Solve For X.1/3 X+4=-2/3 X+12

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Understanding how to solve algebraic equations is a fundamental skill in mathematics that forms the basis for more advanced topics. The specific equation *1/3 X + 4 = -2/3 X + 12* presents an excellent opportunity to explore methods of solving for the variable X, especially when fractions are involved. This guide will walk you through the steps to solve this equation, clarify key concepts related to solving linear equations, and provide practical tips for mastering similar problems.

Introduction to Solving Linear Equations

Before diving into the specific equation, it is essential to understand what linear equations are and how they can be solved.

What Are Linear Equations?

A linear equation is an algebraic equation in which each term is either a constant or the product of a constant and a single variable raised to the first power. These equations typically have the form:

ax + b = 0

where:
- *a* and *b* are constants,
- *x* is the variable.

Goals When Solving Linear Equations

The main goal in solving a linear equation is to isolate the variable on one side of the equation to determine its value. This process involves:
- Combining like terms
- Eliminating fractions
- Using inverse operations (addition, subtraction, multiplication, division)

Step-by-Step Solution of 1/3 X + 4 = -2/3 X + 12

Let's explore each step carefully to solve the specific equation.

Step 1: Understand the Equation

Given:

$1/3\ X + 4 = -2/3\ X + 12$

This equation involves fractions with the variable X, which requires particular attention to avoid errors.

Step 2: Eliminate Fractions

To make calculations easier, eliminate the fractions by multiplying every term by the least common denominator (LCD).

- The denominators are 3 and 3, so the LCD is 3.
- Multiply through by 3:

$$3 \quad (1/3\ X) + 3 \quad 4 = 3 \quad (-2/3\ X) + 3 \quad 12$$

Simplify each term:

- 3 (1/3 X) = X
- 3 4 = 12
- 3 (-2/3 X) = -2X
- 3 12 = 36

Resulting in:

$X + 12 = -2X + 36$

Step 3: Collect Like Terms

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

- Add 2X to both sides:

$$X + 2X + 12 = -2X + 2X + 36$$

Simplify:

$3X + 12 = 36$

- Subtract 12 from both sides:

$$3X + 12 - 12 = 36 - 12$$

Simplify:

3X = 24

Step 4: Solve for X

Divide both sides by 3:

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X = 24 / 3
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Calculate:

X = 8

Step 5: Verify the Solution

Substitute X = 8 back into the original equation to verify:

Original equation:
1/3 X + 4 = -2/3 X + 12

Substitute X = 8:

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(1/3)  8 + 4 = - (2/3)  8 + 12
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Calculate each side:

- Left side:

(8/3) + 4 = 8/3 + 4 = 8/3 + 12/3 = 20/3

- Right side:

-(16/3) + 12 = -16/3 + 36/3 = 20/3

Since both sides equal 20/3, the solution X = 8 is correct.

Understanding Fractions in Algebraic Equations

Fractions can make algebraic equations seem more complex, but with proper techniques, they can be managed effectively.

Common Strategies for Handling Fractions

- Multiplying through by the LCD: This eliminates fractions, simplifying the equation.
- Cross-multiplication: Useful when dealing with equations involving two fractions set equal to each other.
- Simplifying fractions: Always reduce fractions to their simplest form before solving.

Why Eliminating Fractions Helps

Eliminating fractions reduces the potential for mistakes and makes the algebraic steps clearer, especially when combining like terms or isolating variables.

Additional Tips for Solving Similar Equations

To master solving equations involving variables and fractions, keep these strategies in mind:

Practice with Different Equations

Work on various equations, such as:

- Equations with multiple fractions
- Equations involving parentheses
- Quadratic equations (for advanced practice)

Double-Check Your Work

Always verify your solutions by substituting the value back into the original equation.

Be Patient and Methodical

Take your time with each step, especially when dealing with fractions, to avoid careless errors.

Use Visual Aids

Drawing diagrams or using algebra tiles can help visualize the problem, especially for more complex equations.

Real-Life Applications of Solving Equations

Understanding how to solve equations like *1/3 X + 4 = -2/3 X + 12* is not just an academic exercise. These skills are useful in various real-life scenarios:

- Financial calculations: Determining loan payments or investment returns
- Engineering: Solving for unknown quantities in design equations
- Science: Calculating concentrations or reaction rates
- Everyday problem-solving: Budgeting, cooking recipes adjustments, and more

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Summary of the Solution Process

To summarize, solving the equation *1/3 X + 4 = -2/3 X + 12* involves:

1. Multiplying through by the LCD to clear fractions
2. Combining like terms to isolate X
3. Solving for X by division
4. Verifying the solution

The final answer, X = 8, is confirmed through substitution back into the original equation.

