Solve The System Of Inequalities And Indicate Any Three Numbers Which Are Solutions: X-0.8>0, -5x<10

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Understanding how to solve systems of inequalities is a fundamental skill in algebra that helps students and professionals analyze and interpret real-world problems involving multiple constraints. In this article, we will explore the process of solving the specific system of inequalities:

1. $X - 0.8 > 0$
2. $-5x < 10$

We will also identify three example solutions that satisfy both inequalities, discuss the methods involved, and provide visual representations to clarify the solution set.

Understanding Systems of Inequalities

Before diving into the specific inequalities, it’s essential to understand what a system of inequalities is.

What Is a System of Inequalities?

A system of inequalities is a set of two or more inequalities considered simultaneously. The solution to the system is the set of all points (or numbers) that satisfy every inequality in the system.

For example, the system:

$$
\begin{cases}
y > 2x + 1 \\
y \leq -x + 3
\end{cases}
$$

has a solution set consisting of all points (x, y) that satisfy both inequalities at the same time.

When dealing with inequalities involving a single variable (like in our case), the solution set is typically a range of numbers that satisfy all inequalities.

Analyzing the Given System of Inequalities

The system we're addressing is:

1. $X - 0.8 > 0$
2. $-5x < 10$

Let’s analyze each inequality separately.

First Inequality: $X - 0.8 > 0$

Step 1: Isolate X.

$$
X - 0.8 > 0
$$

Add 0.8 to both sides:

$$
X > 0.8
$$

Interpretation: The solution to this inequality is all real numbers greater than 0.8.

Graphical representation: On a number line, this is represented as all points to the right of 0.8, with an open circle at 0.8 indicating that 0.8 itself is not included.

Second Inequality: $-5x < 10$

Step 1: Isolate x.

Divide both sides of the inequality by -5. Remember, dividing by a negative number reverses the inequality sign:

$$
x > \frac{10}{-5}
$$

$$
x > -2
$$

Important note: Since we divided by a negative number, the inequality sign flips from "<" to ">".

Interpretation: The solution to this inequality is all real numbers greater than -2.

Graphical representation: On a number line, all points to the right of -2, with an open circle at -2.

Finding the Solution Set of the System

The solution set of the system consists of all numbers x that satisfy both inequalities simultaneously.

From the previous analysis:

- $X > 0.8$
- $x > -2$

Logical intersection: Since $x > 0.8$ is a stricter condition than $x > -2$, the combined solution set is:

$$
x > 0.8
$$

Conclusion: The solution to the system is all real numbers greater than 0.8.

Visual representation: On a number line, the solution set is all points to the right of 0.8, with an open circle at 0.8.

Indicating Three Solutions That Satisfy the System

To illustrate the solution set, let's select three specific numbers that meet the criteria $x > 0.8$.

Sample solutions:

1. x = 1

- $X - 0.8 = 1 - 0.8 = 0.2 > 0$, so the first inequality holds.
- $-5 \times 1 = -5 < 10$, so the second inequality holds.

2. x = 2.5

- $2.5 - 0.8 = 1.7 > 0$, satisfies the first inequality.
- $-5 \times 2.5 = -12.5 < 10$, satisfies the second inequality.

3. x = 10

- $10 - 0.8 = 9.2 > 0$, satisfies the first inequality.
- $-5 \times 10 = -50 < 10$, satisfies the second inequality.

Summary: These three numbers—1, 2.5, and 10—are solutions to the system because they satisfy both inequalities.

Visualizing the Solution Set

Visual aids help in understanding the solution set better.

Number Line Representation

- Draw a horizontal line representing the real number line.
- Mark the point at 0.8 with an open circle.
- Shade the region to the right of 0.8, indicating all numbers greater than 0.8.

Note: The open circle indicates that 0.8 itself is not part of the solution, only numbers greater than 0.8.

Graphical Representation of the Solution

- Since the inequalities involve only x, the solution set is a half-line starting just after 0.8 extending to infinity.

