

The Inequality $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ Is Given. Solve The Inequality For P

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Introduction

Mathematics often presents us with inequalities that require careful manipulation to find the range of possible solutions. Among these, linear inequalities involving variables, fractions, and constants are common in algebra and serve as foundational skills for higher-level mathematics. The inequality presented — $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ — is a typical example that tests your understanding of algebraic operations, fraction handling, and inequality solving techniques.

In this article, we will explore how to solve this inequality for the variable p step-by-step. We'll cover the necessary mathematical concepts, detail each step of the solution process, and provide insights into why certain operations are performed. Whether you're a student preparing for exams or someone interested in sharpening your algebra skills, this comprehensive guide will help you understand and master solving inequalities involving fractions.

Understanding the Inequality

Before diving into solving, it's essential to understand the structure of the inequality:

$$\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$$

This expression involves:

- Fractions ($\frac{4}{5}$ and $\frac{9}{5}$)
- A term with the variable in the denominator ($\frac{1}{2}p$)
- An inequality symbol ("greater than")

Our goal is to isolate p on one side of the inequality to determine the range of values for p that satisfy the inequality.

Step-by-Step Solution Process

Step 1: Rewrite the Inequality for Clarity

The given inequality is:

$$\left(\frac{4}{5}\right) - \left(\frac{1}{2}\right)p > \frac{9}{5}$$

Note: The term $\frac{1}{2}p$ is interpreted as $\left(\frac{1}{2}\right) p$.

Step 2: Eliminate Fractions by Finding a Common Denominator

Working with fractions can be simplified by clearing denominators. To do this, find the least common denominator (LCD) among 5 and 2, which is 10.

- Multiply every term in the inequality by 10 to eliminate fractions:

$$\begin{aligned} & 10 \times \left(\frac{4}{5} \right) - 10 \times \left(\frac{1}{2} p \right) \\ & > 10 \times \left(\frac{9}{5} \right) \end{aligned}$$

Calculating each term:

$$\begin{aligned} & - \left(10 \times \frac{4}{5} = 10 \times 0.8 = 8 \right) \\ & - \left(10 \times \frac{1}{2} p = 10 \times 0.5 p = 5p \right) \\ & - \left(10 \times \frac{9}{5} = 10 \times 1.8 = 18 \right) \end{aligned}$$

Now, the inequality becomes:

$$\begin{aligned} & 8 - 5p > 18 \end{aligned}$$

Step 3: Isolate the Variable Term

Subtract 8 from both sides to group the variable term:

$$\begin{aligned} & 8 - 5p - 8 > 18 - 8 \end{aligned}$$

Simplifies to:

$$\begin{aligned} & -5p > 10 \end{aligned}$$

Step 4: Solve for p

Divide both sides by -5 to solve for p. Important: When dividing or multiplying both sides of an inequality by a negative number, the inequality sign must be reversed.

$$\begin{aligned} & p < \frac{10}{-5} \end{aligned}$$

Calculating:

$$\begin{aligned} & p < -2 \end{aligned}$$

Final Solution and Interpretation

The solution to the inequality $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ is:

$$p < -2$$

This means that any value of p less than -2 satisfies the original inequality.

Visualizing the Solution

Graphically, this solution indicates a number line where:

- All points to the left of -2 satisfy the inequality.
- The point $p = -2$ itself does not satisfy the inequality because the inequality is strict ("greater than" and not "greater than or equal to").

Additional Insights and Tips for Solving Similar Inequalities

Handling Fractions in Inequalities

- Finding the LCD simplifies the process by eliminating fractions.
- Always perform identical operations on both sides.
- Remember to reverse the inequality sign when dividing or multiplying by a negative number.

Practice Problems

To reinforce your understanding, try solving these inequalities:

1. $\left(\frac{3}{4} - \frac{1}{3}x \leq \frac{7}{4}\right)$
2. $\left(2 - \frac{3}{5}x < 4\right)$
3. $\left(\frac{5}{6}x + 2 > \frac{7}{6}\right)$

Common Mistakes to Avoid

- Forgetting to reverse the inequality sign when dividing by a negative.
- Not simplifying fractions properly.
- Overlooking the strictness of the inequality (e.g., using $\leq$ instead of $<$).

Practical Applications of Solving Inequalities

Understanding how to solve inequalities like $p < -2$ has real-world applications, including:

- Determining feasible ranges for variables in engineering and physics.
- Financial modeling, where inequalities define acceptable investment thresholds.
- Optimization problems in operations research.
- Calculus and advanced mathematics, where inequalities define regions of interest.

