

Drag A Statement Or Reason To Each Box To Complete This Proof.If $3(x+8)=21$, Then $x=1$.Drag A Statement

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Understanding how to methodically solve algebraic equations is a fundamental skill in mathematics. When presented with a problem like $3(x+8)=21$, students often need to follow a structured process to arrive at the correct solution, which in this case is $x=1$. To facilitate learning and ensure clarity, it is helpful to visualize each step of the solution process by dragging the appropriate statement or reason into each box. This interactive approach not only reinforces logical reasoning but also deepens comprehension of algebraic principles.

In this article, we will explore how to complete the proof of the statement "If $3(x+8)=21$, then $x=1$ " by systematically dragging and matching each reasoning step and corresponding statement. We will break down the process into clear, manageable parts, utilizing organizational tools like headings, lists, and detailed explanations to guide learners through the problem-solving journey.

Understanding the Problem

Before solving the equation, it is essential to understand what the problem asks:

- The given equation is $3(x+8)=21$.
- The goal is to prove that $x=1$ is the solution.
- The process involves applying algebraic properties such as the distributive property, division, and inverse operations.

The proof involves a series of logical steps, each justified by a mathematical reason, which can be organized into a flowchart or step-by-step proof.

Step-by-Step Breakdown of the Solution Process

The solution process can be divided into several key steps:

1. Isolate the term with the variable.
2. Simplify the equation.
3. Solve for x .
4. Verify the solution.

Dragging the correct statement or reason into each box ensures the logical flow is maintained and the proof is comprehensive.

Step 1: Write the Original Equation

Statement:

The original equation is $3(x+8)=21$.

Reason:

This is the given problem statement.

Drag into box:

Given the equation: $3(x+8)=21$.

Step 2: Divide Both Sides by 3

Statement:

Divide both sides of the equation by 3 to isolate the expression $x + 8$.

Reason:

Use the division property of equality: dividing both sides by the same non-zero number maintains the equality.

Drag into box:

Divide both sides by 3.

Step 3: Simplify the Left Side

Statement:

Simplify $3 \div 3 = 1$, so the left side becomes $x + 8$.

Reason:

Division property of equality: dividing the coefficient and the expression.

Drag into box:

Simplify $3 \div 3$ to 1.

Step 4: Write the New Equation

Statement:

The simplified equation is $x + 8 = 7$.

Reason:

Performing the division results in $x + 8 = 21 \div 3 = 7$.

Drag into box:

Simplify the right side: $21 \div 3 = 7$.

Step 5: Subtract 8 from Both Sides

Statement:

Subtract 8 from both sides to isolate x .

Reason:

Use the subtraction property of equality: subtracting the same value from both sides maintains equality.

Drag into box:

Subtract 8 from both sides.

Step 6: Simplify the Result

Statement:

Simplify $7 - 8 = -1$.

Reason:

Perform the subtraction: $7 - 8 = -1$.

Drag into box:
Calculate $7 - 8$ to get -1 .

Step 7: Write the Final Solution

Statement:
The value of x is -1 .

Reason:
The simplified equation is $x = -1$.

Drag into box:
Conclude that $x = -1$.

Step 8: Verify the Solution (Optional but Recommended)

Statement:
Substitute $x = -1$ back into the original equation to verify.

Reason:
Substitution confirms the correctness of the solution.

Drag into box:
Substitute $x = -1$ into $3(x+8)$.

Important Clarifications and Notes

- Key properties used:
- Division property of equality: When dividing both sides of an equation by the same non-zero number.
- Subtraction property of equality: When subtracting the same number from both sides.
- Order of steps: The logical flow is crucial; each step builds on the previous.
- Common misconceptions:
- Forgetting to divide both sides.
- Miscalculating the division or subtraction.
- Confusing the solution with the original equation.

Final Proof Summary

By following the steps and dragging the corresponding statements or reasons into each box, you can systematically arrive at the solution $x = -1$ for the equation $3(x+8)=21$. This process demonstrates the importance of applying algebraic principles in a logical sequence, verifying each step to ensure accuracy.

