

Six Times The Sum Of A Number And Twelve Is Forty. Which Equation Represents This? $6N + 12 = 40$ $6N + 12N$

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Understanding how to translate word problems into algebraic equations is a fundamental skill in mathematics. The phrase "Six times the sum of a number and twelve is forty" is a common problem that allows us to practice this translation. The question then asks, "Which equation represents this?" and provides options such as $6N + 12 = 40$, $6N + 12 = 40$, $6N + 12 = 40$, and $6N + 12 = 40$. In this article, we will explore the process of translating the phrase into an algebraic equation, analyze the options given, and learn how to solve such problems effectively.

Understanding the Word Problem

Breaking Down the Phrase

The phrase "Six times the sum of a number and twelve" contains several key elements:

- The "number" is an unknown value, often represented by a variable such as N .
- The "sum of a number and twelve" indicates addition: $N + 12$.
- "Six times" signals multiplication by 6.
- The phrase "is forty" indicates equality to 40.

Translating Words into Mathematical Expressions

To translate the phrase into a mathematical expression:

1. Identify the unknown: N (the number).
2. Determine the sum: $N + 12$.

3. Multiply that sum by 6: $6(N + 12)$.

4. Set this equal to 40: $6(N + 12) = 40$.

Constructing the Algebraic Equation

The Correct Equation

Based on the breakdown, the algebraic equation that represents the phrase is:

$$6(N + 12) = 40$$

This equation clearly states that six times the sum of the number and twelve equals forty.

Expanding the Equation

To solve for N, expand the equation:

1. Distribute 6 over the sum:

- $6N + 6 \cdot 12 = 40$

- $6N + 72 = 40$

2. Isolate N by subtracting 72 from both sides:

- $6N = 40 - 72$

- $6N = -32$

3. Divide both sides by 6:

- $N = -32 / 6$

- $N = -16 / 3$

Thus, the solution for the number N is $-16/3$.

Analyzing the Options Provided

The options given include:

- $6N + 12 = 40$
- $6N + 12 = 40$ (repeated)
- $6N + 12 = 40$ (repeated)
- $6N + 12 = 40$ (repeated)

It appears the options are identical, which suggests the primary focus is to recognize that the correct equation is $6(N + 12) = 40$, not simply $6N + 12 = 40$.

Difference Between $6N + 12 = 40$ and $6(N + 12) = 40$

- $6N + 12 = 40$ implies the sum of $6N$ and 12 equals 40 .
- $6(N + 12) = 40$ correctly represents six times the sum of a number and twelve.

Key Point: It's crucial to identify the correct interpretation because:

- $6N + 12 \neq 6(N + 12)$
- The original phrase emphasizes "six times the sum," which translates to $6(N + 12)$.

How to Identify the Correct Equation in Word Problems

Step-by-Step Approach

To correctly translate word problems into equations, follow these steps:

1. **Read Carefully:** Understand what the problem asks.
2. **Identify the Unknowns:** Assign variables, often N or x .
3. **Break Down the Sentence:** Translate each part into mathematical operations.
4. **Combine Elements:** Formulate the algebraic expression or equation.

5. **Verify the Equation:** Ensure it matches the problem's meaning.

Example

For the problem "Six times the sum of a number and twelve is forty," applying the steps yields:

- Unknown: N
- Sum: $N + 12$
- Six times the sum: $6(N + 12)$
- Equals forty: $6(N + 12) = 40$

Solving the Equation

Step-by-Step Solution

1. Write the equation:

$$6(N + 12) = 40$$

2. Expand the brackets:

$$6N + 72 = 40$$

3. Subtract 72 from both sides:

$$6N = 40 - 72$$

$$6N = -32$$

4. Divide both sides by 6:

$$N = -32 / 6$$

5. Simplify:

$$N = -16 / 3$$

Interpretation of the Solution

The solution $N = -16/3$ indicates that the number is approximately -5.33. This negative value makes sense because the initial sum and multiplication lead to a negative result when solving.

Common Mistakes and How to Avoid Them

Mistake 1: Confusing the phrase "times the sum" with "sum of the times"

- Incorrect: $6N + 12$
- Correct: $6(N + 12)$

Mistake 2: Misplacing parentheses

- Parentheses are essential when multiplying a sum by a number.
- Always check if the phrase indicates multiplication outside or inside the sum.

Mistake 3: Using the wrong operation

- Ensure you correctly interpret "times" as multiplication.
- Confirm that addition is correctly captured for the phrase "the sum of."

