

$4(v + 8) = 40$ Which Solutions Makes This Equation True? 1. 22. 4

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Understanding algebraic equations is fundamental in honing problem-solving skills and developing mathematical reasoning. One common type of algebraic problem involves solving for a variable within an equation, such as the one presented here: $4(v + 8) = 40$. This equation requires us to determine which values of v make the equation true, specifically examining the options 1, 22, and 4.

In this comprehensive guide, we will explore step-by-step methods to solve the equation, analyze each potential solution, and understand the principles behind solving linear equations. Whether you're a student learning algebra for the first time or someone brushing up on your skills, this article will provide clarity and insight into solving equations efficiently.

Understanding the Equation $4(v + 8) = 40$

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

Breaking Down the Equation

The equation $4(v + 8) = 40$ consists of:

- A coefficient (4) multiplying the entire expression inside the parentheses ($v + 8$).
- The parentheses indicating that $v + 8$ should be evaluated first.
- The right side of the equation, which is 40.

This is a linear equation in one variable, v , and solving it involves isolating v to find its value.

Step-by-Step Solution Process

Let's go through the process of solving the equation step-by-step.

Step 1: Distribute the Coefficient

The first step is to eliminate the parentheses by distributing 4 to both v and 8:

$$4 \times v + 4 \times 8 = 40$$

Simplify:

$$4v + 32 = 40$$

Step 2: Isolate the Variable Term

Subtract 32 from both sides to move constants to the right:

$$4v + 32 - 32 = 40 - 32$$

Simplify:

$$4v = 8$$

Step 3: Solve for v

Divide both sides by 4 to isolate v :

$$4v \div 4 = 8 \div 4$$

Simplify:

$$v = 2$$

The solution to the equation is $v = 2$.

Analyzing the Given Options

The question then asks: Which solutions make this equation true? and provides options: 1, 22, and 4.

Let's evaluate each option by substituting these values into the original equation and checking if the equality holds.

Option 1: $v = 1$

Substitute $v = 1$ into the original equation:

$$4(1 + 8) = 40$$

Calculate inside parentheses:

$$4(9) = 40$$

Multiply:

$$36 = 40$$

Since $36 \neq 40$, $v = 1$ is not a solution.

Option 2: $v = 22$

Substitute $v = 22$:

$$4(22 + 8) = 40$$

Calculate inside parentheses:

$$4(30) = 40$$

Multiply:

$$120 = 40$$

Since $120 \neq 40$, $v = 22$ is not a solution.

Option 3: $v = 4$

Substitute $v = 4$:

$$4(4 + 8) = 40$$

Calculate inside parentheses:

$$4(12) = 40$$

Multiply:

$$48 = 40$$

Since $48 \neq 40$, $v = 4$ is not a solution.

Conclusion: Which Solution Makes the Equation True?

Based on the calculations above, the only value of v that satisfies the equation $4(v + 8) = 40$ is $v = 2$.

However, note that the options provided (1, 22, 4) are all incorrect solutions to the original equation, which indicates either a misprint or that the question is testing the understanding of solving equations versus selecting from options.

Key takeaway: The solution $v = 2$ is the only value that makes the original equation true, even though it is not listed among the options.

Extended Explanation: Why Do Only $v = 2$ Work?

Understanding why $v = 2$ is the only solution is crucial for grasping basic algebra. When solving linear equations like this, the goal is to isolate the variable and find the exact value that satisfies the equation.

Why does $v = 2$ satisfy the equation?

Plugging $v = 2$ into the original:

$$4(2 + 8) = 40$$

Compute:

$$4(10) = 40$$

Result:

$$40 = 40$$

This confirms that $v = 2$ makes the equation true.

Why do the other options fail?

- $v = 1$ results in $36 \neq 40$.
- $v = 22$ results in $120 \neq 40$.

- $v = 4$ results in $48 \neq 40$.

This demonstrates the importance of algebraic manipulation to find the true solution rather than relying solely on guesswork or options.

Understanding the Importance of Solving Equations in Real Life

Mastering how to solve equations like $4(v + 8) = 40$ is not just an academic exercise; it has practical applications across various fields:

- Finance: Calculating interest rates, loan payments, and investments.
- Engineering: Designing systems where variables need to be solved for safety and efficiency.
- Science: Analyzing relationships between variables in experiments.
- Computer Science: Algorithms often require solving equations to optimize performance.