Conclusion

Solving inequalities involving fractions and variables might seem challenging at first, but with a systematic approach, it becomes manageable. The key steps involve clearing fractions, isolating the variable, and paying

attention to the inequality sign, especially when multiplying or dividing by negative numbers.

Remember, the inequality $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ simplifies to $p < -2$, indicating all numbers less than -2 satisfy the inequality. Mastering these techniques enhances your algebraic skills and prepares you for more complex mathematical problems.

By practicing similar problems and understanding the underlying principles, you'll develop confidence and proficiency in solving inequalities, a vital skill in mathematics and its applications.

References

- Algebra textbooks and resources
- Khan Academy's Algebra courses
- Mathisfun.com inequality section
- Wolfram Alpha for solving various inequalities

Empower your mathematical journey by mastering the art of solving inequalities!

Frequently Asked Questions

What is the given inequality to solve for p?

The inequality is $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$.

How do I start solving the inequality $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$?

Begin by isolating the term with p by subtracting $\frac{4}{5}$ from both sides of the inequality.

What is the result after subtracting $\frac{4}{5}$ from both sides in the inequality?

You get $-\frac{1}{2}p > \frac{9}{5} - \frac{4}{5}$, which simplifies to $-\frac{1}{2}p > \frac{5}{5}$, or $-\frac{1}{2}p > 1$.

How do I solve for p after obtaining $-\frac{1}{2}p > 1$?

Multiply both sides of the inequality by -2 to cancel out the coefficient of p, remembering to reverse the inequality sign because you're multiplying by a negative number.

What is the inequality after multiplying both sides by -2 ?

Multiplying both sides by -2 gives $p < -2$, since the inequality sign flips

when multiplying by a negative number.

What is the final solution for p in the inequality?

The solution is $p < -2$.

How do I check if $p = -3$ satisfies the original inequality?

Substitute $p = -3$ into the original inequality: $\frac{4}{5} - \frac{1}{2}(-3) > \frac{9}{5}$, which simplifies to $\frac{4}{5} + \frac{3}{2} > \frac{9}{5}$. Calculate both sides to verify the inequality holds.

Can the solution $p < -2$ be expressed in interval notation?

Yes, it can be written as $(-\infty, -2)$.

What should I remember about inequalities when multiplying or dividing by negative numbers?

Always flip the inequality sign when multiplying or dividing both sides by a negative number to maintain the inequality's correctness.

Are there any common mistakes to avoid when solving this inequality?

Yes, avoid forgetting to flip the inequality sign after multiplying both sides by a negative number, and ensure all arithmetic operations are correctly performed to prevent errors.

Additional Resources

The Inequality $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ Is Given. Solve The Inequality For P

Introduction

Mathematics is a domain where clarity, precision, and logical deduction reign supreme. Among its various branches, inequalities hold a special place, serving as foundational tools for expressing relationships between quantities. They are pervasive in fields ranging from economics to engineering, and their proper understanding is crucial for problem-solving and analytical reasoning.

In this article, we undertake an in-depth investigation into a particular inequality: " $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ ". Despite the somewhat cryptic phrasing in the title—"The Inequality $\frac{4}{5} - \frac{1}{2}p > \frac{9}{5}$ Is Given"—the core objective is clear: solve the inequality for p . This task involves algebraic manipulation, an understanding of inequalities, and careful attention to algebraic rules.

We will explore the inequality step by step, analyze the solution set, and

discuss the implications and context of such an inequality in broader mathematical or applied settings.

Understanding the Inequality

The inequality at the heart of this investigation is:

$$4/5 - (1/2)p > 9/5$$

Before proceeding with solving it, it is essential to understand its structure and what it represents.

- The left side combines a constant term, $4/5$, and a term involving the variable p : $-(1/2)p$.
- The right side is a constant, $9/5$.
- The inequality symbol ">" indicates that the expression on the left exceeds the expression on the right.

Key points:

- The coefficient of p is negative because of the $-1/2$ factor.
- The inequality is linear in p , meaning it can be rearranged to isolate p in a straightforward manner.
- The constants are rational numbers, which simplifies the algebraic manipulation.

