1/2(x+24)=21 (distributive Property) Thanks

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Understanding the equation 1/2(x+24)=21 and how it relates to the distributive property is essential for mastering algebra. This article provides a comprehensive guide to solving such equations, emphasizing the application of the distributive property, simplifying expressions, and ensuring clarity in your algebraic process. Whether you're a student seeking help or a teacher looking for resource material, this detailed explanation aims to enhance your grasp of algebraic techniques centered around the distributive property.

Understanding the Equation 1/2(x+24)=21

Before diving into solving the equation, it's important to understand its structure and what it represents. The equation involves a coefficient (1/2) multiplying a binomial expression (x + 24) and equaling 21.

Breaking Down the Components

- **Coefficient:** 1/2, which is a fractional multiplier.
- **Expression inside parentheses:** x+24, a binomial expression involving the variable x and a constant.
- **Equals 21:** the value that the entire expression equates to.

Significance of the Distributive Property

The distributive property allows us to multiply the coefficient across the terms inside the parentheses:

$$ a(b + c) = ab + ac $$

In this context:

$$ \frac{1}{2}(x + 24) = \frac{1}{2} \times x + \frac{1}{2} \times 24 $$

Applying the distributive property simplifies the expression and makes solving the equation more straightforward.

Applying the Distributive Property to the Equation

Let's examine the process step-by-step to understand how to utilize the distributive property effectively.

Step 1: Distribute 1/2 across the parentheses

Applying the distributive property:

$$ \frac{1}{2}(x + 24) = \frac{1}{2} \times x + \frac{1}{2} \times 24 $$

Calculations:

- $\frac{1}{2} \times x = \frac{x}{2}$
- $\frac{1}{2} \times 24 = 12$

So, the expression becomes:

$$ \frac{x}{2} + 12 $$

The original equation now is:

$$ \frac{x}{2} + 12 = 21 $$

Step 2: Isolate the variable term

Subtract 12 from both sides:

$$ \frac{x}{2} + 12 - 12 = 21 - 12 $$

Simplifies to:

$$ \frac{x}{2} = 9 $$

Step 3: Solve for x

To isolate x, multiply both sides by 2, the denominator:

$$ 2 \times \frac{x}{2} = 9 \times 2 $$

Simplifies to:

$$ x = 18 $$

Verifying the Solution

Verification ensures that the found solution is correct.

Substitute x=18 into the original equation:

Original equation:

$$ \frac{1}{2}(x + 24) = 21 $$

Substitute:

$$ \frac{1}{2}(18 + 24) = 21 $$

Calculate:

$$ \frac{1}{2} \times 42 = 21 $$

$$ 21 = 21 $$

Since both sides are equal, the solution $x = 18$ is verified.

Key Concepts in Solving Equations with the Distributive Property

Understanding the underlying concepts helps in solving similar algebraic equations efficiently.

1. Distributive Property

- Used to eliminate parentheses by distributing the multiplier across terms inside parentheses.
- Formula: $a(b + c) = ab + ac$

2. Simplification

- Combining like terms and reducing expressions to simplest form.
- Critical for isolating variables.

3. Inverse Operations

- Addition and subtraction are inverse operations, as are multiplication and division.
- Used to isolate variables after distributing and simplifying.

4. Checking Solutions

- Substituting the solution back into the original equation verifies correctness.

Common Mistakes to Avoid

When working with equations involving the distributive property, be mindful of these common errors:

1. **Forgetting to distribute to all terms:** Ensure the multiplier applies to every term inside parentheses.
2. **Incorrect arithmetic with fractions:** Pay attention to multiplying fractions and whole numbers accurately.
3. **Neglecting to simplify completely:** Always reduce expressions to simplest form before solving further.
4. **Skipping verification:** Always check your solution by substituting back into the original equation.

Extensions and Practice Problems

Practicing similar equations enhances understanding and proficiency.

Practice Problem 1:

Solve for x:

$$\frac{3}{4}(x - 8) = 6$$

Hint: Distribute $\frac{3}{4}$ across $(x - 8)$, then isolate x.

Practice Problem 2:

Solve:

$$ 2(x + 5) = 18 $$

Hint: Use the distributive property to expand, then solve.

