

6 - 3/8x = 15 what Is X

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Understanding algebraic equations is essential for solving real-world problems involving unknown variables. One such equation that often appears in algebra practice and applications is $6 - \frac{3}{8}x = 15$. This equation involves a combination of constants, fractions, and variables, challenging students and learners to apply their algebraic skills to find the value of x . In this comprehensive guide, we will explore how to solve the equation $6 - \frac{3}{8}x = 15$, step by step. We'll also discuss relevant concepts, methods, and tips to help you master similar equations.

Understanding the Equation: $6 - \frac{3}{8}x = 15$

Before diving into solving the equation, it's important to understand its components and what it represents.

Components of the Equation

- Constant term (6): A fixed number that does not change.
- Fractional coefficient ($-\frac{3}{8}$): Multiplies the variable x .
- Variable (x): The unknown we need to solve for.
- Constant on the right side (15): The value to which the expression on the left equals.

The Goal

Find the value of x that satisfies the equation:

$$6 - \frac{3}{8}x = 15$$

This involves isolating x on one side of the equation.

Step-by-Step Solution of $6 - \frac{3}{8}x = 15$

Solving the equation involves algebraic manipulation following a logical sequence.

Step 1: Subtract 6 from both sides

To isolate the term involving x , subtract 6 from both sides of the equation:

$$\begin{aligned} & 6 - \frac{3}{8}x - 6 = 15 - 6 \\ & -\frac{3}{8}x = 9 \end{aligned}$$

Note: Subtracting the same quantity from both sides maintains equality.

Step 2: Eliminate the fraction coefficient

To solve for x, we need to eliminate the fractional coefficient $-\left(\frac{3}{8}\right)$.

- Method: Multiply both sides of the equation by the reciprocal of $-\left(\frac{3}{8}\right)$, which is $-\left(\frac{8}{3}\right)$.

$$-\frac{8}{3} \times -\frac{3}{8}x = -\frac{8}{3} \times 9$$

- Left side: The multiplication simplifies to x because:

$$-\frac{8}{3} \times -\frac{3}{8} = 1$$

- Right side:

$$\begin{aligned} -\frac{8}{3} \times 9 &= -\frac{8}{3} \times \frac{9}{1} = -\frac{8 \times 9}{3 \times 1} \\ &= -\frac{72}{3} = -24 \end{aligned}$$

Thus, the equation becomes:

$$x = -24$$

Final Answer: $x = -24$

Understanding the Solution Process

Let's analyze the steps taken and why they work.

Key Concepts Used

- Addition and subtraction properties of equality: Used to isolate variables.
- Multiplication by reciprocals: To eliminate fractions and coefficients.
- Order of operations: Ensuring calculations are performed in the correct sequence.

Why Multiply by the Reciprocal?

When an equation has a coefficient in front of the variable, multiplying both sides by its reciprocal cancels out the coefficient, leaving the variable alone.

Example:

$$\begin{aligned} & a \cdot x = b \\ & \rightarrow x = \frac{b}{a} \end{aligned}$$

In our case, the coefficient is $\frac{3}{8}$, so its reciprocal is $\frac{8}{3}$.

Additional Tips for Solving Similar Equations

Mastering equations like $6 - \frac{3}{8}x = 15$ requires practice and understanding of algebraic principles. Here are some tips:

1. Always Perform Inverse Operations

- Addition $\leftrightarrow$ Subtraction
- Multiplication $\leftrightarrow$ Division

Use inverse operations to isolate the variable step by step.

2. Be Careful with Fractions

- When fractions are involved, consider multiplying both sides by the least common denominator (LCD) to clear fractions.
- Alternatively, multiply both sides by the reciprocal of the fractional coefficient.

3. Keep Track of Signs

- Watch for negative signs, especially when multiplying or dividing both sides.
- Remember that multiplying or dividing both sides by a negative number reverses the inequality signs if dealing with inequalities.

4. Check Your Solution

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

Verification:

$$\begin{aligned} & 6 - \frac{3}{8} \times (-24) = 6 + \frac{3}{8} \times 24 \\ & = 6 + \frac{3 \times 24}{8} = 6 + \frac{72}{8} = 6 + 9 = 15 \end{aligned}$$

Since the left side equals 15, our solution $x = -24$ is correct.

Real-World Applications of Solving Such Equations

Equations involving fractions and variables frequently appear in various fields:

- Finance: Calculating interest rates or payments.
- Physics: Solving for unknown quantities in formulas.
- Engineering: Designing systems with specific parameters.
- Statistics: Manipulating formulas involving ratios.

Understanding how to solve equations like $6 - \frac{3}{8}x = 15$ equips you with the skills to tackle these real-world problems efficiently.

