Solve For P: 3p-2=2p/5+p-2/3

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Introduction

Solving algebraic equations is a fundamental skill in mathematics that forms the backbone of more advanced topics. One common type of problem involves solving for an unknown variable, often denoted as p. The equation 3p - 2 = 2p/5 + p - 2/3 presents a typical challenge involving fractions and variables on both sides. Mastering how to approach such equations enhances problem-solving skills and deepens understanding of algebraic principles. In this comprehensive guide, we'll explore step-by-step methods to solve for p in this specific equation, including techniques such as clearing fractions, combining like terms, and isolating the variable.

Understanding the Equation

Before diving into the solution process, it is crucial to understand the structure of the equation:

3p - 2 = (2p/5) + p - (2/3)

This equation contains:

- A linear term involving p (3p)
- Constant terms (-2)
- Fractions involving p (2p/5)
- A constant fraction (-2/3)
- Multiple terms on the right side, including a mixed term with p and a fraction.

The main challenge is to eliminate fractions to simplify the equation, then combine like terms, and finally solve for p.

Step-by-Step Approach to Solving for P

Step 1: Identify the Least Common Denominator (LCD)

Since the equation contains fractions with denominators 5 and 3, the first step is to find the Least Common Denominator (LCD) to clear fractions.

- Denominators are 5 and 3.
- LCD of 5 and 3 is 15.

Step 2: Multiply the Entire Equation by the LCD

Multiplying both sides of the equation by 15 eliminates the fractions:

(15) (3p - 2) = (15) [(2p/5) + p - (2/3)]

Calculations:

- Left Side: 15 3p - 15 2 = 45p - 30
- Right Side: 15 (2p/5) + 15 p - 15 (2/3)

Simplify each term on the right:

- 15 (2p/5) = (15/5) 2p = 3 2p = 6p
- 15 p = 15p
- 15 (2/3) = (15/3) 2 = 5 2 = 10

Now, the equation becomes:

45p - 30 = 6p + 15p - 10

Step 3: Simplify Both Sides

Combine like terms on the right side:

6p + 15p = 21p

So, the equation simplifies to:

45p - 30 = 21p - 10

Step 4: Move Variables to One Side

Subtract 21p from both sides to gather all p terms on one side:

45p - 21p - 30 = -10

Simplify:

24p - 30 = -10

Step 5: Isolate the Variable

Add 30 to both sides:

24p = -10 + 30

$24p = 20$

Finally, divide both sides by 24:

$p = 20 / 24$

Simplify the fraction:

$p = 5 / 6$

Final Solution

$p = 5/6$

This is the value of p that satisfies the original equation.

Additional Tips for Solving Equations with Fractions

Solving equations similar to the one above can be challenging, especially with multiple fractions involved. Here are some tips to make the process smoother:

1. Always Find the Least Common Denominator (LCD)

- Identifying the LCD helps eliminate fractions efficiently.
- Multiply both sides of the equation by the LCD to clear fractions.

2. Be Careful When Distributing

- When multiplying through by the LCD, distribute evenly to all terms to avoid errors.

3. Combine Like Terms Carefully

- After clearing fractions, combine similar terms on each side before moving variables.

4. Check Your Solution

- Substitute your value of p back into the original equation to verify correctness.

Common Mistakes to Avoid

- Forgetting to multiply all terms by the LCD: ensure every term is

multiplied.
- Incorrect simplification of fractions: double-check fraction multiplications.
- Sign errors during operations: be cautious with negative signs.
- Dropping terms or miscalculating constants: verify each step.

Practice Problems

To strengthen your understanding, try solving these similar equations:

1. $4p/3 + 2 = p/2 + 5$
2. $(3p - 4)/6 = (2p + 1)/3$
3. $5p + 2/5 = (3p - 1)/2$

Working through these problems will reinforce the techniques discussed and improve your proficiency with equations involving fractions.

Conclusion

Solving for p in the equation $3p - 2 = 2p/5 + p - 2/3$ demonstrates essential algebraic skills, including clearing fractions, combining like terms, and isolating the variable. The key steps involve identifying the LCD, multiplying through to eliminate fractions, simplifying, and carefully solving for the unknown. The final answer, $p = 5/6$, reflects a systematic approach to tackling fractional equations. Mastery of these methods empowers you to handle a wide range of algebraic problems with confidence, laying a strong foundation for advanced mathematics.

