

What Property Is Used To Do $-2y + 15 = -23$

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Understanding the properties used in solving algebraic equations is essential for mastering algebra. When faced with an equation like $-2y + 15 = -23$, identifying the properties involved helps clarify the steps taken to isolate the variable and find its value. In this article, we will explore the property used to manipulate the equation, explain each step in detail, and provide insights into common algebraic properties that facilitate solving such equations.

Introduction to Algebraic Properties

Before diving into the specific property used in solving $-2y + 15 = -23$, it's important to understand the foundational algebraic properties that underpin equation solving:

- Addition Property of Equality
- Subtraction Property of Equality
- Multiplication Property of Equality
- Division Property of Equality
- Distributive Property
- Associative and Commutative Properties

These properties allow us to manipulate equations while maintaining their equality, enabling the systematic isolation of variables.

Step-by-Step Solution of $-2y + 15 = -23$

Let's analyze the steps involved and identify the properties applied at each stage.

Step 1: Isolate the term with the variable

Original equation:

$$-2y + 15 = -23$$

To begin, we want to eliminate the constant term (15) from the left side to focus on the term containing y.

Property Used: Subtraction Property of Equality

Applying the subtraction property states that subtracting the same number from both sides preserves equality.

- Subtract 15 from both sides:

$$(-2y + 15) - 15 = -23 - 15$$

Simplifies to:

$$-2y = -38$$

Explanation:

- We subtracted 15 from both sides to maintain the balance of the equation.

Step 2: Solve for the variable y

Now, the equation is:

$$-2y = -38$$

To isolate y, we need to divide both sides by -2.

Property Used: Division Property of Equality

Dividing both sides by the same non-zero number preserves the equality.

- Divide both sides by -2:

$$(-2y) / -2 = (-38) / -2$$

Simplifies to:

$$y = 19$$

Summary of Properties Used

The key properties involved in solving the equation are:

1. Subtraction Property of Equality

- Ensures the equation remains balanced when subtracting the same value from both sides.

2. Division Property of Equality

- Ensures the equation remains balanced when dividing both sides by the same non-zero value.

These properties are fundamental tools in algebra for solving linear equations systematically.

Understanding the Subtraction Property of Equality

Definition

The subtraction property of equality states:

> If $a = b$, then $a - c = b - c$

This means that subtracting the same number from both sides of an equation does not change the equality.

Application in Our Equation

In our case:

- Starting equation: $-2y + 15 = -23$

- Subtracting 15 from both sides:

$$-2y + 15 - 15 = -23 - 15$$

which simplifies to:

$$-2y = -38$$

This step effectively isolates the term with the variable.

Why It Matters

Using the subtraction property simplifies equations, making it easier to solve for the variable. It is often the first step in linear algebraic equations.

Understanding the Division Property of Equality

Definition

The division property states:

> If $a = b$ and $c \neq 0$, then $a / c = b / c$

This property allows us to divide both sides of an equation by the same non-zero number without altering the equality.

Application in Our Equation

From:

$$-2y = -38$$

Dividing both sides by -2:

$$(-2y) / -2 = -38 / -2$$

which simplifies to:

$$y = 19$$

Importance in Solving Equations

Dividing both sides by the coefficient of the variable is a crucial step in isolating the variable, especially when it has a coefficient other than 1.

Additional Algebraic Properties Relevant to Solving Equations

While the subtraction and division properties are directly used in this example, other algebraic properties provide foundational support:

- Distributive Property: Used when equations involve parentheses.
- Associative Property: Guides grouping of terms.
- Commutative Property: Allows switching the order of addition or multiplication.

Understanding these properties helps in handling more complex equations involving multiple steps.

Common Mistakes to Avoid

When solving equations like $-2y + 15 = -23$, certain mistakes can occur if properties are misapplied:

- Dividing by zero: Never divide both sides by zero.
- Incorrectly applying the properties: For example, adding instead of subtracting.
- Ignoring the sign of the coefficients or constants.

Being attentive to the properties ensures the solution process remains accurate.

