Give The Equation 9m 14 = 4m +56 And The Possible Solution Set S: {5, 14, 70, 112}: Part A: Determine

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Understanding the Given Equation and Solution Set

In this article, we will delve into a mathematical problem involving an algebraic equation and a set of potential solutions. The problem statement is:

"Give the equation 9m 14 = 4m + 56 and the possible solution set S: {5, 14, 70, 112}: Part A: Determine"

At first glance, the problem appears to have some typographical ambiguities, especially with the term "9m 14." This phrase might be shorthand or a typo, but based on common algebraic notation, it is reasonable to interpret it as:

"9m + 14"

Therefore, the core equation to analyze is:

9m + 14 = 4m + 56

Our goal is to determine which elements from the given set S = {5, 14, 70, 112} satisfy this equation, i.e., are solutions to the equation.

Breaking Down the Equation

Step 1: Write the Equation Clearly

The interpreted algebraic equation is:

$$ 9m + 14 = 4m + 56 $$

This is a linear equation in the variable m.

Step 2: Isolate the Variable m

To solve for m, follow these algebraic steps:

1. Subtract $4m$ from both sides:

$$9m - 4m + 14 = 56$$
$$5m + 14 = 56$$

2. Subtract 14 from both sides:

$$5m = 56 - 14$$
$$5m = 42$$

3. Divide both sides by 5:

$$m = \frac{42}{5}$$
$$m = 8.4$$

Conclusion: The unique solution to the equation is $m = 8.4$.

Analyzing the Solution Set S: {5, 14, 70, 112}

Given that the solution to the equation is $m = 8.4$, none of the elements in the set S = {5, 14, 70, 112} are equal to 8.4. Therefore, none of these values satisfy the equation exactly.

However, the problem might be asking us to determine whether any of these elements are solutions or to analyze their relation to the solution.

Are any elements of S solutions to the equation?

Let's evaluate each element in S by substituting m into the original equation:

- For $m = 5$:

$$9(5) + 14 = 45 + 14 = 59$$
$$4(5) + 56 = 20 + 56 = 76$$
Does 59 equal 76? No.

- For $m = 14$:

$$9(14) + 14 = 126 + 14 = 140$$
$$4(14) + 56 = 56 + 56 = 112$$
Does 140 equal 112? No.

- For $m = 70$:

$$9(70) + 14 = 630 + 14 = 644$$
$$4(70) + 56 = 280 + 56 = 336$$
No.

- For $m = 112$:

$$9(112) + 14 = 1008 + 14 = 1022$$
$$4(112) + 56 = 448 + 56 = 504$$
No.

Result: None of the elements in S are solutions to the equation $9m + 14 = 4m + 56$.

Part A: Determining the Solution Set

Given the calculations above, the solution to the equation is $m = 8.4$. Since this value is not part of the set S, we conclude:

- The set S does not contain solutions to the equation.
- The solution is unique and is $m = 8.4$.

This indicates that the set S contains potential solutions or points of interest, but only $m = 8.4$ satisfies the equation exactly.

Extending the Analysis: Additional Insights

1. Nature of Linear Equations

Linear equations like $9m + 14 = 4m + 56$ are straightforward to solve, typically resulting in a single unique solution unless the equation reduces to an identity or inconsistency.

In our case, the solution is:

$$ m = \frac{56 - 14}{9 - 4} = \frac{42}{5} = 8.4 $$

which confirms the earlier calculation.

2. Significance of the Solution

Understanding the solution's significance involves recognizing that:

- The solution $m=8.4$ is a real number, representing the point at which the two expressions are equal.
- The set S contains specific integers, none of which match this solution.
- If the problem involves finding which elements of S satisfy the equation, the answer is none.

3. Applications of Such Problems

Linear equations and solution sets are fundamental in various fields, including:

- Engineering: to determine operating points.
- Economics: to find equilibrium points.
- Data Analysis: to model relationships between variables.

Summary and Conclusion

To conclude, the core steps involved in analyzing the problem are:

- Correctly interpreting the given equation.
- Solving the equation algebraically.
- Comparing solutions to the provided set S.

