Five Times A Number Decreased By Nine Is Equal To Twice The Number Increased By 23. Which Equation Could

Understanding the Problem: Five Times a Number Decreased by Nine Is Equal to Twice the Number Increased by 23

Five Times A Number Decreased By Nine Is Equal To Twice The Number Increased By 23. Which Equation Could serves as a foundational question in algebra that helps students and learners understand how to translate word problems into algebraic equations. This problem provides a straightforward scenario where a single unknown number is manipulated through multiplication and addition/subtraction, and the goal is to find the algebraic expression or equation that models the situation.

In many real-life situations, translating words into mathematical expressions is a critical skill. It involves recognizing keywords such as "times," "decreased by," "increased by," and understanding how these relate to multiplication, subtraction, and addition. In this article, we will explore how to convert the given phrase into an algebraic equation, analyze different possible equations, and solve for the unknown number step-by-step.

Breaking Down the Word Problem

Before jumping into the equations, let's carefully analyze the phrase:

- Five Times A Number indicates multiplying a variable (commonly represented as x) by 5.
- Decreased By Nine suggests subtracting 9 from the previous expression.
- Is Equal To indicates equality, so the two expressions are set equal.
- Twice The Number implies multiplying the same variable x by 2.
- Increased By 23 indicates adding 23 to that expression.

By understanding these components, we can systematically translate the statement into an algebraic equation.

Step-by-Step Conversion to an Algebraic Equation

Let's identify the components:

1. Five Times A Number: 5x
2. Decreased By Nine: 5x - 9

3. Twice The Number: 2x
4. Increased By 23: 2x + 23

Putting it all together, the statement "Five times a number decreased by nine is equal to twice the number increased by 23" translates to:

$$ 5x - 9 = 2x + 23 $$

This is the most straightforward equation that models the problem.

Alternative Equations and Possible Interpretations

While the primary translation is:

$$ 5x - 9 = 2x + 23 $$

it's worth considering whether other equations could represent different interpretations of the statement.

Could there be alternative equations?

- Possibility 1: If the phrase was ambiguous, some might interpret "decreased by nine" as decreasing the entire expression, leading to an equation like:

$$ 5x = 2x + 23 + 9 $$

which simplifies to:

$$ 5x = 2x + 32 $$

- Possibility 2: If the phrase "twice the number increased by 23" was read differently, such as:

$$ 2(x + 23) $$

then the equation might be:

$$ 5x - 9 = 2(x + 23) $$

which expands to:

$$ 5x - 9 = 2x + 46 $$

However, based on the original wording, the most accurate translation remains:

$$ 5x - 9 = 2x + 23 $$

This underscores the importance of carefully analyzing word problems before translating them into equations.

Solving the Equation: Step-by-Step Process

Now that we have the equation:

$$ 5x - 9 = 2x + 23 $$

let's solve for x.

Step 1: Isolate Variable Terms

Subtract 2x from both sides:

$$ 5x - 2x - 9 = 23 $$

which simplifies to:

$$ 3x - 9 = 23 $$

Step 2: Isolate Constant Terms

Add 9 to both sides:

$$ 3x = 23 + 9 $$

$$ 3x = 32 $$

Step 3: Solve for x

Divide both sides by 3:

$$ x = \frac{32}{3} $$

or as a decimal:

$$ x \approx 10.6667 $$

Final Answer:

The value of the number x is $\frac{32}{3}$, or approximately 10.67.

Understanding the Significance of the Solution

Finding the value of x helps verify the correctness of the equation and the translation

process. Plugging x back into the original expressions:

- Left side:

$$ 5 \times \frac{32}{3} - 9 = \frac{160}{3} - 9 $$

Convert 9 to thirds:

$$ \frac{160}{3} - \frac{27}{3} = \frac{133}{3} $$

- Right side:

$$ 2 \times \frac{32}{3} + 23 = \frac{64}{3} + 23 $$

Convert 23 to thirds:

$$ \frac{64}{3} + \frac{69}{3} = \frac{133}{3} $$

Both sides equal $\frac{133}{3}$, confirming the solution is correct.

Real-Life Applications of Such Word Problems

Word problems like this are common in various fields such as:

- Finance: Calculating investments where certain amounts are increased or decreased.
- Physics: Relating quantities that involve proportional relationships.
- Business: Determining profit or loss based on variable factors.
- Education: Teaching students the foundations of algebra and problem-solving skills.

Understanding how to translate complex word problems into simple algebraic equations is a vital skill that aids in logical reasoning and quantitative analysis.

