Determine Which Integer Will Make The Inequality 4x + 6 < 2x + 12 False.

Determine Which Integer Will Make The Inequality 4x + 6 < 2x + 12 False.

Understanding inequalities is fundamental in algebra and serves as a building block for more complex mathematical concepts. When working with inequalities like 4x + 6 < 2x + 12, students and learners often encounter situations where they need to determine the specific values of the variable—here, integers—that make the inequality true or false. This process involves solving the inequality, analyzing the solution set, and then identifying the particular integers that do not satisfy the inequality, i.e., those that make it false.

In this comprehensive guide, we will explore the step-by-step method to determine which integers make the inequality 4x + 6 < 2x + 12 false. We will delve into the algebraic process, interpret the solution, and understand the significance of the solution set within the context of integers. Whether you're a student preparing for exams or someone interested in sharpening your algebra skills, this article aims to provide clarity and confidence in tackling such problems.

Understanding the Inequality: 4x + 6 < 2x + 12

Before solving the inequality, it's essential to understand its structure and what it represents. The inequality 4x + 6 < 2x + 12 compares two algebraic expressions involving the variable x.

Key Concepts:

- Inequality: A statement that compares two expressions using symbols like < (less than), > (greater than), ≤ (less than or equal to), or ≥ (greater than or equal to).
- Solution to an inequality: A value or set of values for x that makes the inequality true.
- False inequality: When the inequality does not hold true for a particular value of x; that is, substituting that value into the inequality results in a false statement.

Step-by-Step Solution to the Inequality

To determine which integers make the inequality false, we first need to find the solution set where the inequality is true. Once we have that, the integers outside this set are the ones that make the inequality false.

Step 1: Write the inequality

$$ 4x + 6 < 2x + 12 $$

Step 2: Isolate the variable x

Subtract 2x from both sides:

$$ 4x - 2x + 6 < 12 $$

Simplify:

$$ 2x + 6 < 12 $$

Now, subtract 6 from both sides:

$$ 2x < 12 - 6 $$

Simplify:

$$ 2x < 6 $$

Step 3: Solve for x

Divide both sides by 2:

$$ x < \frac{6}{2} $$

$$ x < 3 $$

Result: The solution to the inequality is all real numbers less than 3.

Interpreting the Solution

The solution set for the inequality is:

$$ \boxed{x < 3} $$

This means that any real number less than 3 satisfies the inequality $4x + 6 < 2x + 12$.

Important: Since the question asks about integers, we focus on integer values of x that satisfy this inequality.

Integer Solution Set

The integers less than 3 are:

$$ \dots, -2, -1, 0, 1, 2 $$

All these integers satisfy $x < 3$, making the original inequality true.

Identifying Integers That Make the Inequality False

The question now becomes: Which integers do NOT satisfy $x < 3$? In other words, which integers make the inequality false?

List of all integers not satisfying $x < 3$:

- All integers greater than or equal to 3: 3, 4, 5, 6, ...

Conclusion:

Integers that make the inequality false are:

$$ \boxed{\{ x \in \mathbb{Z} \mid x \geq 3 \}} $$

Specifically, the integers:

$$ 3, 4, 5, 6, 7, 8, 9, 10, \dots $$

Any of these integers, when substituted for x, will make the inequality false.

Verifying the False Integers

It's a good practice to verify some of these integers to confirm they indeed make the inequality false.

Example 1: $x = 3$

Substitute into the original inequality:

$$ 4(3) + 6 < 2(3) + 12 $$

Calculate:

$$ 12 + 6 < 6 + 12 $$

$$ 18 < 18 $$

Is $18 < 18$? No, because 18 is equal to 18. Therefore, the inequality is false when $x = 3$.

Example 2: $x = 4$

Substitute:

$$ 4(4) + 6 < 2(4) + 12 $$

Calculate:

$$ 16 + 6 < 8 + 12 $$

$$ 22 < 20 $$

Is $22 < 20$? No, it's false. So, $x = 4$ does not satisfy the inequality.

Similarly, for any $x \geq 3$, the inequality will be false because the left side will be greater than or equal to the right side, or equal in the boundary case.

Summary and Key Takeaways

- The inequality $4x + 6 < 2x + 12$ simplifies to $x < 3$.
- The set of all real solutions where the inequality holds true is all x less than 3.
- The integers that satisfy $x < 3$ are: $\dots, -2, -1, 0, 1, 2$.

- The integers that make the inequality false are: \(\boxed{\{ x \in \mathbb{Z} \mid x \geq 3 \}}\), including 3, 4, 5, and beyond.
- To verify, substitute these integers into the original inequality to confirm it is false.