Additional Tips for Mastery

- Practice solving similar equations to reinforce the process.
- Always double-check calculations to avoid simple errors.
- Use visual aids like flowcharts or proof trees to map reasoning steps.
- Remember that each step must have a justified reason; this builds strong mathematical reasoning skills.

Conclusion

Organizing the proof by dragging statements or reasons into each box is a powerful strategy to understand algebraic problem solving. It transforms abstract steps into a concrete, visual process that enhances comprehension and retention. Whether for homework, exams, or self-study, mastering this approach will improve your algebra skills and prepare you for more complex mathematical challenges.

Keywords for SEO optimization: algebra, solve equations, algebraic reasoning, proof steps, drag and drop math, solving for x, algebraic properties, step-by-step solution, verify solutions, mathematical reasoning

Frequently Asked Questions

What is the first step to solve the equation $3(x +$

$8) = 21?$

Divide both sides of the equation by 3 to isolate the expression $x + 8$.

After dividing both sides by 3, what is the simplified form of the equation?

$x + 8 = 7$

What is the next step to isolate x in the equation $x + 8 = 7$?

Subtract 8 from both sides of the equation.

What is the result after subtracting 8 from both sides?

$x = 7 - 8$

What is the value of x after performing the subtraction?

$x = -1$

Does the value $x = -1$ satisfy the original equation $3(x + 8) = 21$?

Yes, substituting $x = -1$ gives $3(-1 + 8) = 3(7) = 21$, which is true.

Is the statement 'Then $x = 1$ ' correct based on the solution?

No, the correct value of x is -1 , not 1 .

What statement should be dragged to complete the proof correctly?

$x = -1$

Additional Resources

Drag A Statement Or Reason To Each Box To Complete This Proof. If $3(x+8)=21$, Then $x=1$. Drag A Statement

Introduction: The Power of Logical Reasoning in Algebra

Mathematics is often perceived as a collection of numbers and symbols, but at its core, it is a language of logic and reasoning. When solving algebraic equations, understanding the step-by-step process is crucial—not just to arrive at the correct answer, but to grasp the underlying principles that lead us there. This process is akin to constructing a logical chain, where each statement or reason supports the next, culminating in a complete and convincing proof.

In this article, we will dissect a simple yet instructive algebraic proof: demonstrating that if $3(x + 8) = 21$, then $x = 1$. The task involves dragging appropriate statements or reasons into each step of the proof to validate each progression. By doing so, we will explore the reasoning behind each move, illustrating how algebraic principles are applied systematically. This exercise not only clarifies the specific solution but also highlights key strategies in algebraic reasoning that are widely applicable.

Understanding the Equation: Setting the Stage for the Proof

Before diving into the proof, it's essential to understand the given equation:

$$\begin{aligned} &[\\ &3(x + 8) = 21 \\ &] \end{aligned}$$

This equation involves a linear expression inside parentheses multiplied by a coefficient. Our goal is to isolate x and determine its value. The process involves performing inverse operations—undoing addition and multiplication—to solve for x .

The core steps include:

1. Applying the distributive property or recognizing the expression as a single term.
2. Isolating the term containing x .
3. Dividing both sides by the coefficient to solve for x .

Each of these steps corresponds to a logical statement or reason that supports the progression towards the conclusion $x = 1$.

Step-by-Step Breakdown of the Proof

Step 1: Recognize the Equation and Its Structure

Statement: $3(x + 8) = 21$

Reason: Given the problem statement or the original equation.

Explanation: This initial statement establishes the starting point of the proof. It asserts the algebraic relationship we are analyzing.

Step 2: Apply the Distributive Property (or Recognize the Expression as a Single Term)

Statement: $3x + 24 = 21$

Reason: Apply the distributive property: $a(b + c) = ab + ac$.

Deep Explanation: The distributive property allows us to eliminate the parentheses by multiplying each term inside by 3:

```
\[
3 \times x = 3x
\]
\[
3 \times 8 = 24
\]
```

This step simplifies the equation, making it easier to isolate x . Recognizing when to distribute or when an expression is already simplified is vital in algebra.