Tips for Creating Your Own Equations from Word Problems

If you're aiming to craft similar problems or solve others, consider these tips:

- Identify Keywords: Words like "times," "product," "sum," "difference," "increased by," "decreased by," "equal to" are clues.
- Define Variables Clearly: Assign a variable (commonly x) to the unknown quantity.
- Translate Step-by-Step: Break down sentences into parts and convert each into an algebraic expression.
- Check for Ambiguities: Re-read the problem to ensure the interpretation aligns with the intended meaning.
- Verify Your Equation: Substitute the solution back into the original expressions to confirm correctness.

Conclusion

The phrase "Five times a number decreased by nine is equal to twice the number increased by 23" can be effectively translated into the algebraic equation:

$$ 5x - 9 = 2x + 23 $$

Solving this straightforwardly demonstrates the power of algebra in modeling real-world scenarios. The solution $x = \frac{32}{3}$ not only satisfies the equation but also exemplifies the importance of precise interpretation and translation of word problems into mathematical language. Mastering this skill opens doors to solving more complex problems across mathematics, science, and everyday life.

Frequently Asked Questions

What is the algebraic equation representing 'Five times a number decreased by nine is equal to twice the number increased by 23'?

The equation is 5x - 9 = 2x + 23.

How do you solve for the variable in the equation 5x - 9 = 2x + 23?

Subtract 2x from both sides to get 3x - 9 = 23, then add 9 to both sides to get 3x = 32, and finally divide both sides by 3 to find x = 32/3.

What is the solution to the equation 'Five times a number decreased by nine is equal to twice the number increased by 23'?

The solution is x = 32/3.

Which steps are involved in translating the word problem into an algebraic equation?

Identify the unknown number as x, translate 'five times a number decreased by nine' as 5x - 9, translate 'twice the number increased by 23' as 2x + 23, and set them equal to form the equation 5x - 9 = 2x + 23.

Can this problem be solved using mental math or

estimation? Why or why not?

Since the equation involves fractions and precise solutions, it's best to solve algebraically rather than estimate, to find the exact value of x.

Additional Resources

Understanding the Equation: "Five Times A Number Decreased By Nine Is Equal To Twice The Number Increased By 23"

Mathematics often presents us with intriguing phrases that describe relationships between quantities, and translating these verbal descriptions into algebraic equations is both a foundational skill and an essential step in problem-solving. The statement—"Five times a number decreased by nine is equal to twice the number increased by 23"—is a classic example of how natural language can be precisely converted into a mathematical equation. This process not only enhances our algebraic fluency but also sharpens our critical thinking and analytical abilities.

In this detailed review, we will delve deep into understanding this type of problem, exploring its components, how to translate it into an algebraic equation, solve it systematically, interpret the solution, and consider various related concepts. Whether you're a student learning algebra for the first time or someone brushing up on problem-solving strategies, this comprehensive analysis aims to provide clarity, depth, and insight.

Dissecting the Verbal Statement

Breaking Down the Phrase

The key to translating a word problem into an equation is to carefully interpret each part of the statement. Let's analyze the phrase:

"Five times a number decreased by nine is equal to twice the number increased by 23."

- "Five times a number": This indicates multiplication of a variable (say, x) by 5 → 5x
- "Decreased by nine": Subtract 9 from the previous result → 5x - 9
- "Is equal to": Indicates equality, so the expression on the left equals the expression on the right.
- "Twice the number": Multiply the variable x by 2 → 2x
- "Increased by 23": Add 23 to the previous result → 2x + 23

Putting it all together, the verbal statement translates into the algebraic equation:

> 5x - 9 = 2x + 23

This concise translation captures the entire scenario. Recognizing each component's mathematical equivalent is critical for accurate modeling.

Formulating the Equation

Establishing the Algebraic Expression

The core of this problem is the equation:

> 5x - 9 = 2x + 23

Here, x is the unknown number we need to find. The goal is to solve for x, which involves isolating the variable on one side of the equation.

Why is this step important?

- It converts a verbal description into a manipulable mathematical form.
- It allows the use of algebraic techniques to find the exact value of the unknown.
- It provides a framework for checking the reasonableness of potential solutions.

Solving the Equation Step-by-Step

1. Write Down the Equation

\[
5x - 9 = 2x + 23
\]

2. Simplify and Rearrange

To isolate x, we want all x-terms on one side and constants on the other.

