

Negative Three Times A Number Plus 4 Is No More Than The Number Minus 8 Find The Number

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Mathematics often involves solving inequalities that help us understand the relationships between different quantities. One common type of problem involves translating word problems into algebraic inequalities and then solving for the unknown. In this article, we will explore a specific problem: "Negative Three Times A Number Plus 4 Is No More Than The Number Minus 8". Our goal is to find the value(s) of the number that satisfy this inequality.

Understanding inequalities is crucial because they model real-world situations where variables are constrained within certain limits. Whether in budgeting, physics, or everyday decision-making, inequalities help us represent and analyze such constraints mathematically. By solving the inequality presented in this problem, you'll sharpen your algebraic skills and gain confidence in translating word problems into mathematical expressions.

Let's delve into the problem step-by-step, analyze the inequality, and explore methods to find the solution.

Understanding the Problem

The problem states: "Negative Three Times A Number Plus 4 Is No More Than The Number Minus 8". To solve this, we need to:

- Identify the unknown variable (the number).
- Translate the verbal statement into an algebraic inequality.
- Solve the inequality to find the range of possible values for the number.

Key components of the problem:

- The phrase "Negative Three Times A Number" indicates multiplying the unknown by -3 .
- "Plus 4" suggests adding 4 to the result.
- "Is No More Than" signifies an inequality where the expression on the left is less than or equal to the expression on the right.
- "The Number Minus 8" indicates subtracting 8 from the unknown.

Translating the Word Problem into an Inequality

To formalize the problem, let's assign a variable:

Let x = the unknown number.

Now, translate each part of the statement into algebra:

- "Negative Three Times A Number" $\rightarrow -3x$
- "Plus 4" $\rightarrow -3x + 4$
- "Is No More Than" $\rightarrow \leq$ (less than or equal to)
- "The Number Minus 8" $\rightarrow x - 8$

Putting it all together, the inequality becomes:

$$-3x + 4 \leq x - 8$$

This inequality expresses the relationship described in the problem.

Solving the Inequality Step-by-Step

Now, we'll solve:

$$-3x + 4 \leq x - 8$$

Step 1: Get all variable terms on one side

Subtract x from both sides:

$$-3x - x + 4 \leq -8$$

Simplify:

$$-4x + 4 \leq -8$$

Step 2: Isolate the variable term

Subtract 4 from both sides:

$$-4x \leq -8 - 4$$

$$-4x \leq -12$$

Step 3: Solve for x

Divide both sides by -4:

$$\begin{aligned} & \backslash[\\ & x \geq \frac{-12}{-4} \\ & \backslash] \end{aligned}$$

Remember, dividing both sides of an inequality by a negative number reverses the inequality sign:

$$\begin{aligned} & \backslash[\\ & x \geq 3 \\ & \backslash] \end{aligned}$$

Result: The solution set is all real numbers (x) such that:

$$\begin{aligned} & \backslash[\\ & x \geq 3 \\ & \backslash] \end{aligned}$$

This means that any number greater than or equal to 3 satisfies the original inequality.

Interpreting the Solution

The solution $(x \geq 3)$ indicates that the number we're looking for is any number that is 3 or larger. For example:

- $(x = 3)$
- $(x = 4)$
- $(x = 10)$
- $(x = 100)$

all satisfy the inequality.

Check with an example:

Suppose $(x = 3)$:

$$\begin{aligned} & \backslash[\\ & -3(3) + 4 = -9 + 4 = -5 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ & x - 8 = 3 - 8 = -5 \\ & \backslash] \end{aligned}$$

Since $(-5 \leq -5)$ (equality), the solution holds.

Suppose $(x = 5)$:

$$\begin{aligned} & \backslash[\\ & -3(5) + 4 = -15 + 4 = -11 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ & 5 - 8 = -3 \\ & \backslash] \end{aligned}$$

Check if $(-11 \leq -3)$: Yes, since -11 is less than -3.

Graphical Representation of the Solution

Visualizing inequalities can help solidify understanding. The solution $(x \geq 3)$ can be represented on a number line:

- Draw a number line.
- Mark the point $(x = 3)$.
- Shade all points to the right of 3, indicating all numbers greater than or equal to 3.
- Use a closed circle at 3 to denote that 3 is included in the solution set.

