9z - (6 - z)

Applying the distributive property:

- 9z - 6 + z

Note: When distributing the negative sign across the parentheses, the signs inside the parentheses change:

- Negative times positive: negative
- Negative times negative: positive

Thus, the expansion leads to:

Expanded Left Side: $9z - 6 + z$

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2. Combine Like Terms on Each Side

Now, simplify both sides where possible:

- Left Side:

$9z + z - 6 = (9z + z) - 6 = 10z - 6$

- Right Side remains as is:

$12z - 10$

At this point, the simplified equation becomes:

$10z - 6 = 12z - 10$

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3. Isolate the Variable Term

The goal is to get all terms involving z on one side and the constants on the other:

- Subtract 10z from both sides:

$(10z - 6) - 10z = (12z - 10) - 10z$

Simplifies to:

$-6 = 2z - 10$

- Why subtract 10z? To consolidate z terms on the right side, making it easier to solve.

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4. Move Constants to One Side

Next, add 10 to both sides to isolate the term with z:

$-6 + 10 = 2z - 10 + 10$

Simplifies to:

$4 = 2z$

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5. Solve for Z

Finally, divide both sides by 2:

$(4) / 2 = (2z) / 2$

Which simplifies to:

$2 = z$

Solution: $z = 2$

Verification of the Solution

It’s always good practice to verify the solution by substituting $z = 2$ back into the original equation:

Original equation:

$9z - (6 - z) = 12z - 10$

Substitute $z = 2$:

- Left Side:

$9(2) - (6 - 2) = 18 - (4) = 18 - 4 = 14$

- Right Side:

$12(2) - 10 = 24 - 10 = 14$

Since both sides are equal, the solution $z = 2$ is verified.

Deep Dive into Key Concepts and Techniques

To truly master solving such equations, understanding the underlying principles is essential. Let's examine the core concepts involved:

1. Distribution Property

- This property allows the removal of parentheses by multiplying each term inside by the factor outside.
- Essential when parentheses are preceded by addition or subtraction signs.
- Example: $a(b + c) = ab + ac$

2. Combining Like Terms

- Simplifies the equation by consolidating terms with the same variables and exponents.
- Critical for reducing complex expressions to manageable forms.
- In our example, combining $9z$ and z into $10z$, and constants like -6 and -10.

3. Maintaining Equation Balance

- Every operation performed on one side must be performed on the other to maintain equality.
- Addition, subtraction, multiplication, and division are all symmetric operations in solving equations.

4. Isolating the Variable

- The ultimate goal: get the variable alone on one side, with a coefficient of 1.
- Achieved through inverse operations (addition vs subtraction, multiplication vs division).

Common Challenges and How to Overcome Them

While solving for z in the given equation is straightforward, some common pitfalls can trip up students:

1. Misapplication of Distribution

- Forgetting to change signs when distributing the negative sign.
- Mistake: $9z - (6 - z) = 9z - 6 + z$ (correct)
- Common error: $9z - 6 - z$ (incorrect, as it neglects the sign change)

Tip: Always carefully consider the sign when distributing.

2. Combining Terms Incorrectly

- Misadding coefficients or constants.
- Solution: Double-check coefficients and constants before combining.

3. Sign Errors During Transposition

- Moving terms across the equal sign requires flipping signs.
- Solution: Use inverse operations carefully and double-check each step.

4. Dividing by Zero

- While not relevant here, always verify that the coefficient of the variable is not zero before division.

Extensions and Related Problems

Once comfortable with this problem, students can explore variations to deepen understanding:

- Equations with multiple variables or higher-degree polynomials.
- Equations involving fractions or radicals.
- Word problems translating real-world scenarios into algebraic expressions.

Example: Solve for z in a similar but more complex equation:

- $3(2z + 4) - (z - 1) = 2z + 7$

This encourages practicing distribution, combining like terms, and solving multi-step equations.

Practical Applications of Solving for Z

Understanding how to solve for variables like z isn't just an academic exercise; it has real-world applications:

- Engineering: Calculating unknown forces or parameters.
- Economics: Determining equilibrium points.
- Physics: Solving for unknown quantities in formulas.
- Computer Science: Algorithm design and problem-solving.

Mastering such equations enhances logical thinking, problem-solving skills, and quantitative reasoning, all valuable across numerous disciplines.

Conclusion: Mastery Achieved Through Practice

The equation 9z - (6 - z) = 12z - 10 is an excellent example illustrating fundamental algebraic techniques. By systematically applying distribution, combining like terms, and maintaining equation balance, we found that z = 2 satisfies the equation. This process highlights essential skills that form the foundation for tackling more complex algebraic problems.

Practice is key to mastery. Repeating similar problem types, verifying solutions, and understanding the underlying principles will build confidence and proficiency. Remember, each algebraic problem is like a puzzle—approach it methodically, and the solution will emerge with clarity. Whether solving for z or any other variable, these skills are invaluable tools in your mathematical toolkit.

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