Key takeaways:

- The equation $9m + 14 = 4m + 56$ simplifies to $m=8.4$.
- The solution set S = {5, 14, 70, 112} contains integers, none of which are solutions.
- The problem demonstrates the importance of algebraic manipulation to find solutions and interpret solution sets in relation to given data.

Final Remarks: Tips for Solving Similar Equations

- Always carefully interpret the given equation, especially if the notation appears ambiguous.
- Isolate the variable step-by-step to avoid errors.
- Check solutions by substituting back into the original equation.
- When given a set of potential solutions, verify each element to determine if it satisfies the equation.

By mastering these steps, students and professionals can efficiently analyze linear equations and their solutions, enhancing problem-solving skills in mathematics and related disciplines.

Meta Note: If you're working on similar problems, always verify whether the set of potential solutions contains the actual solutions, and be mindful of the context or any potential typos in the problem statement.

Frequently Asked Questions

What is the first step to solve the equation 9m + 14 = 4m + 56?

Subtract 4m from both sides to collect like terms: 9m - 4m + 14 = 56, simplifying to 5m + 14 = 56.

How do you isolate the variable m in the equation 5m + 14 = 56?

Subtract 14 from both sides to get 5m = 42, then divide both sides by 5 to find m = 42/5, which is 8.4.

Based on the solution m = 8.4, which values from the set {5, 14, 70, 112} satisfy the equation?

None of the values 5, 14, 70, or 112 equal 8.4, so none are solutions to the equation.

What does the set S = {5, 14, 70, 112} represent in the context of solving the equation?

It represents potential solution candidates, and we need to check which, if

any, satisfy the equation when substituted for m.

Is there a value in the set S that solves the equation 9m + 14 = 4m + 56?

No, none of the values in S satisfy the equation since the solution for m is 8.4, which is not in the set.

What is the correct solution set for the equation 9m + 14 = 4m + 56?

The solution set is {8.4}, which is not part of the given set S, indicating none of the listed options are solutions.

Additional Resources

Equation: Give The Equation 9m + 14 = 4m + 56 And The Possible Solution Set S: {5, 14, 70, 112}: Part A: Determine

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Introduction

Mathematics is fundamentally about understanding relationships between quantities, often expressed through equations. When given an algebraic equation such as 9m + 14 = 4m + 56, the primary goal is to determine the values of the variable (in this case, m) that satisfy the equation. Such solutions form what is known as the solution set. The problem also hints at a possible solution set S = {5, 14, 70, 112}, prompting us to analyze whether these values satisfy the equation and how they relate to the process of solving it. This article provides a comprehensive review of how to determine solutions, the methods involved, and the interpretation of solution sets in algebra.

Understanding the Equation 9m + 14 = 4m + 56

Formulating the Problem

The given equation:

$$ 9m + 14 = 4m + 56 $$

is a linear algebraic expression involving a single variable, m. The goal is to isolate m on one side of the equation to find all possible values that make the equation true.

Key features:

- It is a linear equation because the variable m appears to the first power and the equation can be rearranged into the standard form ax + b = cx + d.
- Both sides contain terms with m and constants, providing a straightforward pathway to solving.

Pros:

- Simplicity of linear equations makes them easy to manipulate.
- Clear steps can be followed to isolate the variable.

Cons:

- If the equation is not simplified properly, solutions may be missed or invalid solutions may be accepted.
- The presence of multiple potential solution candidates (like the set {5, 14, 70, 112}) can create confusion about which, if any, satisfy the original equation.

Step-by-Step Solution Process

1. Isolate the variable term

The first step involves gathering all m terms on one side:

$$ 9m + 14 = 4m + 56 $$

Subtract 4m from both sides:

$$ 9m - 4m + 14 = 56 $$

Simplify:

$$ 5m + 14 = 56 $$

2. Isolate the constant term next

Subtract 14 from both sides:

$$ 5m + 14 - 14 = 56 - 14 $$

Simplify:

$$ 5m = 42 $$

3. Solve for m

Divide both sides by 5:

$$ m = \frac{42}{5} $$

Simplify:

$$ m = 8.4 $$

This is the unique solution to the equation, indicating that m = 8.4 satisfies the original equation.