Additional Tips for Solving Inequalities

- Always perform the same operation on both sides of the inequality to maintain balance.
- When dividing or multiplying both sides by a negative number, reverse the inequality sign.
- Check boundary points to understand if they are included or excluded in the solution set.
- Remember that inequalities can have infinite solution sets, especially when involving linear expressions.

Practical Applications of Inequalities in Real Life

Understanding which integers satisfy or violate an inequality has numerous applications beyond pure mathematics:

- Budgeting: Ensuring expenses stay below a certain limit.
- Safety thresholds: Determining acceptable levels of exposure or risk.
- Engineering: Designing systems that operate within specified parameters.
- Statistics: Making decisions based on data constraints.

In all these cases, accurately identifying the values that satisfy or violate conditions is crucial for effective decision-making.

Conclusion

Determining which integers make the inequality $4x + 6 < 2x + 12$ false involves solving the inequality, interpreting the solution set, and then identifying integers outside this set. By following a systematic approach—simplifying the inequality, analyzing the solution, verifying with examples—you can confidently identify the integers that do not satisfy the inequality.

Understanding these concepts enhances your algebra skills and prepares you for more advanced mathematical problems. Remember, practice is key: work through similar inequalities to strengthen your problem-solving abilities and deepen your understanding of inequalities and their solution sets.

Keywords for SEO Optimization:

- Inequality solving techniques
- Determine integers that violate inequalities
- Algebra inequalities tutorial
- Solving linear inequalities step-by-step
- Inequality solutions for integers
- How to find false values in inequalities
- Mathematical problem-solving tips
- Algebra practice problems
- Real-world applications of inequalities
- Understanding solution sets in algebra

Frequently Asked Questions

How do you identify the integer that makes the inequality 4x + 6 < 2x + 12 false?

First, solve the inequality to find the range of x values that satisfy it, then determine which integers do not satisfy the inequality to find the one that makes it false.

What is the first step in solving the inequality 4x + 6 < 2x + 12?

Subtract 2x from both sides to get 2x + 6 < 12, simplifying the inequality.

After simplifying, what is the next step to find the relevant integers?

Subtract 6 from both sides to get 2x < 6, then divide both sides by 2 to get x < 3.

Which integers satisfy the inequality 4x + 6 < 2x + 12?

All integers less than 3, namely ..., -1, 0, 1, 2, satisfy the inequality.

Which integer makes the inequality $4x + 6 < 2x + 12$ false?

Any integer greater than or equal to 3 makes the inequality false; for example, $x = 3$.

Is $x = 3$ a solution to the inequality $4x + 6 < 2x + 12$?

No, $x = 3$ makes the inequality false because it results in equality rather than a true statement.

How can you verify which integer makes the inequality false?

Substitute the integer into the original inequality; if the statement is false, that integer is the one we're looking for.

What is the general rule for determining integers that make an inequality false?

Find the solution set of the inequality and identify the integers outside that set; these are the integers that make the inequality false.

Additional Resources

Determining Which Integer Will Make the Inequality $4x + 6 < 2x + 12$ False

When analyzing inequalities, one of the fundamental objectives is to find the values of variables—particularly integers—that satisfy or violate the given inequality. In this detailed review, we will explore the process of identifying which specific integers make the inequality $4x + 6 < 2x + 12$ false. This involves understanding how inequalities work, solving the inequality, analyzing its solution set, and then determining which integers fall outside that set.

Understanding the Inequality and Its Components

Before jumping into solution steps, it's essential to understand what the inequality $4x + 6 < 2x + 12$ represents.

2.1 The Expression Breakdown

- Left Side: $4x + 6$
- Right Side: $2x + 12$

This inequality compares two algebraic expressions involving the variable x, which can be any real number, but our focus is on the integers that make the statement false.

2.2 The Nature of the Inequality

The inequality "less than" (<) indicates that the left expression is strictly less than the right expression for the inequality to be true. Conversely, if the condition does not hold, the inequality is false.

Solving the Inequality: Step-by-Step Approach

To determine which integers make the inequality false, it's necessary first to find the set of x-values (real numbers) for which the inequality is true. Once identified, the integers outside that set are precisely those that render the inequality false.

2.1 Isolating x

Let's proceed by solving $4x + 6 < 2x + 12$.

Step 1: Subtract 2x from both sides to gather x-terms on one side:

$$
4x - 2x + 6 < 12
$$

which simplifies to:

$$
2x + 6 < 12
$$

Step 2: Subtract 6 from both sides:

$$
2x < 6
$$

Step 3: Divide both sides by 2:

$$
x < 3
$$

2.2 Interpretation of the Solution

The solution to the inequality is $x < 3$. This means:

- The inequality $4x + 6 < 2x + 12$ is true for all real numbers less than 3.
- It is false for all x values greater than or equal to 3.

Analyzing the Solution Set

Having determined that the inequality holds true when $x < 3$, we can now analyze which integers violate the inequality, i.e., make it false.