Practice Problem 3:

Solve for x:

$$ \frac{1}{3}(2x + 3) = 4 $$

Hint: Distribute, then isolate x.

Summary

Mastering equations like 1/2(x+24)=21 involves understanding and applying the distributive property effectively. Key steps include distributing the coefficient across the parentheses, simplifying expressions, and using inverse operations to isolate the variable. Always verify your solutions to ensure accuracy. With consistent practice, you'll develop confidence in handling similar algebraic equations and deepen your understanding of fundamental mathematical properties.

Additional Resources

- Algebra textbooks and workbooks
- Online algebra tutorials and videos
- Practice worksheets with solutions
- Math tutoring and study groups

By mastering the distributive property and its applications, you'll strengthen your algebra skills and build a solid foundation for advanced mathematics. Keep practicing, stay organized, and don't hesitate to revisit fundamental concepts whenever needed. Happy solving!

Frequently Asked Questions

How do I solve the equation 1/2(x + 24) = 21 using the distributive property?

First, multiply both sides by 2 to eliminate the fraction: (x + 24) = 42. Then, subtract 24 from both sides to find x: x = 42 - 24, so x = 18.

Can I use the distributive property directly on 1/2(x + 24) = 21?

While you can distribute if you write 1/2 as a fraction, it's easier to multiply both sides by 2 first. Distributing 1/2 over (x + 24) isn't necessary here, but if you choose, multiply 1/2 by each term inside the parentheses.

What is the first step to solve 1/2(x + 24) = 21?

The first step is to eliminate the fraction by multiplying both sides of the equation by 2, resulting in (x + 24) = 42.

Why do we multiply both sides by 2 in this equation?

We multiply both sides by 2 to cancel out the denominator 1/2, making the equation easier to solve.

After clearing the fraction, how do I find x in the equation?

Subtract 24 from both sides of the equation (x + 24) = 42 to get x = 18.

Is distributing necessary in solving 1/2(x + 24) = 21?

No, distributing isn't necessary here because multiplying both sides by 2 simplifies the equation directly. Distribution is more useful when multiplying 1/2 across each term.

What if I choose to distribute 1/2 over (x + 24), how would I do it?

You would multiply 1/2 by each term inside the parentheses: (1/2)x + (1/2)24 = 21. Simplify to get (1/2)x + 12 = 21, then solve for x.

How do I solve (1/2)x + 12 = 21?

Subtract 12 from both sides: (1/2)x = 9. Then, multiply both sides by 2 to isolate x: x = 18.

What are common mistakes to avoid when solving this equation?

Common mistakes include not multiplying both sides by 2 to clear the fraction, forgetting to subtract 24 or 12 at the correct step, or distributing incorrectly. Always double-check each step for accuracy.

Can I use a calculator to solve this type of equation?

Yes, you can use a calculator to perform the multiplication, subtraction, and division steps to ensure accuracy, especially with more complex equations.

Additional Resources

1/2(x+24)=21 (Distributive Property): An In-Depth Exploration

Mathematics, often regarded as the universal language, relies heavily on fundamental properties and principles to solve equations and understand relationships. Among these, the distributive property holds a central place, serving as a cornerstone in algebraic manipulation and problem-solving. This article delves into the equation 1/2(x+24)=21, exploring its structure, the application of the distributive property, and the broader implications of this principle in mathematical reasoning.

Understanding the Equation: Context and Components

The equation 1/2(x+24)=21 appears straightforward but encapsulates several important concepts: fractions, variables, constants, and the distributive property. Analyzing each component provides clarity for the solution process and highlights the significance of the distributive property in algebra.

Breakdown of the Equation

- Fraction coefficient (1/2): Multiplies the entire expression within parentheses, indicating a scalar multiplication.
- Expression inside parentheses (x+24): Represents a binomial, combining a variable and a constant.
- Equal sign (=): Denotes equality between the expression and the constant 21.
- Constant (21): The value that the expression on the left equals, serving as the target outcome.

In essence, the equation models a scaled sum involving an unknown variable, which necessitates algebraic techniques to isolate and solve for x.

Applying the Distributive Property to the Equation

The distributive property states that for all real numbers a, b, and c:

$a(b + c) = ab + ac$

This property allows us to eliminate parentheses by distributing the scalar multiplication across each term inside.