Conclusion

Mastering the technique of solving equations with fractions, such as *1/3 X + 4 = -2/3 X + 12*, is an essential step in algebra. By following systematic steps—eliminating fractions, combining like terms, and verifying solutions—you can confidently tackle similar problems. Remember, practice is key to becoming proficient. With consistent effort and application of these strategies, you'll enhance your algebra skills and deepen your understanding of mathematical problem-solving.

Additional Resources for Learning Algebra

- Online tutorials: Websites like Khan Academy offer free lessons on solving linear equations.
- Math textbooks: Look for algebra textbooks that provide numerous practice problems.
- Tutoring services: Consider seeking help from teachers or tutors for personalized guidance.
- Math apps: Use apps that allow step-by-step solving to reinforce understanding.

By integrating these resources into your study routine, you'll be well on your way to mastering algebraic equations and applying these skills across various disciplines and real-world situations.

Frequently Asked Questions

How do I solve the equation (1/3)X + 4 = (-2/3)X + 12?

To solve (1/3)X + 4 = (-2/3)X + 12, first add (2/3)X to both sides to gather X terms on one side: (1/3)X + (2/3)X + 4 = 12. Simplify: (3/3)X + 4 = 12, which simplifies to X + 4 = 12. Then subtract 4 from both sides: X = 8.

What is the value of X in the equation (1/3)X + 4 = (-2/3)X + 12?

The value of X is 8.

Why do we combine like terms when solving (1/3)X + 4 = (-2/3)X + 12?

Combining like terms helps to isolate X and simplify the equation, making it easier to solve for the variable.

Can you explain step-by-step how to solve (1/3)X + 4 = (-2/3)X + 12?

Yes. Step 1: Add (2/3)X to both sides: (1/3)X + (2/3)X + 4 = 12. Step 2: Simplify the X terms: (3/3)X + 4 = 12, which is X + 4 = 12. Step 3: Subtract 4 from both sides: X = 8.

What is the importance of clearing fractions in solving equations like (1/3)X + 4 = (-2/3)X + 12?

Clearing fractions simplifies the equation, making it easier to perform algebraic operations and find the value of X accurately.

What are common mistakes to avoid when solving (1/3)X + 4 = (-2/3)X + 12?

Common mistakes include forgetting to distribute, not combining like terms correctly, or making errors in arithmetic when adding or subtracting fractions.

Is the solution to (1/3)X + 4 = (-2/3)X + 12 unique?

Yes, this linear equation has a unique solution, which is X = 8.

How can I check if my solution X = 8 is correct for the equation (1/3)X + 4 = (-2/3)X + 12?

Substitute X = 8 back into the original equation: (1/3)(8) + 4 = (-2/3)(8) + 12. Calculate both sides:

(8/3) + 4 and (-16/3) + 12. Simplify to verify both sides are equal, confirming the solution is correct.

What type of equation is (1/3)X + 4 = (-2/3)X + 12?

It's a linear equation in one variable.

How would the solution change if the equation was (1/3)X + 4 = (-2/3)X + 10?

Following similar steps, solving (1/3)X + 4 = (-2/3)X + 10 would give X = 6, since subtracting 4 from both sides and combining like terms leads to X = 6.

Additional Resources

Solve For X.1/3 X+4=-2/3 X+12: A Comprehensive Guide to Solving Linear Equations

When approaching algebraic expressions, understanding how to solve for X in equations like X.1/3 X+4=-2/3 X+12 is fundamental. These types of problems often seem intimidating at first glance, but with a clear step-by-step process, you can confidently find the value of X and master the art of algebra. In this guide, we'll dissect the problem meticulously, explore different methods, and provide practical tips to enhance your problem-solving skills.

Understanding the Equation

Before diving into the solution, let's analyze the equation:

X.1/3 X + 4 = -2/3 X + 12

At first glance, the notation X.1/3 X might seem confusing. It could be misinterpreted, but in algebraic terms, this likely means X multiplied by 1/3 X, or perhaps X times (1/3) times X. To avoid ambiguity, let's clarify the expression.

Clarification of the Expression

- If the original expression is X (1/3) X, then it simplifies to (1/3) X^2.
- Alternatively, if it is X (1/3 X), then it becomes (1/3) X X = (1/3) X^2.
- Or, if it is X 1/3 X, it's the same as (1/3) X^2.

Given the structure, the most logical interpretation is:

(1/3) X^2 + 4 = -(2/3) X + 12

This makes sense because the original notation seems to be a typo or formatting issue; in algebra, X.1/3 X typically represents (1/3) X^2.