Practice Problems for Mastery

To reinforce your understanding, try solving these similar equations:

1. $2 + \frac{5}{4}x = 10$
2. $7 - \frac{2}{3}x = 4$
3. $-3 + \frac{1}{2}x = 5$
4. $\frac{3}{5}x - 2 = 8$
5. $-4 + \frac{7}{8}x = -2$

Solution tips:

- Isolate the fractional term.
- Clear fractions by multiplying through by LCDs.
- Use inverse operations to solve for x .

Conclusion

The equation $6 - \frac{3}{8}x = 15$ exemplifies the importance of understanding algebraic principles such as isolating variables, handling fractions, and performing inverse operations. The solution $x = -24$ demonstrates how systematic steps lead to the correct answer. By practicing similar problems and applying the strategies discussed, you can strengthen your algebra skills, enabling you to solve more complex equations with confidence.

Remember, mastering algebra not only helps in academic pursuits but also enhances problem-solving skills applicable in everyday life and various professional fields. Keep practicing, stay patient, and you'll continue to improve your mathematical proficiency!

Frequently Asked Questions

How do I solve the equation $6 - \frac{3}{8}x = 15$ for x ?

First, subtract 6 from both sides to get $-\frac{3}{8}x = 9$. Then, multiply both sides by -1 to get $\frac{3}{8}x = -9$. Finally, multiply both sides by the reciprocal of $\frac{3}{8}$, which is $\frac{8}{3}$, to find x : $x = -9 \left(\frac{8}{3}\right) = -24$.

What is the value of x in the equation $6 - \frac{3}{8}x = 15$?

The value of x is -24. You find this by isolating x : subtract 6 from both sides, then multiply both sides by $\frac{8}{3}$.

Can I solve $6 - \frac{3}{8}x = 15$ without fractions?

Yes, you can clear fractions by multiplying the entire equation by 8 to eliminate the denominator: $8 \cdot 6 - 8 \cdot \frac{3}{8}x = 8 \cdot 15$, which simplifies to $48 - 3x = 120$. Then, solve for x accordingly.

What steps are involved in solving for x in $6 - \frac{3}{8}x = 15$?

Steps include: 1) Subtract 6 from both sides, 2) Multiply both sides by 8 to clear the fraction, 3) Simplify and solve for x , which results in $x = -24$.

Is the solution $x = -24$ correct for the equation $6 - \frac{3}{8}x = 15$?

Yes, substituting $x = -24$ back into the original equation confirms the solution: $6 - \frac{3}{8}(-24) = 6 + 9 = 15$, which is correct.

How do I check if my solution $x = -24$ is correct?

Plug $x = -24$ into the original equation: $6 - (3/8)(-24)$. Calculate $(3/8)(-24) = -9$, so the equation becomes $6 - (-9) = 15$, which simplifies to 15. Since both sides are equal, the solution is correct.

Additional Resources

6 - 3/8x = 15: What Is X?

Understanding and solving algebraic equations is a fundamental skill in mathematics that applies across numerous disciplines—from engineering and economics to everyday problem-solving. Among these equations, linear equations involving fractions often pose a challenge for students and learners due to the intricacies of manipulating fractional values. One such equation, $6 - 3/8x = 15$, exemplifies these challenges and offers an excellent opportunity to explore algebraic techniques in depth.

In this comprehensive article, we will analyze the equation $6 - 3/8x = 15$ step by step, breaking down the methods to isolate and solve for the variable x . We will examine the underlying principles, the significance of fractions in algebra, and the logical procedures involved. Whether you're a student seeking to deepen your understanding or an educator aiming to clarify key concepts, this detailed review aims to provide clarity and insight into solving such equations.

Understanding the Equation: Components and Context

Breaking Down the Equation

The equation $6 - 3/8x = 15$ consists of several components:

- Constants: The numbers 6 and 15 are constants, representing fixed values.
- Variable: The letter x is the unknown that we need to solve for.
- Coefficient: The term $-3/8x$ indicates that x is multiplied by the fractional coefficient $-3/8$.

Interpreting this, the equation states that when you subtract $(3/8)$ times x from 6, the result is 15. Our goal is to find the specific value of x that satisfies this relationship.

The Significance of Fractions in Algebra

Fractions are integral in algebra because they enable precise representation of ratios,

proportions, and parts of a whole. Solving equations with fractions requires careful manipulation to maintain equality. The key challenges include:

- Eliminating fractions to simplify calculations.
- Ensuring proper handling of negative signs.
- Maintaining the balance of the equation during operations.

In the equation $6 - \frac{3}{8}x = 15$, the fractional coefficient $-\frac{3}{8}$ adds complexity, but it can be managed effectively through strategic algebraic steps.