Step-by-Step Application

1. Identify the distributive structure:

The expression 1/2(x + 24) can be viewed as (1/2) x + (1/2) 24.

2. Distribute the scalar:
Applying the distributive property:

$$
\frac{1}{2} \times x + \frac{1}{2} \times 24
$$

3. Simplify each term:
- $\frac{1}{2} \times x = \frac{x}{2}$
- $\frac{1}{2} \times 24 = 12$

4. Rewrite the original equation with the distributed form:

$$
\frac{x}{2} + 12 = 21
$$

This transformation simplifies the structure, making the variable x more accessible for solving.

The Significance of the Distributive Property in Algebra

The distributive property is fundamental in algebra, enabling the expansion and simplification of expressions. Its importance can be highlighted through various aspects:

1. Simplification of Expressions

It converts complex expressions with parentheses into more manageable algebraic forms, facilitating further operations like addition, subtraction, and solving equations.

2. Foundation for Factoring

Understanding distribution underpins the reverse process: factoring. Recognizing common factors and reversing distribution is vital in solving quadratic equations and polynomial expressions.

3. Extending to Polynomial Operations

The property extends naturally to polynomials, where distributing monomials across binomials is routine, such as in binomial expansion.

4. Critical in Solving Equations

Applying the distributive property allows for the isolation of variables, ultimately leading to solutions in linear and nonlinear equations.

Solving the Equation: Step-by-Step Process

With the distributed form established, the equation simplifies to:

$$
\frac{x}{2} + 12 = 21
$$

The goal is to solve for x.

Step 1: Isolate the variable term

Subtract 12 from both sides:

$$
\frac{x}{2} = 21 - 12
$$
$$
\frac{x}{2} = 9
$$

Step 2: Eliminate the fraction

Multiply both sides by 2 to clear the denominator:

$$
x = 9 \times 2
$$
$$
x = 18
$$

Step 3: Verify the solution

Substitute x = 18 back into the original equation:

$$
\frac{1}{2}(18 + 24) = 21
$$
$$
\frac{1}{2} \times 42 = 21
$$

\]
\[
21 = 21
\]

Verification confirms that x = 18 is the correct solution.

Broader Implications and Educational Significance

While the solution process appears straightforward, understanding the role of the distributive property is crucial for higher-level mathematics and critical thinking.

1. Building Algebraic Fluency

Mastering distribution fosters fluency in algebra, enabling students and practitioners to manipulate increasingly complex expressions efficiently.

2. Developing Problem-Solving Strategies

Recognizing when and how to apply the distributive property enhances strategic thinking, promoting a systematic approach to unfamiliar problems.

3. Foundation for Advanced Topics

The concept serves as a foundation for calculus, linear algebra, and abstract algebra, where distribution and expansion are routine.

4. Real-World Application

Many practical problems, such as financial modeling, physics calculations, and engineering designs, rely on algebraic manipulation enabled by the distributive property.

Common Misconceptions and Pitfalls

Despite its simplicity, students often encounter misconceptions regarding the distributive property:

- Misinterpreting distribution over subtraction:
The property applies to both addition and subtraction inside parentheses, but students may forget to adjust signs accordingly.

- Misapplication to non-distributive contexts:
Confusing distribution with other operations, such as combining like terms prematurely.

- Overlooking the importance of parentheses:
Ensuring parentheses are correctly identified is crucial, especially in complex expressions.

Understanding these pitfalls emphasizes the need for careful analysis and reinforces the importance of foundational properties.

Conclusion: The Power of the Distributive Property in Mathematical Problem Solving

The equation 1/2(x+24)=21 exemplifies the practical application of the distributive property in simplifying and solving algebraic equations. Its use transforms a potentially intimidating expression into a straightforward linear equation, illustrating the elegance and utility of fundamental mathematical principles.

Beyond this specific problem, the distributive property remains a vital tool across all levels of mathematics, fostering critical thinking and problem-solving skills. Recognizing its role not only facilitates the mastery of algebra but also lays the groundwork for exploring more advanced mathematical concepts and real-world applications.

In mastering the distributive property, students and practitioners unlock a powerful method for navigating the complexities of algebra, reinforcing the idea that foundational principles are the keys to mathematical literacy and success.

1 2 X 24 21 Distributive Property Thanks

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