How To Do 2/5 = (x-3)/(7x+15)

How To Do 2/5 = (x-3)/(7x+15)

Understanding how to solve equations involving fractions is a fundamental skill in algebra. The equation 2/5 = (x-3)/(7x+15) presents an opportunity to practice cross-multiplication and algebraic manipulation to find the value of x. Whether you are a student preparing for exams or someone looking to strengthen your algebra skills, mastering this type of equation will enhance your problem-solving toolkit. In this comprehensive guide, we will walk through the steps to solve the equation 2/5 = (x-3)/(7x+15), explain key concepts, and provide helpful tips to ensure clarity and understanding.

Understanding the Equation

Before diving into the solution, it’s essential to understand the structure and components of the equation:

- The left side is a simple fraction: 2/5.
- The right side is a rational expression involving the variable x: (x-3)/(7x+15).

The goal is to find all values of x that satisfy the equation, meaning when both sides are equal.

Key Concepts Needed

1. Cross-Multiplication

Cross-multiplication is a technique used to eliminate fractions when two ratios are equal:

- For an equation of the form a/b = c/d, cross-multiplied as ad = bc.

2. Handling Rational Expressions

- Rational expressions involve fractions with variables in numerator and denominator.
- To solve equations involving rational expressions, clearing denominators via multiplication is often necessary.

3. Domain Restrictions

- The values of x that make the denominator zero are not valid solutions.
- For $(x-3)/(7x+15)$, the denominator $7x + 15 \neq 0$, so $x \neq -15/7$.

Step-by-Step Solution

Step 1: Write down the original equation

$$
\frac{2}{5} = \frac{x - 3}{7x + 15}
$$

Step 2: Cross-multiplied to eliminate fractions

Multiply both sides by the denominators:

$$
2 \times (7x + 15) = 5 \times (x - 3)
$$

This yields:

$$
2(7x + 15) = 5(x - 3)
$$

Step 3: Expand both sides

Distribute the coefficients:

$$
14x + 30 = 5x - 15
$$

Step 4: Collect like terms

Subtract $5x$ from both sides:

\[
14x - 5x + 30 = -15
\]

Simplify:

\[
9x + 30 = -15
\]

Subtract 30 from both sides:

\[
9x = -15 - 30
\]

\[
9x = -45
\]

Step 5: Solve for x

Divide both sides by 9:

\[
x = \frac{-45}{9} = -5
\]

Step 6: Verify the solution

Check if x = -5 makes the denominator zero:

\[
7x + 15 = 7(-5) + 15 = -35 + 15 = -20 \neq 0
\]

Since the denominator is not zero, x = -5 is valid.

Final Answer and Interpretation

The solution to the equation 2/5 = (x-3)/(7x+15) is:

\[

\boxed{x = -5}
\]

This means that when x = -5, both sides of the original equation are equal.

Additional Tips for Solving Rational Equations

1. Always check the domain restrictions

- Before finalizing your solution, verify that the value does not make any denominator zero.
- For this equation, x ≠ -15/7 to avoid division by zero.

2. Simplify step-by-step

- Carry out algebraic steps carefully.
- Expand parentheses properly and combine like terms diligently.

3. Verify your solution

- Substitute the found value back into the original equation.
- Confirm both sides are equal to avoid mistakes.

4. Use alternative methods when necessary

- If cross-multiplication seems complicated, consider clearing denominators by multiplying through by the least common denominator (LCD).

Practice Problems to Reinforce Learning

To solidify your understanding, try solving these similar equations:

1. \(\frac{3}{4} = \frac{x + 2}{2x - 1}\)
2. \(\frac{5}{6} = \frac{2x - 4}{3x + 9}\)
3. \(\frac{7}{9} = \frac{x}{3x + 4}\)

Use the step-by-step approach outlined above to find solutions and verify their validity.

Conclusion

Mastering equations like 2/5 = (x-3)/(7x+15) involves understanding the principles of cross-multiplication, rational expression manipulation, and domain restrictions. By following a systematic approach—multiplying through to eliminate fractions, expanding, collecting like terms, solving for the variable, and verifying your solution—you can confidently tackle similar problems. Remember to always check for restrictions that might invalidate your solutions, and practice regularly to improve your algebra skills.