Therefore, the equation simplifies to:

$(1/3) X^2 + 4 = - (2/3) X + 12$

Step-by-Step Solution Strategy

Now that we've clarified the equation, let's proceed systematically.

Step 1: Rewrite the Equation

Express the equation clearly:

$(1/3) X^2 + 4 = - (2/3) X + 12$

Step 2: Eliminate Fractions

To make calculations easier, multiply both sides of the equation by 3 (the least common denominator of 3):

$3 [(1/3) X^2 + 4] = 3 [- (2/3) X + 12]$

which simplifies to:

$X^2 + 12 = -2 X + 36$

Step 3: Bring All Terms to One Side

To set the equation to zero, move all terms to one side:

$X^2 + 12 + 2 X - 36 = 0$

Simplify:

$X^2 + 2 X - 24 = 0$

Solving the Quadratic Equation

The simplified quadratic:

$X^2 + 2 X - 24 = 0$

can be solved using various methods:

- Factoring
- Quadratic formula
- Completing the square

Let's explore each method.

Method 1: Factoring

Find two numbers that multiply to -24 and add to 2.

Factors of -24:

- 1 and -24 (sum: -23)
- 2 and -12 (sum: -10)
- 3 and -8 (sum: -5)
- 4 and -6 (sum: -2)
- -4 and 6 (sum: 2) ← Here we go!

Factors: -4 and 6

Rewrite the quadratic:

$X^2 - 4X + 6X - 24 = 0$

Group terms:

$(X^2 - 4X) + (6X - 24) = 0$

Factor each group:

$X(X - 4) + 6(X - 4) = 0$

Factor out common binomial:

$(X - 4)(X + 6) = 0$

Set each factor equal to zero:

- $X - 4 = 0 \rightarrow X = 4$
- $X + 6 = 0 \rightarrow X = -6$

Solutions: $X = 4$, $X = -6$

Method 2: Quadratic Formula

The quadratic formula:

$X = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$

For the quadratic:

$X^2 + 2X - 24 = 0$

Coefficients:

$a = 1, b = 2, c = -24$

Plug into the formula:

$X = [-2 \pm \sqrt{(2^2 - 4\ 1\ (-24))}] / (2)$

$X = [-2 \pm \sqrt{(4 + 96)}] / 2$

$X = [-2 \pm \sqrt{100}] / 2$

$X = [-2 \pm 10] / 2$

Calculate both solutions:

- $X = (-2 + 10) / 2 = 8 / 2 = 4$
- $X = (-2 - 10) / 2 = -12 / 2 = -6$

Solutions: $X = 4$, $X = -6$

Method 3: Completing the Square (Optional)

Given the simplicity of the quadratic, factoring and quadratic formula are more straightforward. However, for completeness:

$X^2 + 2X - 24 = 0$

Add and subtract $(b/2)^2$:

$(b/2)^2 = (2/2)^2 = 1^2 = 1$

Rewrite:

$X^2 + 2X + 1 - 1 - 24 = 0$

Group:

$(X + 1)^2 - 25 = 0$

Set equal to zero:

$(X + 1)^2 = 25$

$X + 1 = \pm\sqrt{25} = \pm 5$

Solutions:

- $X = -1 + 5 = 4$

- X = -1 - 5 = -6

Solutions: X = 4, X = -6

Final Answer

The solutions to the equation X.1/3 X + 4 = -2/3 X + 12 are:

X = 4 and X = -6

Additional Tips for Solving Similar Equations

- Always clear fractions early: Multiplying through by the least common denominator simplifies calculations.
- Pay attention to signs: Negative coefficients can be tricky; double-check your work.
- Use factoring when possible: It’s faster and often more straightforward.
- Apply the quadratic formula for complex quadratics: Especially when factoring isn't obvious.
- Verify your solutions: Substitute back into the original equation to confirm correctness.

Practice Problems

To strengthen your skills, try solving these similar equations:

1. (2/5) X^2 - 3 = (1/5) X + 7
2. 3X^2 + 5X - 2 = 0
3. (1/2) X^2 - 4X + 1 = 0

Each problem will reinforce your understanding of solving quadratic equations with fractions.

Conclusion

Mastering how to solve for X in equations like X.1/3 X + 4 = -2/3 X + 12 is a crucial step in developing algebraic proficiency. By carefully simplifying fractions, employing factoring or the quadratic formula, and verifying solutions, you build confidence in tackling a wide range of algebraic challenges. Remember, patience and practice are key—so keep working through different problems and you'll become more comfortable with these fundamental techniques.

Solve For X 1 3 X 4 2 3 X 12

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