2.1 The Set of x-values that satisfy the inequality:

$$
\boxed{
\text{True when } x \in (-\infty, 3)
}
$$

2.2 The set of integers that satisfy the inequality:

$$
\boxed{
x \in \{ \dots, -2, -1, 0, 1, 2 \}
}
$$

since all these integers are less than 3.

2.3 The integers for which the inequality is false:

$$
x \in \{ 3, 4, 5, 6, \dots \}
$$

because for these integers, $x \geq 3$, and the inequality $4x + 6 < 2x + 12$ does not hold.

Focusing on the Question: Which Integers Make

the Inequality False?

The core of this problem is to identify all integers that do not satisfy the inequality, i.e., make it false.

3.1 The set of integers that make the inequality false:

\[
\boxed{
\text{All integers } x \geq 3
}
\]

which includes:

- 3
- 4
- 5
- 6
- 7
- ... and so on, extending infinitely in the positive direction.

In-Depth Analysis: Why These Integers Make the Inequality False

Understanding why these integers violate the inequality is crucial for a comprehensive grasp.

4.1 The nature of the inequality

Since the inequality $4x + 6 < 2x + 12$ simplifies to $x < 3$, any integer $x \geq 3$ will not satisfy this condition, hence making the inequality false.

4.2 Visualizing the solution

If you imagine the number line:

- All points less than 3 satisfy the inequality.
- All points at or beyond 3 violate the inequality.

The boundary at $x = 3$ is critical, as the inequality is strict (<), so at $x = 3$, the inequality becomes:

\[
4(3) + 6 < 2(3) + 12 \Rightarrow 12 + 6 < 6 + 12 \Rightarrow 18 < 18

\]

which simplifies to $18 < 18$, a false statement.

Therefore, $x = 3$ is the smallest integer where the inequality is false.

Extending the Analysis: Considering Other Types of Numbers

While the focus is on integers, it's instructive to consider the broader set of real numbers.

5.1 Real numbers greater than or equal to 3

- All real numbers $x \geq 3$ make the inequality false.
- The boundary point $x = 3$ makes the inequality false because it results in an equality ($18 < 18$ is false).

5.2 Rational numbers and irrational numbers

- Any rational or irrational number $x \geq 3$ will also violate the inequality.
- For example, $x = 3.0001$ or $x = 3.14159$ will make the inequality false.

5.3 Implication for integer selection

- When asked specifically about integers, only the integers ≥ 3 are relevant.

Implications and Applications

Understanding which integers violate an inequality is fundamental in various mathematical contexts, especially in:

6.1 Algebra and Inequality Solutions

- Determining critical points where inequalities switch from true to false.
- Establishing solution sets for inequalities involving integers, which is common in discrete mathematics.

6.2 Real-world Problem Solving

- In scenarios where variables represent quantities like counts, ages, or units, identifying invalid values helps avoid incorrect assumptions or calculations.

6.3 Programming and Algorithm Development

- When coding conditions, knowing the boundaries ensures correct implementation of constraints.

Summarizing Key Findings

To consolidate the analysis:

- The inequality $4x + 6 < 2x + 12$ simplifies to $x < 3$.
- The solution set includes all real numbers less than 3.
- Integers less than 3 (i.e., ..., -2, -1, 0, 1, 2) satisfy the inequality.
- Integers greater than or equal to 3 (i.e., 3, 4, 5, ...) make the inequality false.

Therefore, the integers that make the inequality false are all integers greater than or equal to 3.

Final Answer: List of Integers That Make the Inequality False

$$
\boxed{
\text{All integers } x \geq 3
}
$$

This set includes:

- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- $\dots$

and extends infinitely in the positive direction.

Conclusion: The Significance of Boundary Points

Understanding the boundary point x=3 is crucial because:

- It marks the transition from the inequality being true to false.
- At x=3, the inequality becomes an equality, which is not part of the true solution set.
- For all x > 3, the inequality is false.
- For x < 3, the inequality holds true.

This analysis underscores the importance of solving inequalities carefully and understanding the solution set's boundaries, especially when working with integers versus real numbers.

In summary, the key takeaway is that all integers greater than or equal to 3 will make the inequality 4x + 6 < 2x + 12 false. Recognizing this pattern allows for precise problem-solving and reinforces foundational algebraic principles in inequality analysis.

Determine Which Integer Will Make The Inequality 4x 6 Lt 2x 12 False

Determine Which Integer Will Make The Inequality 4x 6 Lt 2x 12 False

Related Articles

- What Month Was The Last Signature Placed On The Declaration Of Independence
- Preeclamptic Patient Has Respiratory Depression After Receiving MgSO4 - Do What?
- AB= 50 Feet, CD = 100 Feet And BE= 30 Feet, What Is The Best Estimate For BC

Back to Home