By understanding the process of solving for variables, individuals can develop critical thinking skills that are applicable beyond mathematics.

Common Mistakes and How to Avoid Them

When solving equations, students often make errors that can lead to incorrect solutions. Here are some common mistakes and tips to avoid them:

1. Forgetting to distribute properly

- Always distribute coefficients across parentheses before combining like terms.

2. Failing to perform the same operation on both sides

- Maintain equation balance by applying the same operation to both sides.

3. Ignoring the order of operations

- Follow PEMDAS (Parentheses, Exponents, Multiplication/Division, Addition/Subtraction) carefully.

4. Misinterpreting options

- When options are provided, verify solutions by substitution rather than guesswork.

5. Not checking solutions

- Always substitute your solutions back into the original equation to verify correctness.

Additional Practice Problems for Mastery

To reinforce your understanding, try solving similar equations:

1. Solve for x : $3(x - 5) = 16$
2. Find v : $5(v + 2) = 35$
3. Determine y : $2(3y + 4) = 26$
4. Solve for z : $7(z - 3) = 28$

Answers:

1. $x = 7$
2. $v = 5$
3. $y = 3$
4. $z = 7$

Practicing these types of problems will help solidify your algebra skills.

Summary: Key Takeaways

- The equation $4(v + 8) = 40$ simplifies to $v = 2$.
- Among the options 1, 22, and 4, none satisfy the equation.
- Solving linear equations involves distribution, combining like terms, and isolating the variable.
- Always verify solutions by substitution.
- Understanding algebraic principles enhances problem-solving skills applicable in many real-world scenarios.

Final Thoughts

Mastering the process of solving equations like $4(v + 8) = 40$ is essential for building a strong foundation in mathematics. While the provided options may not include the correct solution, the process outlined here illustrates the importance of proper algebraic techniques. Remember, the key to success in algebra is practice, attention to detail, and verifying your answers.

By consistently applying these principles, you'll develop confidence in tackling more complex equations and mathematical challenges, laying the groundwork for success in academics, careers, and everyday problem-solving.

Frequently Asked Questions

What is the solution to the equation $4(v + 8) = 40$?

The solution is $v = 2$.

How do you solve the equation $4(v + 8) = 40$ step-by-step?

First, divide both sides by 4 to get $v + 8 = 10$. Then, subtract 8 from both sides to find $v = 2$.

Which options make the equation $4(v + 8) = 40$ true: 1, 2, or 4?

Option 2 makes the equation true, since $v = 2$ satisfies the equation.

Why is $v = 2$ the correct solution for $4(v + 8) = 40$?

Because substituting $v = 2$ into the equation results in $4(2 + 8) = 4(10) = 40$, which is true.

Can $v = 4$ be a solution to $4(v + 8) = 40$?

No, because substituting $v = 4$ gives $4(4 + 8) = 4(12) = 48$, which does not equal 40.

Is the solution $v = 22$ relevant to the equation $4(v + 8) = 40$?

No, because plugging in $v = 22$ results in $4(22 + 8) = 4(30) = 120$, which does not satisfy the equation.

What is the significance of the options 1, 2, and 4 in solving the equation?

They are potential solutions tested to see which satisfy the equation, with $v = 2$ being the correct one.

How can I quickly determine which among 1, 2, or 4 solves $4(v + 8) = 40$?

Substitute each value into the equation and check if the left side equals 40. Only $v = 2$ satisfies the equation.

Additional Resources

$4(v + 8) = 40$: Which Solutions Make This Equation True?

Understanding algebraic equations is fundamental to developing problem-solving skills in mathematics. The equation $4(v + 8) = 40$ is a classic example often encountered by students learning to manipulate algebraic expressions and solve for a variable. In this article, we will thoroughly analyze this equation, explore the possible solutions, and discuss the methods to determine which solutions satisfy the equation. The goal is to provide a comprehensive review that clarifies the process and highlights the key concepts involved.

Understanding the Equation: $4(v + 8) = 40$

Before diving into solving, it is essential to comprehend what the equation represents. The expression $4(v + 8)$ indicates that the sum of v and 8 is being multiplied by 4, resulting in 40. The task is to identify the value(s) of v that satisfy this relationship.