Summary of the Problem-Solving Process

To summarize, solving the equation $-2y + 15 = -23$ involves:

1. Applying the Subtraction Property of Equality to eliminate the constant term and isolate the term containing y .
2. Applying the Division Property of Equality to divide both sides by the coefficient of y .
3. Simplifying to find the value of y .

This systematic approach demonstrates how fundamental algebraic properties facilitate solving linear equations efficiently.

Conclusion

The property used to solve the equation $-2y + 15 = -23$ is primarily the Subtraction Property of Equality, which allows subtracting the same number from both sides to isolate the term containing the variable. Subsequently, the Division Property of Equality enables dividing both sides by the coefficient of y to find its value.

Mastering these properties not only helps in solving straightforward equations but also builds a strong foundation for tackling more complex algebraic problems. Recognizing and applying these properties correctly ensures accuracy and confidence in algebraic manipulations.

By understanding these properties and their applications, students and learners can approach algebraic equations systematically, leading to successful problem-solving and a deeper comprehension of mathematical principles.

Frequently Asked Questions

What property allows us to add or subtract the same number from both sides of the equation without changing its value?

The Addition Property of Equality allows us to add or subtract the same number from both sides of the equation.

Which property is used when we add 23 to both sides of the equation to isolate the variable term?

The Addition Property of Equality.

What property justifies subtracting 15 from both sides to simplify the equation?

The Subtraction Property of Equality.

When solving the equation $-2y + 15 = -23$, which property is applied when dividing both sides by -2?

The Division Property of Equality.

Why is it valid to perform the same operation on both sides of an equation?

Because of the Property of Equality, which states that performing the same operation on both sides preserves the equality.

What is the overall property used throughout the solving process of the equation $-2y + 15 = -23$?

The Property of Equality, as it justifies performing the same operations on both sides to solve for the variable.

Additional Resources

Property Used To Do $-2y + 15 = -23$ is a question that draws attention to the fundamental principles underlying algebraic manipulation, particularly the properties of equality and operations. To understand the property used in solving an equation like this, it is essential to delve into the core algebraic properties that govern how equations are manipulated, simplified, and solved. This article explores these properties in detail, providing a comprehensive understanding of their roles, applications, and significance in algebraic problem-solving.

Understanding the Context: What Is the Equation Telling Us?

Before delving into properties, it's crucial to interpret the equation correctly. The given equation appears to be:

$$\text{Do} - 2y + 15 = -23$$

Assuming "Do" here might be a typographical or formatting issue, and perhaps it was meant to be:

$$-2y + 15 = -23$$

or perhaps:

$$d - 2y + 15 = -23$$

For the purpose of this discussion, we'll interpret the equation as:

$$-2y + 15 = -23$$

This is a standard linear algebraic equation involving a single variable, y . The goal is to isolate y to find its value, which involves applying various algebraic properties systematically.

Core Properties in Algebra: An Overview

In algebra, solving equations relies on a set of foundational properties that allow us to manipulate expressions without changing their solutions. These properties include:

- Reflexive Property
- Symmetric Property
- Transitive Property
- Substitution Property
- Addition Property of Equality
- Subtraction Property of Equality
- Multiplication Property of Equality
- Division Property of Equality
- Distributive Property

Each property plays a specific role in maintaining the equality during manipulations, ensuring the

integrity of the solution process.

Key Property Used in Solving $-2y + 15 = -23$

The most fundamental property used in this context is the Addition and Subtraction Properties of Equality.

Addition and Subtraction Properties of Equality

These properties state that:

- You can add or subtract the same number from both sides of an equation without changing the equality.
- Addition Property of Equality: If $a = b$, then $a + c = b + c$.
- Subtraction Property of Equality: If $a = b$, then $a - c = b - c$.

In solving the equation:

$$\begin{aligned} & \{ \\ & -2y + 15 = -23 \\ & \} \end{aligned}$$

the initial step involves subtracting 15 from both sides to isolate the term with the variable:

$$\begin{aligned} & \{ \\ & -2y + 15 - 15 = -23 - 15 \\ & \} \end{aligned}$$

which simplifies to:

$$\begin{aligned} & \{ \\ & -2y = -38 \\ & \} \end{aligned}$$

This step relies explicitly on the Subtraction Property of Equality.