Additional Insights and Applications

Understanding how to solve such systems is crucial in many practical scenarios, such as:

- Business and Economics: Determining feasible profit margins given constraints.
- Engineering: Ensuring certain parameters stay within safe operational limits.
- Statistics: Defining acceptable ranges for experimental variables.

Importance of Proper Inequality Handling

When solving inequalities:

- Always perform inverse operations carefully.
- Remember that dividing or multiplying both sides by a negative number reverses the inequality sign.
- Check the solutions to ensure they satisfy the original inequalities.

Conclusion

Summarizing our findings:

- The system $X - 0.8 > 0$ and $-5x < 10$ simplifies to $x > 0.8$.
- Any real number greater than 0.8 satisfies both inequalities.
- Three example solutions are $x = 1$, $x = 2.5$, and $x = 10$.
- The solution set is all real numbers greater than 0.8, visually represented as a half-line on the number line.

Mastering the solution of systems of inequalities enhances problem-solving skills and provides a foundation for tackling more complex mathematical models in various scientific and practical fields.

Remember: For any system of inequalities, always analyze each inequality carefully, understand the solution set, and then find the intersection to determine the overall solutions.

Frequently Asked Questions

What is the solution to the inequality X - 0.8 > 0?

The solution is X > 0.8.

How do you solve the inequality -5X < 10?

Divide both sides by -5 (remember to reverse the inequality sign), resulting in X > -2.

What is the combined solution for the system of inequalities: X - 0.8 > 0 and -5X < 10?

The combined solution is X > 0.8 and X > -2, which simplifies to X > 0.8.

Can you find three numbers that satisfy both inequalities?

Yes. For example, X = 1, X = 2, and X = 10 all satisfy both inequalities because they are greater than 0.8.

Is X = 0.5 a solution to the system?

No, because 0.5 is not greater than 0.8, so it does not satisfy the first inequality.

Is X = -3 a solution to the system?

No, because -3 is not greater than 0.8, so it doesn't satisfy the first inequality.

What about X = 1.5? Does it satisfy both inequalities?

Yes, since 1.5 > 0.8 and -5(1.5) = -7.5 < 10, it satisfies both inequalities.

What is the graph of the solution set for the system?

The graph is a number line to the right of 0.8, extending infinitely, representing all X > 0.8.

Are the solutions of the system bounded or unbounded?

The solution set is unbounded since X can be any number greater than 0.8, extending infinitely to the right.

Additional Resources

Solve the System of Inequalities and Indicate Any Three Numbers Which Are Solutions

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Introduction

Solving systems of inequalities is a fundamental skill in algebra that enables students and mathematicians to understand the relationship between multiple inequalities simultaneously. Unlike equations, inequalities express a range of solutions rather than a single value, making the process both interesting and essential for real-world applications such as optimization problems, economic modeling, and scientific analysis.

This detailed exploration focuses on a specific system of inequalities:

1. $X - 0.8 > 0$
2. $-5X < 10$

Our goal is to find all values of X that satisfy both inequalities at the same time. Additionally, once the solution set is determined, we will identify three specific numbers within that set to illustrate valid solutions.

Understanding the System of Inequalities

Before solving, it is crucial to understand what each inequality represents and how to interpret their solutions.

1. Inequality $X - 0.8 > 0$

This inequality states that:

$$X - 0.8 > 0$$

which can be rearranged as:

$$X > 0.8$$

This means any value of X greater than 0.8 will satisfy the first inequality.

2. Inequality $-5X < 10$

This inequality states:

$$-5X < 10$$

To isolate X, divide both sides by -5. It is vital to remember that dividing an inequality by a negative number reverses the inequality sign:

$$X > \frac{10}{-5}$$

$$X > -2$$

Therefore, the second inequality states that any value of X greater than -2 satisfies it.

Step-by-Step Solution Process

Let's analyze the solution set for each inequality separately before finding their intersection.