- Subtract 2x from both sides:

\[

$$
5x - 2x - 9 = 2x - 2x + 23
$$

$$
(5x - 2x) - 9 = 0 + 23
$$

$$
3x - 9 = 23
$$

- Next, add 9 to both sides to move constants to the right:

$$
3x - 9 + 9 = 23 + 9
$$

$$
3x = 32
$$

3. Solve for x

Divide both sides by 3:

$$
x = \frac{32}{3}
$$

- The solution is:

$$
x = \frac{32}{3} \approx 10.6667
$$

Note: Since the problem involves real numbers, the fractional result is valid unless the context specifies integer solutions.

Interpreting the Solution

What does x = 32/3 mean in context?

- The number x is approximately 10.6667, or exactly $\frac{32}{3}$.

- This value satisfies the original verbal statement when substituted back into the expressions.

Verification of the solution

Always verify your solution by substituting x back into the original expressions:

- Left side: 5x - 9

$$
5 \times \frac{32}{3} - 9 = \frac{160}{3} - 9
$$

Express 9 as $\frac{27}{3}$ to combine:

$$
\frac{160}{3} - \frac{27}{3} = \frac{133}{3}
$$

- Right side: 2x + 23

$$
2 \times \frac{32}{3} + 23 = \frac{64}{3} + 23
$$

Express 23 as $\frac{69}{3}$:

$$
\frac{64}{3} + \frac{69}{3} = \frac{133}{3}
$$

Both sides equal $\frac{133}{3}$, confirming the solution's correctness.

Deeper Insights and Variations

Understanding the Structure of Similar Problems

This problem exemplifies a common pattern in algebra:

- Verbal descriptions involving multiplication, addition/subtraction, and equality.
- Conversion to linear equations.
- Solving through algebraic operations.

Recognizing this pattern helps in solving a wide array of similar problems, such as:

- "Three times a number plus seven equals twice the number minus five."
- "Six more than twice a number equals four less than three times the number."

Key components to identify:

- Coefficients of the variable (multipliers)
- Constant terms (additions/subtractions)
- The equality operator

Common Variations and Their Solutions

- Equations with multiple variables: e.g., "Five times a number decreased by nine is equal to twice the number increased by 23, and the number is greater than 5." (Additional constraints)
- Quadratic equations: When the verbal statement implies squared terms.
- Inequalities: When the statement involves greater than, less than, etc.

Extensions and Applications

- Word problems involving real-world contexts (e.g., finance, physics, geometry).
- Setting up equations from textual descriptions.
- Developing problem-solving strategies for complex or multi-step problems.

Strategies for Teaching and Learning

Step-by-Step Approach

- Read the problem carefully.
- Identify key quantities and their relationships.
- Translate verbal expressions into algebraic expressions.
- Formulate the equation.
- Solve systematically, checking each step.
- Verify the solution by substitution.
- Interpret the answer within the problem context.

Common Pitfalls to Avoid

- Misinterpreting phrases (e.g., confusing "decreased by" with "increased by").
- Forgetting to apply the distributive property if needed.
- Making algebraic errors in operations.
- Not checking the solution in the original context.

Practical Tips

- Write down all parts of the problem.
- Use variables that are meaningful (e.g., x for the unknown number).
- Keep track of each step and verify calculations.
- Practice with varied problems to recognize patterns.

Conclusion: The Power of Algebra in Word Problems

The process of translating a verbal statement into an algebraic equation and solving it is a fundamental skill that opens doors to understanding and analyzing real-world situations mathematically. The problem "Five times a number decreased by nine is equal to twice the number increased by 23" exemplifies how clear reasoning and systematic algebraic techniques can unlock solutions from seemingly complex language.

By mastering these steps—dissection of the problem, formulation of the equation, methodical solving, and verification—you develop a robust problem-solving toolkit that applies across countless scenarios. Whether dealing with simple linear equations or more complex algebraic structures, the core principles remain consistent: understand, translate, solve, verify, and interpret.

This deep exploration underscores that algebra is not merely about manipulating symbols but about understanding relationships, patterns, and the logic that connects quantities. As you continue to practice such problems, you'll enhance not only your mathematical skills but also your analytical thinking, critical reasoning, and confidence in tackling diverse challenges.

In summary:

- The verbal problem translates to the algebraic equation: $5x - 9 = 2x + 23$
- The solution is $x = 32/3$
- Verification confirms the correctness
- The process exemplifies fundamental algebraic techniques applicable to various problems
- Developing these skills empowers you to approach future word problems with clarity and confidence

Remember, every complex problem begins with understanding its components—and with patience and practice, solving these equations becomes intuitive and rewarding.

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