This visual approach makes it clear which numbers satisfy the inequality.

Real-World Applications of This Inequality

Understanding inequalities like $(x \geq 3)$ has practical implications. Here are some contexts where such inequalities are relevant:

1. Budgeting and Financial Planning

Suppose you need to save at least \$3 per day to reach a savings goal. The inequality $(x \geq 3)$ models this situation, where (x) is the amount saved daily.

2. Manufacturing and Quality Control

A factory might have a minimum acceptable output level per shift. If production per shift must be at least 3 units, then the production number per shift (x) satisfies $(x \geq 3)$.

3. Fitness and Exercise Goals

If someone aims to run at least 3 miles daily, then their daily miles (x) satisfy $(x \geq 3)$.

4. Academic Goals

A student might need to score at least 80% on an exam. If the score percentage is (x) , then the inequality is $(x \geq 80)$.

Additional Tips for Solving Inequalities

When working with inequalities, keep these tips in mind:

- Always perform the same operation on both sides of the inequality.
- Reversing the inequality sign when dividing or multiplying by a negative number.
- Check solutions by substituting back into the original inequality.
- Graph solutions for visual understanding.

- Be cautious of extraneous solutions when dealing with absolute values or complex inequalities.

Practice Problems to Reinforce Learning

To strengthen your understanding, try solving these similar inequalities:

1. $2x - 5 > 3x + 2$
2. $-4x + 7 \leq 3x - 2$
3. $5x + 1 \geq 2x + 8$
4. $-6x - 4 < 2x + 10$

Solution outlines:

- For each, isolate x on one side.
- Simplify and solve the inequality.
- Check your solutions by substituting values.

Conclusion

The inequality "Negative Three Times A Number Plus 4 Is No More Than The Number Minus 8" translates to $-3x + 4 \leq x - 8$. Solving it step-by-step reveals that the solution is $x \geq 3$. This means any number greater than or equal to 3 satisfies the original statement.

Understanding how to translate verbal problems into algebraic inequalities and solve them is a fundamental skill in mathematics. It enables you to model real-world situations, analyze constraints, and make informed decisions based on numerical data.

By practicing similar problems and visualizing solutions, you can strengthen your algebraic reasoning skills and apply them across various fields, from finance to engineering. Remember, the key steps involve translating words into expressions, simplifying, and carefully solving the inequality while respecting the rules, especially when dividing by negative numbers.

Keywords for SEO Optimization:

- Inequalities in algebra
- Solving inequalities step-by-step
- Word problems involving inequalities
- How to solve for a variable in inequalities
- Understanding "no more than" in math
- Algebraic translation of word problems
- Practical applications of inequalities
- Solving linear inequalities
- Inequality solutions and graphing
- Math problem examples and solutions

Frequently Asked Questions

What is the main goal when solving the inequality 'Negative three times a number plus 4 is no more than the number minus 8'?

The goal is to find all values of the variable (the number) that satisfy the inequality.

How do you set up the inequality from the statement 'Negative three times a number plus 4 is no more than the number minus 8'?

You translate it into an inequality: $-3x + 4 \leq x - 8$.

What is the first step in solving the inequality $-3x + 4 \leq x - 8$?

Subtract x from both sides: $-3x - x + 4 \leq -8$, simplifying to $-4x + 4 \leq -8$.

After simplifying to $-4x + 4 \leq -8$, what is the next step?

Subtract 4 from both sides: $-4x \leq -8 - 4$, so $-4x \leq -12$.

How do you isolate x in the inequality $-4x \leq -12$?

Divide both sides by -4 , remembering to reverse the inequality sign: $x \geq 3$.

What does the solution $x \geq 3$ mean in the context of the problem?

It means the number must be greater than or equal to 3 to satisfy the original inequality.

Can the solution to this inequality include negative numbers?

No, based on the solution $x \geq 3$, only numbers equal to or greater than 3 satisfy the inequality.

How can I verify the solution $x \geq 3$?

Substitute values greater than or equal to 3 into the original inequality to check if it holds true.