Step 1: Solution for $X - 0.8 > 0$

- Rearranged inequality: $X > 0.8$

- Solution set: All real numbers greater than 0.8

- Interval notation: $(0.8, \infty)$

Step 2: Solution for $-5X < 10$

- Rearranged inequality: $X > -2$

- Solution set: All real numbers greater than -2

- Interval notation: $(-2, \infty)$

Finding the Intersection of the Solution Sets

Since the system requires both inequalities to be satisfied simultaneously, the solution set is the intersection of the individual solution sets.

- Solution set for the first inequality: $(0.8, \infty)$
- Solution set for the second inequality: $(-2, \infty)$

The intersection is:

$$(0.8, \infty) \cap (-2, \infty) = (0.8, \infty)$$

because every number greater than 0.8 is also greater than -2. The more restrictive condition here is $X > 0.8$, which dominates the interval.

Final Solution Set

The combined solution set for the system of inequalities is:

$$ \boxed{X > 0.8} $$

Expressed in interval notation:

$$ (0.8, \infty) $$

This means any real number greater than 0.8 is a solution that satisfies both inequalities.

Visualizing the Solution

To better understand the solution set, visualize the inequalities on a number line:

- Draw a number line with points at -2 and 0.8.
- Shade the region to the right of 0.8, indicating all numbers greater than 0.8.
- The interval is open at 0.8 because the inequality is strict ($>$), not $\geq$).

Indicating Three Solution Numbers

Now that the solution set is identified, the next step is to select three specific numbers that satisfy the system.

Since the solution set is all numbers greater than 0.8, any three numbers greater than 0.8 qualify. Here are some examples:

1. Number 1: 1.5

- Check against $X > 0.8$: $1.5 > 0.8$ — True
- Check against $-5X < 10$: $-5 \times 1.5 = -7.5 < 10$ — True

2. Number 2: 10

- $10 > 0.8$ — True
- $-5 \times 10 = -50 < 10$ — True

3. Number 3: 0.9

- $0.9 > 0.8$ — True
- $-5 \times 0.9 = -4.5 < 10$ — True

All three numbers are solutions, clearly illustrating the solution set.

Additional Insights and Considerations

1. Boundary Points

- Because the inequalities are strict ($>$), the boundary points at 0.8 and -2 are not included in the solution set.
- If the inequalities were non-strict ($\geq$ or $\leq$), the solution set would include the boundary points.

2. Graphical Representation

Graphing the inequalities helps clarify their intersection:

- Draw a number line.
- Shade the region $X > 0.8$ with an open circle at 0.8.
- The entire shaded region to the right of 0.8 represents the solutions.

3. Real-world Applications

Understanding such systems is vital in fields like:

- Economics: where constraints might define feasible ranges for variables.
- Engineering: for design parameters that must satisfy multiple conditions.
- Science: for modeling phenomena with multiple restrictions.

Common Mistakes to Avoid

- Incorrectly reversing inequalities when dividing by negative numbers.
- Confusing the solution sets of individual inequalities with their intersection.
- Including boundary points when the inequalities are strict; remember, open intervals exclude the boundary.

Summary and Conclusion

To summarize:

- The system of inequalities:

\[
\begin{cases}
X - 0.8 > 0 \\
-5X < 10

\end{cases}
\]

simplifies to:

$$
\begin{cases}
X > 0.8 \\
X > -2
\end{cases}
$$

- The solution set is the intersection:

$$
X > 0.8
$$

- The solution set in interval notation:

$$
(0.8, \infty)
$$

- Three example solutions are:

- $X = 1.5$
- $X = 10$
- $X = 0.9$

These solutions satisfy both inequalities, confirming the correctness of the solution.

Final Remarks

Mastering the process of solving systems of inequalities enhances mathematical reasoning and problem-solving skills. It involves careful algebraic manipulation, understanding of inequalities' properties, and visual representation for clarity. Practicing such systems prepares learners for more complex mathematical models and real-life scenarios where multiple conditions must be satisfied simultaneously.

Always remember: When solving inequalities, pay close attention to the direction of the inequality sign, especially when multiplying or dividing by negative numbers, and clearly interpret the solution set in the context of the problem.

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