Application of the Properties in Solving the Equation

Let's walk through the solution process step by step, highlighting the properties employed at each stage.

Step 1: Isolate the Variable Term

- Goal: Get the term with y alone on one side.
- Action: Subtract 15 from both sides.

Property Used: Subtraction Property of Equality

$$\begin{aligned} & \backslash [\\ & -2y + 15 - 15 = -23 - 15 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash [\\ & -2y = -38 \\ & \backslash] \end{aligned}$$

Step 2: Solve for y

- Goal: Get y alone.
- Action: Divide both sides by -2 to solve for y.

Property Used: Division Property of Equality

$$\begin{aligned} & \backslash [\\ & \frac{-2y}{-2} = \frac{-38}{-2} \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash [\\ & y = 19 \\ & \backslash] \end{aligned}$$

Step 3: Verify the Solution

- Substitute $y = 19$ back into the original equation to verify.

$$\begin{aligned} & \backslash [\\ & -2(19) + 15 = -23 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} &\backslash[\\ &-38 + 15 = -23 \\ &\backslash] \end{aligned}$$

$$\begin{aligned} &\backslash[\\ &-23 = -23 \\ &\backslash] \end{aligned}$$

The equality holds, confirming the solution's correctness.

Deeper Dive into the Properties and Their Significance

Understanding the properties used is more than knowing the rules; it is about appreciating their significance in algebra.

The Subtraction and Addition Properties

These properties are fundamental because they allow us to "undo" operations. For example, if a term is added to the variable, subtracting the same term maintains the balance. This is akin to maintaining equality in a balanced scale: if you add to one side, you must add to the other, and similarly for subtraction.

Significance:

- They enable the step-by-step reduction of complex equations.
- They ensure that each step is valid and preserves the solution set.
- They provide a logical framework for solving equations systematically.

The Division Property

Dividing both sides of an equation by a non-zero number isolates the variable. This property hinges on the fact that division is the inverse operation of multiplication.

Significance:

- It allows for scaling equations to solve for the variable directly.
- It emphasizes the importance of non-zero divisors; dividing by zero is undefined, a critical consideration in algebra.

The Distributive Property (If applicable)

Though not directly used in this specific problem, the distributive property often plays a role in more complex equations, allowing the expansion or factoring of expressions.

Broader Implications of These Properties in Algebra

These properties form the backbone of algebraic reasoning and problem-solving. Their applications extend beyond simple equations to advanced topics such as:

- Polynomial operations
- Factoring and expanding expressions
- Solving systems of equations
- Algebraic proofs

They also underpin the logic of mathematical reasoning, ensuring consistency and validity during manipulations.

Common Mistakes and Misconceptions

While these properties are straightforward, learners often encounter pitfalls:

- Dividing by Zero: Attempting to divide both sides of an equation by zero, which is undefined.
- Incorrect Application of Properties: For example, adding to only one side or forgetting to do the same operation on both sides.
- Sign Errors: Mismanaging negative signs during operations, leading to incorrect solutions.

Understanding the properties deeply helps prevent these errors and promotes rigorous mathematical reasoning.

Conclusion: The Fundamental Role of Properties in Algebra

In solving the equation $-2y + 15 = -23$, the key property used is the Subtraction Property of Equality,

alongside the Division Property of Equality to isolate the variable. These properties are essential tools that uphold the logical structure of algebra, allowing mathematicians and students alike to manipulate and solve equations confidently and correctly.

The broader significance of understanding these properties lies in their universal applicability across all areas of mathematics. They serve as the foundational rules that ensure calculations are valid, solutions are accurate, and mathematical reasoning remains consistent. Mastery of these properties not only facilitates solving specific equations but also builds a strong conceptual framework for exploring more complex mathematical concepts in algebra and beyond.

By appreciating the properties used — their rationale, application, and importance — learners develop a deeper understanding of algebra, transforming rote procedures into logical problem-solving strategies. This foundational knowledge is vital for advancing in mathematics, science, engineering, and any discipline that relies on analytical thinking and quantitative reasoning.

References:

- Algebra textbooks and educational resources
- Common core standards for mathematical practices
- Mathematical reasoning and proof principles

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