What is an example of a number that satisfies the

inequality?

Yes, for example, $x = 4$: $-3(4) + 4 = -12 + 4 = -8$, and the right side is $4 - 8 = -4$; since $-8 \leq -4$, it satisfies the inequality.

Why is it important to reverse the inequality sign when dividing by a negative number?

Because dividing by a negative flips the inequality direction, ensuring the solution remains true.

Additional Resources

Negative Three Times A Number Plus 4 Is No More Than The Number Minus 8 Find The Number: An In-Depth Analytical Approach

Understanding and solving inequalities in algebra can often seem daunting, especially when they involve multiple variables and complex expressions. Among these, problems expressed in words—also known as word problems—pose a unique challenge because they require translating a real-world scenario into a mathematical inequality before solving it. One such problem, which involves a simple yet engaging inequality, is: "Negative three times a number plus 4 is no more than the number minus 8. Find the number." This statement, while straightforward, encapsulates key concepts in algebraic manipulation, inequality solving, and critical reasoning.

In this comprehensive article, we will dissect this problem thoroughly, exploring its components, translating it into an algebraic inequality, solving it systematically, and interpreting the solution in context. Our goal is not only to find the answer but also to understand the process and principles behind solving such inequalities, making this a valuable resource for students, educators, and anyone interested in algebraic reasoning.

Understanding the Problem Statement

Breaking Down the Language

The problem statement reads: "Negative three times a number plus 4 is no more than the number minus 8." To work with it mathematically, we must interpret this language into an algebraic expression.

- Negative three times a number: This suggests multiplying a variable (say, x) by -3 . So, this part becomes $-3x$.
- Plus 4: This adds 4 to the previous expression, resulting in $-3x + 4$.
- Is no more than: This phrase indicates a less than or equal to relationship, which in algebra is represented by $\leq$.
- The number minus 8: This translates to $x - 8$.

Putting all these together, the statement becomes:

$$-3x + 4 \leq x - 8$$

The task is to find all values of x that satisfy this inequality.

Why Is It Important to Translate Words into Math?

Translating verbal statements into algebraic expressions is a foundational skill in mathematics. It allows us to apply algebraic rules and techniques systematically. Misinterpretation can lead to incorrect solutions, so clarity in this translation step is critical. For example, understanding the phrase "no more than" as a "less than or equal to" helps avoid errors that could arise from misreading the inequality.

Formulating the Inequality

The Algebraic Expression

Based on the breakdown above, the inequality is:

$$-3x + 4 \leq x - 8$$

This single inequality captures the entire problem statement, and our goal is to solve for x .

Understanding the Components

- The left side ($-3x + 4$) represents the "negative three times a number plus 4."
- The right side ($x - 8$) represents "the number minus 8."
- The inequality ($\leq$) indicates that the left side is less than or equal to the right side.

This setup is typical in algebraic problem-solving, where the key is to isolate x and determine the set of all values that satisfy the inequality.

Solving the Inequality Step-by-Step

Step 1: Write the inequality clearly

$$\begin{aligned} & \backslash[\\ & -3x + 4 \leq x - 8 \\ & \backslash] \end{aligned}$$

Step 2: Gather all x-terms on one side

To do this, subtract x from both sides:

$$\begin{aligned} & \left[\right. \\ & -3x - x + 4 \leq x - x - 8 \\ & \left. \right] \end{aligned}$$

Simplifies to:

$$\begin{aligned} & \left[\right. \\ & -4x + 4 \leq -8 \\ & \left. \right] \end{aligned}$$

Step 3: Isolate the x-term

Subtract 4 from both sides:

$$\begin{aligned} & \left[\right. \\ & -4x + 4 - 4 \leq -8 - 4 \\ & \left. \right] \end{aligned}$$

$$\begin{aligned} & \left[\right. \\ & -4x \leq -12 \\ & \left. \right] \end{aligned}$$

Step 4: Solve for x

Divide both sides by -4 :

$$\begin{aligned} & \left[\right. \\ & x \geq \frac{-12}{-4} \\ & \left. \right] \end{aligned}$$

Remember, dividing both sides of an inequality by a negative number reverses the inequality sign:

$$\begin{aligned} & \left[\right. \\ & x \geq 3 \\ & \left. \right] \end{aligned}$$

Interpreting the Solution

Solution Set

The solution to the inequality is:

$$\left[\right.$$

$x \geq 3$
 $\backslash$

This means that any number greater than or equal to 3 satisfies the original statement that "Negative three times a number plus 4 is no more than the number minus 8."