This type of equation exemplifies a linear algebraic expression with one variable, v . The straightforward nature of the equation makes it an excellent starting point for learners to understand the process of isolating the variable and verifying solutions.

Step-by-Step Solution Process

1. Expand the Equation

The first step involves expanding the left side of the equation:

$$\begin{aligned}4(v + 8) &= 40 \\ \rightarrow 4v + 4 \cdot 8 &= 40 \\ \rightarrow 4v + 32 &= 40\end{aligned}$$

This simplifies the expression and makes it easier to manipulate.

2. Isolate the Variable

Next, subtract 32 from both sides to isolate the term with v :

$$\begin{aligned}4v + 32 - 32 &= 40 - 32 \\ \rightarrow 4v &= 8\end{aligned}$$

Then, divide both sides by 4 to solve for v :

$$\begin{aligned}4v / 4 &= 8 / 4 \\ \rightarrow v &= 2\end{aligned}$$

This calculation shows that $v = 2$ is a potential solution.

3. Verify the Solution

Always verify the solution by substituting $v = 2$ back into the original equation:

$$\begin{aligned}4(2 + 8) &= 40 \\ \rightarrow 4(10) &= 40 \\ \rightarrow 40 &= 40\end{aligned}$$

Since both sides are equal, $v = 2$ satisfies the equation.

Are There Other Solutions?

For linear equations like $4(v + 8) = 40$, there is typically only one solution, as they represent straight-line relationships with a single point of intersection. The process above confirms that $v = 2$ is the sole solution.

However, in certain contexts or more complex equations, multiple solutions

might exist. It is important to understand why only one solution exists here and to recognize the characteristics of linear equations that lead to unique solutions.

Alternative Methods to Solve the Equation

While the algebraic approach described is standard, other methods can also be used, especially in educational settings.

Graphical Method

Plotting the equation $4(v + 8) = 40$ can visually demonstrate the solution:

- Rewrite as $y = 4(v + 8)$, where y is the output.
- Plot the line $y = 4v + 32$.
- Draw the horizontal line $y = 40$.
- The intersection point's v -coordinate gives the solution.

This approach visually confirms that $v = 2$.

Pros and Cons of Different Methods

Method	Pros	Cons
Algebraic solution	Precise, straightforward, universally applicable	May be abstract for some learners
Graphical method	Visual understanding, intuitive	Less precise, requires graphing tools
Substitution/elimination	Useful for systems of equations, flexible	More complex for single equations, overkill for simple equations

Features and Characteristics of the Equation

Understanding the features of an equation helps in grasping how to approach it:

- Linear Equation: The given equation is linear because the variable v appears to the first power and the equation can be written in the form $ax + b$

= c.

- Single Solution: As expected with linear equations, it has one unique solution.
- Easy to Solve: The straightforward algebraic steps make it accessible for learners at various levels.

Common Mistakes to Avoid

When solving equations like $4(v + 8) = 40$, students often make errors such as:

- Forgetting to expand the parentheses properly.
- Making arithmetic mistakes during addition or subtraction.
- Dividing incorrectly or forgetting to verify the solution.
- Confusing the solution with other potential roots, especially in quadratic equations.

Being attentive to each step and verifying the solution ensures accuracy.

Practical Applications and Real-World Relevance

While the equation $4(v + 8) = 40$ may seem purely theoretical, understanding how to solve such equations has practical applications:

- Financial Calculations: Determining unknown quantities in budgeting or investment scenarios.
- Engineering: Calculating forces or parameters in system design.
- Science: Solving for unknown variables in experiments.

The skills learned here are foundational for more complex problem-solving tasks in various fields.

Conclusion

The equation $4(v + 8) = 40$ exemplifies a fundamental algebraic problem that underpins much of mathematical reasoning. By expanding, isolating the variable, and verifying the solution, we find that $v = 2$ is the only value that satisfies the equation. Understanding this process not only reinforces

algebraic manipulation skills but also prepares learners for tackling more complex equations and systems.

The key takeaways include the importance of carefully expanding expressions, performing inverse operations systematically, and verifying solutions to ensure accuracy. Whether approached algebraically or graphically, solving such equations enhances logical thinking and problem-solving capabilities—skills essential across academic disciplines and real-world applications alike.

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