Additional Practice Problems

To strengthen understanding, try translating and solving these similar problems:

1. "Three times the difference of a number and five is twenty." What is the equation? Solve for the number.
2. "Four times the sum of a number and seven equals fifty." What is the equation? Find the number.
3. "Eight times the sum of a number and ten is sixty-four." Write the equation and solve it.

Answers:

1. Equation: $3(N - 5) = 20$; $N = 15/3 = 5$
2. Equation: $4(N + 7) = 50$; $N = 42/4 = 10.5$
3. Equation: $8(N + 10) = 64$; $N + 10 = 8$; $N = -2$

Conclusion

Translating word problems into algebraic equations is an essential skill that enhances problem-solving abilities in mathematics. In the case of "Six times the sum of a number and twelve is forty," recognizing the need for parentheses around $(N + 12)$ is crucial to accurately represent the problem. The correct equation, $6(N + 12) = 40$, allows for straightforward expansion and solution. Understanding these translation techniques helps students and learners build confidence in algebra and prepares them for more complex math problems.

Remember, always carefully analyze the language of the problem, identify key phrases like "times" or "sum," and translate the sentence into an equation step-by-step. Practice with similar problems to master this skill, and you'll find algebra becomes much more manageable and intuitive.

Frequently Asked Questions

What is the algebraic equation for 'Six times the sum of a number and twelve equals forty'?

The equation is $6(n + 12) = 40$.

How do you simplify the equation $6(n + 12) = 40$?

Distribute 6 to get $6n + 72 = 40$.

What is the value of the number n in the equation $6n + 72 = 40$?

Subtract 72 from both sides: $6n = 40 - 72$, so $6n = -32$. Then, divide both sides by 6: $n = -32/6 = -16/3$.

Is the equation $6N + 12 = 40$ equivalent to $6N + 12 = 406N + 12N$?

No, the equation $6N + 12 = 406N + 12N$ simplifies to $6N + 12 = 418N$, which is different from the original problem.

Which of the provided equations correctly represents the problem: 'Six times the sum of a number and twelve is forty'?

The correct equation is $6(n + 12) = 40$, not $6N + 12 = 406N + 12N$.

What mistake might be made if someone writes the equation as $6N + 12 = 40$ $6N + 12N$?

They might be mistakenly combining terms or misinterpreting the original problem, leading to an incorrect or unrelated equation. The correct form should be $6(n + 12) = 40$.

Additional Resources

Understanding the Equation: Six Times The Sum Of A Number And Twelve Is Forty

Mathematics often uses equations to express relationships between different quantities, providing clarity and precision in problem-solving. One such intriguing problem is: "Six times the sum of a number and twelve is forty." This statement is a classic example of how natural language can be translated into a mathematical expression, allowing us to analyze, solve, and interpret the problem systematically.

In this review, we'll delve deep into the meaning of this statement, how to construct the corresponding equation, analyze the provided options, and explore the broader implications of such algebraic expressions. We'll also discuss strategies for solving these types of equations, interpret their solutions in real-world contexts, and highlight common pitfalls to avoid.

Deciphering the Problem Statement

Before jumping into equations, it's crucial to understand the problem's language fully:

- "Six times" indicates a multiplication factor of 6.
- "The sum of a number and twelve" suggests adding 12 to an unknown number, which we'll denote as N .
- "Is forty" signifies an equality to 40.

Putting it together in plain language, the problem states: "Six multiplied by the sum of some number and 12 equals 40."

Translating the Word Problem into an Equation

The key to translating such language into an algebraic equation involves identifying the components:

- Let (N) represent the unknown number.
- The phrase "the sum of a number and twelve" translates to $(N + 12)$.
- The phrase "six times" indicates multiplying by 6, so $6 \times (N + 12)$.
- The phrase "is forty" translates to $(= 40)$.

Hence, the algebraic expression becomes:

$$6 \times (N + 12) = 40$$

or, more simply,

$$6(N + 12) = 40$$

This is the most straightforward and accurate translation of the problem into an algebraic equation.

Analyzing the Provided Equations

In the prompt, two equations are given:

1. $6N + 12 = 40$
2. $6N + 12N$

Let's analyze each.

Equation 1: $6N + 12 = 40$

This equation suggests that 6 times some number (N) , plus 12, equals 40.

Comparison with our translation:

- Does this match the original problem?

Not exactly. The original problem involves "the sum of a number and twelve" being multiplied by 6. That sum, $(N + 12)$, is multiplied by 6, which expands to $(6N + 6 \times 12 = 6N + 72)$, not $(6N + 12)$.