With patience and attention to detail, solving rational equations becomes an accessible and manageable task, paving the way for success in algebra and beyond.

Frequently Asked Questions

How do I solve the equation 2/5 = (x - 3)/(7x + 15)?

To solve for x, cross-multiply to get 2(7x + 15) = 5(x - 3), then expand both sides and solve the resulting linear equation.

What is the first step in solving 2/5 = (x - 3)/(7x + 15)?

The first step is to cross-multiply: 2(7x + 15) = 5(x - 3).

How do I simplify the equation after cross-multiplying 2/5 = (x - 3)/(7x + 15)?

Expand both sides: 14x + 30 = 5x - 15, then move all terms to one side to solve for x.

What is the solution for x in 2/5 = (x - 3)/(7x + 15)?

Solving the equation leads to x = -3.

Are there any restrictions on x in the equation 2/5 = (x - 3)/(7x + 15)?

Yes, the denominator 7x + 15 cannot be zero, so x ≠ -15/7.

How can I check if my solution for x is correct in 2/5 = (x -

3)/(7x + 15)?

Substitute your value of x back into the original equation to verify if both sides are equal.

What does cross-multiplied form mean in solving rational equations like 2/5 = (x - 3)/(7x + 15)?

It means multiplying both sides by the denominators to eliminate fractions, turning the equation into a linear form.

Can the equation 2/5 = (x - 3)/(7x + 15) have more than one solution?

In this case, it has a single solution, x = -3. Rational equations typically have a unique solution unless multiple solutions satisfy the equation.

What is the importance of checking for extraneous solutions in equations like 2/5 = (x - 3)/(7x + 15)?

Because solving rational equations can introduce solutions that make denominators zero or do not satisfy the original equation, so it's important to verify solutions.

How do I interpret the solution x = -3 in the context of the original equation?

It means that when you substitute x = -3 back into the original equation, both sides are equal, confirming it as the valid solution.

Additional Resources

How To Do 2/5 = (x-3)/(7x+15): An In-Depth Guide to Solving Rational Equations

Mathematics often presents us with equations that seem complex at first glance, but upon closer analysis, reveal straightforward methods of solution. One such example is the rational equation:

\[\frac{2}{5} = \frac{x - 3}{7x + 15} \]

Understanding how to manipulate and solve equations like this is foundational for students and professionals working in fields that require algebraic reasoning, such as engineering, economics, and data science. This article provides a comprehensive, step-by-step approach to solving the equation, along with insights into common pitfalls, alternative methods, and the underlying principles that make the solution possible.

Understanding the Equation and Its Components

Before diving into solving, it's crucial to understand the structure of the equation:

$$\frac{2}{5} = \frac{x - 3}{7x + 15}$$

This is a proportional equation, where two ratios are set equal. The key components are:

- Numerators: 2 (left) and $x - 3$ (right).
- Denominators: 5 (left) and $7x + 15$ (right).

The goal is to find the value(s) of x that satisfy this equality.

Initial Observations and Constraints

Before solving, consider:

- Domain restrictions: The denominator cannot be zero because division by zero is undefined.

$$
7x + 15 \neq 0 \Rightarrow x \neq -\frac{15}{7}
$$

- The equation represents a rational relationship; therefore, solutions must be checked against this restriction post-solution.

Step-by-Step Approach to Solving the Equation

The most straightforward method to solve the equation is to eliminate the fractions by cross-multiplying, then solving the resulting algebraic equation.

Step 1: Cross-Multiplied Form

Cross-multiplied equations involve multiplying both sides by the denominators to clear fractions:

$$
2 \times (7x + 15) = 5 \times (x - 3)
$$

This simplifies the problem from a rational equation to a linear algebraic equation.

Step 2: Expand Both Sides

Distribute the multiplication:

$$
2 \times 7x + 2 \times 15 = 5 \times x - 5 \times 3
$$

$$
14x + 30 = 5x - 15
$$

Step 3: Isolate x

Bring all terms containing x to one side and constants to the other:

$$
14x - 5x = -15 - 30
$$

$$
9x = -45
$$

Solve for x:

$$
x = \frac{-45}{9} = -5
$$

Step 4: Verify the Solution

Recall the domain restriction:

$$
x \neq -\frac{15}{7} \approx -2.14
$$

Since $x = -5$, which is not equal to $-\frac{15}{7}$, the solution is valid.