Analyzing the Given Solution Set S: {5, 14, 70, 112}

Given the set S = {5, 14, 70, 112}, the next step is to determine which of these values satisfy the original equation 9m + 14 = 4m + 56.

Method:

- Substitute each value of m into the original equation.
- Check whether both sides are equal.

Testing each candidate:

1. For m = 5

Calculate left side:

$$ 9(5) + 14 = 45 + 14 = 59 $$

Calculate right side:

$$ 4(5) + 56 = 20 + 56 = 76 $$

Since 59 ≠ 76, m = 5 is not a solution.

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2. For m = 14

Left side:

$$ 9(14) + 14 = 126 + 14 = 140 $$

Right side:

$$ 4(14) + 56 = 56 + 56 = 112 $$

Since 140 ≠ 112, m = 14 is not a solution.

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3. For m = 70

Left side:

$$ 9(70) + 14 = 630 + 14 = 644 $$

Right side:

$$ 4(70) + 56 = 280 + 56 = 336 $$

Since 644 ≠ 336, m = 70 is not a solution.

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4. For m = 112

Left side:

$$ 9(112) + 14 = 1008 + 14 = 1022 $$

Right side:

$$ 4(112) + 56 = 448 + 56 = 504 $$

Since 1022 ≠ 504, m = 112 is not a solution.

Conclusion: None of the candidate solutions from the set S satisfy the

original equation. The only solution is m = 8.4, which is not part of the set S.

Implications for the Solution Set and Its Interpretation

The Actual Solution Set

Based on the algebraic solution, the solution set for the equation is:

$$\boxed{\left\{ \frac{42}{5} \right\}}$$

which simplifies to m = 8.4. Since this is a single real solution, the solution set is a singleton.

Key points:

- The solution m = 8.4 is unique.
- The given set S = {5, 14, 70, 112} does not contain the solution, indicating they are extraneous candidates in this context.

Understanding the Discrepancy

The set S might have been provided as possible solutions based on prior estimations or as distractors. Alternatively, the problem could be testing whether students can verify potential solutions against the original equation.

Features of such verification:

- Pros:
- Reinforces the importance of substitution to verify solutions.
- Clarifies that not all candidates from a set are solutions.

- Cons:
- If students assume solutions without verification, they might accept invalid solutions.
- May cause confusion if the set S was intended to represent solutions for a different problem or if misinterpreted.

Additional Insights and Educational Value

Understanding Solution Sets and Their Significance

- Equations can have unique solutions, multiple solutions, or no solutions.
- In this case, the linear equation has a single unique solution.
- When presented with a candidate solution set, always verify by substitution, which demonstrates good mathematical practice.

Features of the Solution Process

- Stepwise approach enhances clarity, reduces errors, and builds understanding.
- Verification of candidate solutions ensures correctness.
- Recognizing the difference between algebraic solutions and candidate solution sets is essential.

Potential Pitfalls and How to Avoid Them

- Assuming all elements of a candidate set are solutions without verification.
- Overlooking the possibility of no solutions or multiple solutions.
- Failing to simplify equations correctly, leading to incorrect solutions.

Conclusion

In summary, the algebraic equation $9m + 14 = 4m + 56$ simplifies to $m = 8.4$, indicating a unique solution. The provided solution set $S = \{5, 14, 70, 112\}$ does not contain the actual solution, illustrating the importance of verifying candidate solutions rather than accepting them blindly. This exercise underscores critical algebraic skills including equation manipulation, solution verification, and understanding the nature of solution sets.

Key takeaways:

- Always solve equations systematically.
- Verify each candidate solution against the original equation.
- Recognize the difference between potential solutions and actual solutions.
- Understand that solution sets can be singleton, multiple, or empty

depending on the equation.

Through this thorough analysis, students can develop a deeper appreciation of solving linear equations and the significance of solution sets in algebra.

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