- Therefore, this equation does not precisely represent the original statement. However, it is a common misinterpretation, so it's important to clarify.

Equation 2: $(6N + 12N)$

This simplifies to:

$$\begin{aligned} &[\\ 6N + 12N &= 18N \\ &] \end{aligned}$$

which is an expression, not an equation, unless set equal to something.

Analysis:

- This expression sums two terms involving (N) : $6N$ and $12N$.
- The sum $(6N + 12N = 18N)$ does not directly relate to our original problem unless paired with an equality.

Conclusion:

Neither of these equations accurately captures "Six times the sum of a number and twelve is forty." The correct algebraic representation is:

$$\begin{aligned} &[\\ 6(N + 12) &= 40 \\ &] \end{aligned}$$

which, when expanded, becomes:

$$\begin{aligned} &[\\ 6N + 72 &= 40 \\ &] \end{aligned}$$

Deriving the Correct Equation

Let's re-derive the proper equation step-by-step:

1. Identify the core components:

- Unknown number: (N)
- Sum of the number and 12: $(N + 12)$
- Six times this sum: $(6 \times (N + 12))$

2. Express the statement:

$$6 \times (N + 12) = 40$$

3. Expand the equation:

$$6N + 6 \times 12 = 40$$

$$6N + 72 = 40$$

4. Solve for (N) :

$$6N = 40 - 72$$

$$6N = -32$$

$$N = \frac{-32}{6} = -\frac{16}{3}$$

This solution indicates that the unknown number is $(-\frac{16}{3})$, approximately -5.33.

Significance of the Solution and Its Interpretation

Understanding what the solution means in context is vital:

- The negative value for (N) suggests that "the number" is less than zero, which might be acceptable depending on the problem's context.
- For example, if the problem pertains to temperature, finance, or other real-world measures where negatives are meaningful, this solution makes sense.
- If the problem were about counting objects, negative numbers would be nonsensical, indicating a need to revisit assumptions or interpret the problem differently.

Common Mistakes and Misinterpretations

When dealing with algebraic translation and problem-solving, several mistakes can occur:

Mistake 1: Misreading "Six times the sum..."

- Incorrect translation: $(6N + 12 = 40)$
- Correct translation: $(6(N + 12) = 40)$

Mistake 2: Expanding incorrectly

- Instead of expanding $(6(N + 12))$ to $(6N + 72)$, some may incorrectly write $(6N + 12)$, leading to wrong solutions.

Mistake 3: Confusing the expression with an equation

- The expression $(6N + 12N)$ is not an equation unless set equal to a number.

Mistake 4: Ignoring parentheses

- Parentheses are crucial in indicating order of operations. Failing to include parentheses leads to incorrect expansion and solutions.

Strategies for Solving Similar Equations

When faced with equations of this nature, follow these systematic steps:

1. Identify the key components: Know what the word problem is asking.
2. Translate carefully: Write the algebraic expression, paying attention to parentheses.
3. Expand and simplify: Use distributive property as needed.
4. Isolate the variable: Use algebraic operations to solve for (N) .
5. Check your solution: Substitute back into the original equation to verify correctness.

Applying the Solution in Real-World Contexts

Suppose the problem is framed in a real-world scenario:

- If (N) represents a certain quantity, such as a debt, temperature change, or measurement, then the negative value indicates a decrease or a below-zero measurement.
- For example, in financial terms, if (N) is an initial debt, then the calculation might be relevant to budgeting or financial analysis.

Summary and Final Remarks

- The statement "Six times the sum of a number and twelve is forty" translates precisely into the algebraic equation:

$$\begin{aligned} & \left[\right. \\ & 6(N + 12) = 40 \\ & \left. \right] \end{aligned}$$

- Proper translation requires careful attention to language, parentheses, and mathematical conventions.
- Expanding and solving leads to the solution:

$$\begin{aligned} & \left[\right. \\ & N = -\frac{16}{3} \\ & \left. \right] \end{aligned}$$

- The initial equations provided in the prompt, $(6N + 12 = 40)$ and $(6N + 12N)$, do not fully capture the original problem's intent unless modified appropriately.
- Recognizing the difference between expressions and equations is critical.

In conclusion, mastering the translation of word problems into algebraic equations is foundational in mathematics. It enables problem solvers to approach complex scenarios systematically, ensuring accurate solutions and meaningful interpretations. Always pay close attention to language cues, use parentheses appropriately, and verify your solutions by substitution. This disciplined approach enhances both understanding and problem-solving efficiency across a broad spectrum of mathematical and real-world problems.

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