Substitute back into the original equation to verify:

$$
\frac{2}{5} \stackrel{?}{=} \frac{-5 - 3}{7 \times -5 + 15}
$$

Calculate numerator:

$$
-5 - 3 = -8
$$

Calculate denominator:

$$
7 \times -5 + 15 = -35 + 15 = -20
$$

So,

$$
\frac{-8}{-20} = \frac{8}{20} = \frac{2}{5}
$$

which matches the left side, confirming that $x = -5$ is indeed a valid solution.

Alternative Methods for Solving Rational Equations

While cross-multiplication is the most straightforward method, other approaches can be employed, especially in more complex equations.

1. Cross-Multiplication with Algebraic Manipulation

This involves rewriting the equation as:

$$
(2/5) = (x - 3)/(7x + 15)
$$

then multiplying both sides to clear fractions:

$$
2(7x + 15) = 5(x - 3)
$$

which is exactly the method used above but can be extended to more complex cases.

2. Cross-Product Method for Multiple Ratios

When an equation involves multiple ratios, you can set up a proportion and cross-multiply systematically to generate algebraic equations.

3. Graphical Method

Plotting the two functions:

$$
f(x) = \frac{2}{5}
$$
and
$$
g(x) = \frac{x - 3}{7x + 15}
$$

can visually show points of intersection, which correspond to solutions. This approach is useful for understanding the behavior of the functions but less practical for exact solutions.

Handling Potential Pitfalls and Special Cases

While the solution appears straightforward, several common issues can arise:

1. Forgetting Domain Restrictions

Always check that your solutions do not make any denominator zero. In our case, $x \neq -\frac{15}{7}$. Since the solution $x = -5$ is valid, no restrictions are violated.

2. Multiple Solutions

In more complex rational equations, you might end up with quadratic or higher-degree equations that produce multiple solutions. Always verify each against the original equation and restrictions.

3. Extraneous Solutions

Occur when a solution satisfies the algebraic manipulation but not the original equation due to domain restrictions or transformations.

Extending the Concept: Generalizing to Similar Equations

The approach used here can be generalized for similar equations:

$$
\frac{A}{B} = \frac{C(x)}{D(x)}
$$

Steps:

1. Cross-multiply to clear fractions:

$$
A \times D(x) = B \times C(x)
$$

2. Expand and simplify:

$$
A \times D(x) - B \times C(x) = 0
$$

3. Solve for x using algebraic methods appropriate for the degree of the resulting polynomial.

4. Check solutions against restrictions (values that make denominators zero).

Practical Applications and Significance

Understanding how to manipulate and solve equations like $\frac{2}{5} = \frac{x - 3}{7x + 15}$ has practical implications:

- Engineering: Calculating ratios in systems involving proportional relationships.
- Economics: Solving for unknown quantities in proportional models.
- Data Science: Normalizing or transforming data based on rational functions.
- Education: Developing problem-solving skills and understanding algebraic principles.

Summary and Key Takeaways

- Rational equations can be effectively solved by cross-multiplied algebraic manipulation.
- Always verify solutions against the original equation and account for domain restrictions.
- Alternative methods, including graphical analysis, provide additional insights.
- The core principle involves transforming the equation into a solvable algebraic form and carefully analyzing solutions.

Final Remarks

Mastering the process of solving rational equations like 2/5 = (x-3)/(7x+15) builds foundational skills in algebra that are essential for advanced mathematical problem-solving. By understanding the steps, recognizing potential pitfalls, and applying alternative methods when necessary, students and professionals alike can confidently approach similar equations in academic, professional, or real-world contexts.

Remember: Always verify your solutions and understand the underlying principles to develop a deeper mastery of algebraic reasoning.

How To Do 2 5 X 3 7x 15

How To Do 2 5 X 3 7x 15

Related Articles

- Help Plz:)))Ill Mark U Brainliest
- What Are Density-dependent Factors?
- Molar Mass Of Cu(NO)2 = .

Back to Home