SEO Keywords for Better Visibility

- Solve for P
- Algebraic equations with fractions
- How to solve equations involving fractions
- Clearing fractions in algebra
- Solving linear equations with fractions
- Step-by-step algebra solutions
- Simplifying equations with variables and fractions
- Algebra practice problems
- Tips for solving fractional equations
- Mathematical problem-solving techniques

By understanding and practicing solving equations like $3p - 2 = 2p/5 + p - 2/3$, students and learners can enhance their problem-solving skills, improve their mathematical fluency, and prepare for more complex algebraic challenges.

Frequently Asked Questions

How do I solve the equation 3p - 2 = (2p/5) + (p - 2)/3 for p?

To solve for p, first find a common denominator for the fractions, which is 15. Rewrite the equation as 3p - 2 = (6p/15) + ((5p - 10)/15). Multiply through by 15 to clear denominators: 15(3p - 2) = 6p + 5p - 10. Simplify and solve for p accordingly.

What is the first step in solving 3p - 2 = (2p/5) + (p - 2)/3?

The first step is to clear the denominators by multiplying both sides of the equation by the least common denominator, which is 15, to eliminate fractions and simplify the solving process.

Can I solve the equation 3p - 2 = (2p/5) + (p - 2)/3 without clearing denominators?

While possible, it's more straightforward to clear denominators first. Otherwise, you'd need to work with fractions directly, which can be more complex and error-prone. Clearing denominators simplifies the process.

After clearing fractions in 3p - 2 = (2p/5) + (p - 2)/3, what is the resulting equation?

Multiplying both sides by 15 (the least common denominator) results in: 15(3p - 2) = 15(2p/5) + 15((p - 2)/3), which simplifies to 45p - 30 = 6(2p) + 5(p - 2).

What are common mistakes to avoid when solving for p in this equation?

Common mistakes include incorrect multiplication when clearing denominators, forgetting to distribute correctly, or mixing up signs during simplification. Always double-check each step and distribute carefully.

What is the solution to the equation 3p - 2 = (2p/5) + (p - 2)/3?

The solution is p = 1. After clearing denominators and simplifying, you find p = 1 as the value satisfying the original equation.

Additional Resources

Solve For P: 3p - 2 = 2p/5 + p - 2/3 is a classic algebraic problem that exemplifies the process of solving for an unknown variable within a rational equation. This type of problem is fundamental in algebra because it encompasses key skills such as managing fractions, isolating variables, and simplifying complex expressions. Whether you're a student brushing up on algebra or an educator designing a lesson plan, understanding how to approach and solve such equations is crucial. In this article, we will explore the step-by-step process to solve this particular equation, analyze the underlying concepts, discuss common pitfalls, and highlight the importance of mastering these techniques.

Understanding the Equation

At first glance, the equation involves multiple terms, including a linear expression on the left and rational expressions on the right:

$$3p - 2 = \frac{2p}{5} + p - \frac{2}{3}$$

This structure presents an opportunity to practice combining like terms, managing fractions, and applying algebraic principles to isolate the variable p.

Breaking Down the Components

The Left Side: $3p - 2$
This is a straightforward linear expression involving the variable p and a constant term. The coefficient of p is 3, and it is subtracted by 2.

The Right Side: $\frac{2p}{5} + p - \frac{2}{3}$
This side combines rational expressions and a linear term:
- $\frac{2p}{5}$, a fraction involving p,
- p, a simple linear term,
- $-\frac{2}{3}$, a constant fraction.

The presence of fractions necessitates careful handling to combine all terms effectively.

Approach to Solving the Equation

The goal is to find the value of p that satisfies the equation. The general approach involves:

1. Eliminating fractions by finding a common denominator.
2. Combining like terms.
3. Isolating the variable p.
4. Solving for p.

Let's explore each step in detail.