Step-by-Step Solution Process

Step 1: Isolate the Fractional Term

The first step is to isolate the term involving x . The current equation is:

$$6 - \left(\frac{3}{8}\right)x = 15$$

Subtract 6 from both sides to move the constant term:

$$6 - \left(\frac{3}{8}\right)x - 6 = 15 - 6$$

Which simplifies to:

$$-\left(\frac{3}{8}\right)x = 9$$

This step simplifies the equation and makes it clearer to focus on x .

Step 2: Eliminate the Fraction

To solve for x , we need to eliminate the fractional coefficient $-\frac{3}{8}$. Since the coefficient is a fraction, the natural approach is to multiply both sides of the equation by the reciprocal of $-\frac{3}{8}$, which is $-\frac{8}{3}$.

Multiplying both sides:

$$-\left(\frac{3}{8}\right)x \left(-\frac{8}{3}\right) = 9 \left(-\frac{8}{3}\right)$$

On the left side, the multiplication simplifies because:

$$\left(-\frac{3}{8}\right) \left(-\frac{8}{3}\right) = \left(\frac{3}{8}\right) \left(\frac{8}{3}\right) = \frac{(3 \ 8)}{(8 \ 3)} = \frac{24}{24} = 1$$

Thus, the left side simplifies to x :

x

On the right side:

$$9 - (-8/3) = 9 + 8/3 = (27 + 8) / 3 = 35 / 3 = 11\frac{2}{3}$$

Therefore, the solution for x is:

$$x = -24$$

Step 3: Verify the Solution

Verification ensures that the solution satisfies the original equation.

Substitute $x = -24$ back into the original equation:

$$6 - (3/8)(-24) = 15$$

Calculate the fractional term:

$$(3/8)(-24) = 3/8 \cdot -24$$

Simplify:

$$- 24 \div 8 = 3$$

$$- \text{ So, } 3/8 \cdot -24 = 3(-3) = -9$$

Now, substitute:

$$6 - (-9) = 6 + 9 = 15$$

Since the left side equals the right side, $x = -24$ is indeed the correct solution.

Deeper Analysis and Learning Points

Understanding the Role of Inverse Operations

The key concept in solving the equation was the use of inverse operations:

- Addition and subtraction are inverse operations.
- Multiplication and division are inverse operations.

By subtracting 6 initially, we isolated the fractional term. Subsequently, multiplying both sides by the reciprocal of $-3/8$ effectively "canceled out" the fraction, isolating x . Recognizing these inverse relationships is fundamental to algebra.

Handling Fractions Effectively

Handling fractions requires an understanding of:

- Reciprocal values: The reciprocal of a fraction a/b is b/a .
- Multiplying through: To clear fractions, multiply both sides of the equation by the least common denominator (LCD) or the reciprocal of the fractional coefficient.
- Sign management: Be attentive to negative signs, as they influence the direction of inequalities and the final sign of solutions.

In our case, multiplying by $-8/3$ was an efficient method to clear the fractional coefficient, transforming the problem into a straightforward algebraic calculation.

Common Mistakes and How to Avoid Them

When solving equations with fractions, common pitfalls include:

- Ignoring signs: Failing to account for negative signs can lead to incorrect solutions.
- Incorrect reciprocal multiplication: Always verify the reciprocal and ensure both sides are multiplied equally.
- Not verifying solutions: Always substitute your answer back into the original equation to confirm correctness.

Being meticulous in each step ensures accuracy and deepens understanding.

Broader Implications and Applications

Practical Applications of Solving Such Equations

Equations like $6 - 3/8x = 15$ are not merely academic exercises; they have real-world applications:

- Finance: Calculating interest rates or loan repayments involving ratios.
- Physics: Solving for variables in formulas involving fractional coefficients.
- Engineering: Determining component values in systems with proportional relationships.

Mastering fractional algebra enhances problem-solving skills across fields that depend on

precise quantitative analysis.

Educational Significance

Learning to solve equations with fractions builds foundational skills:

- Enhances understanding of algebraic manipulation.
- Develops logical reasoning and problem-solving capabilities.
- Prepares students for advanced topics like quadratic equations, systems of equations, and calculus.

Through practice, learners develop confidence in handling complex equations, fostering mathematical literacy.

Conclusion: Mastery of Fractional Equations

The equation $6 - \frac{3}{8}x = 15$ demonstrates the importance of systematic algebraic techniques and the careful handling of fractions. By isolating the variable, clearing fractions through multiplication by the reciprocal, and verifying solutions, students can confidently navigate similar problems.

The solution $x = -24$ not only satisfies the equation but also exemplifies the power of inverse operations and strategic manipulation in algebra. As learners deepen their understanding of these principles, they unlock the ability to solve an array of equations that underpin scientific, technological, and everyday applications.

In essence, mastering such equations fosters analytical thinking, precision, and confidence—skills that extend far beyond the classroom into real-world problem-solving scenarios. Whether tackling complex scientific formulas or managing personal finances, the ability to manipulate and solve equations with fractions remains an invaluable mathematical competency.

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