Step 3: Subtract 24 from Both Sides

Statement: $3x = -3$

Reason: Subtract 24 from both sides of the equation to isolate the term with x .

Deep Explanation: To maintain equality, any operation performed on one side must be performed on the other. Since the goal is to have $3x$ alone, subtracting 24 cancels out the 24 on the left:

```
\[
24 - 24 = 0
\]
\[
21 - 24 = -3
\]
```

This step leverages the property of equality, ensuring the balance of the

equation.

Step 4: Divide Both Sides by 3

Statement: $(x = -1)$

Reason: Divide both sides of the equation by 3 to solve for (x) .

Deep Explanation: Since $(3x)$ means 3 times (x) , dividing both sides by 3 isolates (x) :

$$\begin{aligned} & \left[\frac{3x}{3} = x \right. \\ & \left. \frac{-3}{3} = -1 \right] \end{aligned}$$

This step uses the division property of equality. The key is understanding that dividing both sides by the same non-zero number preserves equality.

Step 5: Conclude the Solution

Statement: $(x = -1)$

Reason: The simplified value derived from the previous step.

Deep Explanation: The algebraic manipulation leads to the conclusion that (x) equals (-1) . This completes the proof by providing the explicit value of (x) satisfying the original equation.

Clarifying the Discrepancy: The Original Claim vs. the Calculation

In the initial prompt, the statement claims: "If $3(x+8)=21$, then $X=1$." Our calculation shows that $(x = -1)$, not 1. This discrepancy suggests that the original assertion was either a typographical error or an intentional trick.

Implication: When solving algebraic equations, verifying the solution is crucial. Substituting $(x = 1)$ back into the original equation:

$$\begin{aligned} & \left[3(1 + 8) = 3 \times 9 = 27 \neq 21 \right. \\ & \left. \right] \end{aligned}$$

Thus, $x=1$ does not satisfy the original equation. Conversely, substituting $x = -1$:

$$3(-1 + 8) = 3 \times 7 = 21$$

which confirms that $x = -1$ is the correct solution.

Lesson: Always verify your solutions by substitution, and ensure the steps in your proof align with the actual algebraic calculations.

The Importance of Dragging the Correct Statements

In educational tools or interactive exercises, students are often asked to drag statements or reasons into each step of a proof. This approach emphasizes understanding the logical flow rather than rote memorization.

Key points when dragging statements:

- Identify the goal of each step: Are you simplifying, isolating a variable, or verifying a solution?
- Use properties of equality: Addition, subtraction, multiplication, division.
- Apply algebraic properties appropriately: Distributive property, combining like terms, inverse operations.
- Verify solutions: Substitute back into original equations to confirm correctness.

Broader Applications: Building a Foundation in Algebra

Mastering these logical steps is foundational for more advanced topics in mathematics, such as solving inequalities, systems of equations, or exploring functions. The practice of dragging and matching statements fosters critical thinking, reinforcing the understanding of why each step is necessary.

Practical tips for students:

- Always write down each step clearly.
- Know the properties of equality and their conditions.
- Check solutions by substitution.
- Be cautious of assumptions—ensure your reasoning aligns with algebraic principles.

Final Thoughts: The Elegance of Logical Proofs in Algebra

While the initial problem was straightforward, the process reveals the elegance and discipline involved in algebraic reasoning. Dragging statements or reasons into each step isn't just about completing an exercise; it's about internalizing the logical sequence that underpins all algebraic problem-solving. Recognizing each property, understanding its application, and verifying solutions cultivate a mathematical mindset that transcends individual problems.

In conclusion, whether you're solving simple equations or tackling complex systems, the principles remain consistent: apply properties correctly, maintain logical flow, verify your solutions, and always seek understanding. Through practice and attentive reasoning, algebra becomes not just a set of rules but a powerful language for unlocking the patterns and structures of the mathematical universe.

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