Step-by-Step Solution of the Inequality

The goal is to find all values of p that satisfy:

$$4/5 - (1/2)p > 9/5$$

Step 1: Eliminate the fractions

To facilitate easier calculations, clear denominators by multiplying both sides of the inequality by the least common denominator (LCD).

The denominators are 5 (from $4/5$ and $9/5$) and 2 (from $1/2p$).

- LCD of 5 and 2 is 10.

Multiplying both sides by 10:

$$10 (4/5 - (1/2)p) > 10 (9/5)$$

Calculations:

$$\begin{aligned}
 -10 \left(\frac{4}{5} \right) &= 10 \cdot \frac{4}{5} = \left(\frac{10}{1} \right) \left(\frac{4}{5} \right) = \left(\frac{10 \cdot 4}{1 \cdot 5} \right) = \frac{40}{5} = 8 \\
 -10 \left(\frac{1}{2} \right) p &= 10 \left(\frac{1}{2} \right) p = 5p \\
 -10 \left(\frac{9}{5} \right) &= \left(\frac{10}{1} \right) \left(\frac{9}{5} \right) = \left(\frac{10 \cdot 9}{1 \cdot 5} \right) = \frac{90}{5} = 18
 \end{aligned}$$

Thus, the inequality becomes:

$$8 - 5p > 18$$

Step 2: Isolate the term with p

Subtract 8 from both sides:

$$8 - 5p - 8 > 18 - 8$$

Simplifies to:

$$-5p > 10$$

Step 3: Solve for p

Divide both sides by -5:

$$-5p / -5 > 10 / -5$$

Important: When dividing both sides of an inequality by a negative number, the inequality sign reverses.

Calculations:

$$p < -2$$

Solution Set and Interpretation

The solution to the inequality $\frac{4}{5} - \left(\frac{1}{2} \right) p > \frac{9}{5}$ is:

$$p < -2$$

This indicates that all real numbers less than -2 satisfy the original inequality.

Visualizing the Solution

Graphically, the solution set corresponds to all points to the left of $p = -2$

on the real number line. The boundary point $p = -2$ is not included because the inequality is strict (" $>$ "), not " $\geq$ ".

Broader Context and Applications

While the algebraic manipulation appears straightforward, inequalities like this have broad applications across disciplines. They often represent constraints, thresholds, or bounds in real-world problems. For example:

- Economics: Inequalities can model budget constraints or profit thresholds.
- Engineering: They may express safety limits or tolerances.
- Statistics: Inequalities define confidence intervals or bounds on estimates.
- Computer Science: Constraints in algorithms or resource allocation problems.

In the context of this particular inequality, perhaps it could model a scenario where a certain variable p (which could represent price, rate, or some other measure) must stay below -2 to satisfy a specified condition.

Common Mistakes and Considerations in Solving Inequalities

When solving inequalities, especially those involving variables and fractions, students and practitioners should be cautious of the following:

- Remember the rule for multiplying/dividing by negative numbers: Always reverse the inequality sign when doing so.
- Check for extraneous solutions: Although less common with linear inequalities, always verify solutions in the original inequality.
- Maintain the inequality's direction: During algebraic steps, ensure the inequality sign is correctly adjusted when multiplying or dividing by negative values.
- Simplify carefully: Rational expressions can be manipulated more straightforwardly when cleared of denominators.

Summary and Final Remarks

By systematically analyzing the inequality $\frac{4}{5} - \left(\frac{1}{2}\right)p > \frac{9}{5}$, we deduced that:

- Multiplying through by 10 to clear fractions simplifies the inequality.
- The solution set is $p < -2$.
- The boundary point $p = -2$ is excluded from the solution set due to the strict inequality.

This exercise underscores the importance of careful algebraic manipulation and attention to the rules governing inequalities. The ability to solve such inequalities is fundamental in mathematical reasoning and has practical implications across multiple fields.

In essence, the inequality "Givin" (or given) was not just a simple algebraic challenge but a window into the rigor and precision necessary for mathematical problem-solving. Whether used in theoretical contexts or applied scenarios, the techniques demonstrated here are vital tools for analysts, scientists, and students alike.

References

- Stewart, J. (2015). Algebra and Trigonometry. Cengage Learning.
- Larson, R., & Edwards, B. H. (2013). Precalculus with Limits. Cengage Learning.
- Stewart, J. (2012). Calculus: Early Transcendentals. Brooks Cole.

Author's Note: This detailed exploration emphasizes comprehensive understanding and methodical reasoning, core values in mathematical analysis and education.

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