Step-by-Step Solution

Step 1: Find the Least Common Denominator (LCD)

The denominators present are 5 and 3. The LCD of 5 and 3 is 15. Multiplying both sides of the entire equation by 15 eliminates fractions:

$$
15(3p - 2) = 15 \left(\frac{2p}{5} + p - \frac{2}{3} \right)
$$

This simplifies to:

$$
15 \times 3p - 15 \times 2 = 15 \times \frac{2p}{5} + 15 \times p - 15 \times \frac{2}{3}
$$

Calculating each term:

- $15 \times 3p = 45p$
- $15 \times 2 = 30$
- $15 \times \frac{2p}{5} = 15 \times \frac{2p}{5} = 3 \times 2p = 6p$
- $15 \times p = 15p$
- $15 \times \frac{2}{3} = 5 \times 2 = 10$

So, the equation becomes:

$$
45p - 30 = 6p + 15p - 10
$$

Step 2: Simplify Both Sides

Combine like terms on the right:

$$
45p - 30 = (6p + 15p) - 10
$$
$$
45p - 30 = 21p - 10
$$

Step 3: Isolate \(p \)

Bring all \(p \)-terms to one side and constants to the other:

\[
45p - 21p = -10 + 30
\]
\[
24p = 20
\]

Step 4: Solve for \(p \)

Divide both sides by 24:

\[
p = \frac{20}{24} = \frac{5}{6}
\]

Result: The solution to the equation is \(p = \frac{5}{6} \).

Verifying the Solution

It's always good practice to verify the solution by substituting \(p = \frac{5}{6} \) back into the original equation:

\[
3 \times \frac{5}{6} - 2 \stackrel{?}{=} \frac{2 \times \frac{5}{6}}{5} + \frac{5}{6} - \frac{2}{3}
\]

Calculate each side:

- Left Side:

\[
3 \times \frac{5}{6} = \frac{15}{6} = \frac{5}{2}
\]
\[
\frac{5}{2} - 2 = \frac{5}{2} - \frac{4}{2} = \frac{1}{2}
\]

- Right Side:

\[
\frac{2 \times \frac{5}{6}}{5} = \frac{\frac{10}{6}}{5} = \frac{\frac{5}{3}}{5} = \frac{5}{3} \times \frac{1}{5} = \frac{1}{3}
\]
\[

$$
\frac{5}{6} - \frac{2}{3} = \frac{5}{6} - \frac{4}{6} = \frac{1}{6}
$$

Sum the right side:

$$
\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}
$$

Both sides equal $\frac{1}{2}$, confirming the solution is correct.

Key Concepts and Skills Demonstrated

1. Handling Fractions: Recognizing the importance of finding the LCD to clear fractions simplifies the algebraic manipulation.
2. Distributive Property: Used when multiplying both sides by the LCD.
3. Combining Like Terms: Simplifies expressions to isolate the variable.
4. Verification: Substituting solutions back into the original equation ensures accuracy.

Common Challenges and How to Overcome Them

- Misidentifying the LCD: Always list the denominators and find the least common multiple.
- Sign Errors: Be cautious with negative signs, especially when moving terms across the equality.
- Incorrect Distribution: Double-check each multiplication step when distributing.
- Simplification Mistakes: Carefully combine like terms, especially fractions.

Features and Advantages of This Approach

- Systematic Process: Breaking down the problem into steps makes complex equations manageable.
- Fraction Management: Using LCDs simplifies the equation, reducing errors.
- Verification: Confirms the correctness of the solution, reinforcing understanding.
- Reinforces Algebra Skills: Mastering such problems enhances overall algebra competence.

Extensions and Practice Problems

Once comfortable with this type of problem, students can progress to more complex equations involving:

- Variables in denominators with other algebraic expressions.
- Equations with multiple fractions and variables.
- Quadratic equations involving rational expressions.

Sample Practice Problem:

Solve for \(p \):

$$
\frac{p+1}{2} + \frac{3p - 4}{4} = \frac{2p}{3} - 1
$$

Final Thoughts

Solving for \(p \) in equations like 3p - 2 = 2p/5 + p - 2/3 exemplifies fundamental algebraic techniques that are essential for higher-level mathematics. Mastery of fraction management, distributing, combining like terms, and verification not only helps in solving similar problems but also builds a strong foundation for advanced topics such as algebraic functions, equations with multiple variables, and calculus. Practice, patience, and careful step-by-step reasoning are key to becoming proficient in solving such algebraic equations, ultimately enhancing mathematical confidence and problem-solving skills.

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