Expressing the Solution in Different Forms

- Interval notation: $[3, \infty)$
- Graphical representation: A number line with a closed circle at 3, shading to the right to indicate all numbers greater than or equal to 3.

Verification of the Solution

To ensure correctness, pick test points within and outside the solution set:

- Test point within: $x = 3$

$\backslash$
 $-3(3) + 4 = -9 + 4 = -5$
 $\backslash$
 $\backslash$
 $3 - 8 = -5$
 $\backslash$

Check if:

$\backslash$
 $-5 \leq -5$
 $\backslash$

Yes, equality holds; the point $x=3$ satisfies the inequality.

- Test point outside: $x = 2$

$\backslash$
 $-3(2) + 4 = -6 + 4 = -2$
 $\backslash$
 $\backslash$
 $2 - 8 = -6$
 $\backslash$

Check:

$\backslash$
 $-2 \leq -6$
 $\backslash$

No, since -2 is not less than or equal to -6 , $x=2$ does not satisfy the inequality. This confirms that the solution set starts at 3 and extends to infinity.

Contextual Implications and Real-World Applications

Understanding the Practical Meaning

While the problem appears purely mathematical, it can relate to real-world scenarios. For example, suppose x represents a certain quantity—such as the number of items produced, the level of investment, or a parameter in a process—and the inequality models a constraint or threshold.

- For example: If x represents the number of units produced, the inequality states that "negative three times the units produced plus 4" should not exceed "the units minus 8." This could model a scenario where overproduction leads to certain costs or resource constraints.

Implications of the Solution

- The fact that x must be greater than or equal to 3 indicates that only when the variable reaches 3 or higher does the scenario satisfy the constraints.
- Values below 3 violate the inequality, perhaps representing undesirable or infeasible conditions in the context.

Broader Significance

This problem exemplifies the importance of inequalities in decision-making, planning, and optimization. Whether in economics, engineering, or social sciences, understanding how to model and solve such inequalities helps in establishing feasible ranges for variables, ensuring systems operate within safe or efficient limits.

Additional Considerations and Common Pitfalls

Handling Inequalities Carefully

- When dividing both sides of an inequality by a negative number, always reverse the inequality sign.
- Be cautious with the signs during each algebraic step to avoid errors.
- Always check the solution by substituting back into the original inequality to confirm.

Dealing with Complex Inequalities

- For inequalities involving absolute values, quadratic expressions, or

multiple variables, the process becomes more involved, requiring techniques such as factoring, quadratic formula, or graphing.

- Practice with simpler inequalities like this one builds foundational skills necessary for tackling more complex problems.

Using Technology for Verification

- Graphing calculators or algebra software can visualize the solution set, providing an additional layer of confidence.
- Plotting both sides of the inequality or the difference can help see where the inequality holds.

Conclusion: Mastering Inequalities for Mathematical Fluency

The problem, "Negative three times a number plus 4 is no more than the number minus 8," is more than just an exercise in algebra; it embodies essential skills in translating words into mathematical expressions, manipulating inequalities, and interpreting solutions. By methodically breaking down the statement, formulating the inequality, solving it step-by-step, and verifying the result, learners not only find the specific answer ($x \geq 3$) but also develop a systematic approach applicable to countless other problems.

Mastering such concepts enhances critical thinking and problem-solving abilities, valuable across academic disciplines and real-world applications. The process exemplifies how abstract mathematics connects deeply with everyday reasoning, enabling us to model and analyze constraints, optimize outcomes, and make informed decisions.

As we continue to explore inequalities, remember that each problem reinforces the importance of clarity, precision, and logical progression—cornerstones of mathematical literacy and intellectual rigor. Whether in classrooms, research, or practical scenarios, these skills empower us to navigate complex situations with confidence and analytical insight.

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