

What Is The Answer To This Equation?

$12m - 4 = 4m + 12$

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Understanding how to solve algebraic equations is a fundamental skill in mathematics, and one of the most common types involves solving for an unknown variable. The equation $12m - 4 = 4m + 12$ is a straightforward example that allows us to demonstrate the process of isolating the variable, simplifying the equation, and finding the value of m . In this article, we will explore this specific equation in depth, breaking down each step, explaining the underlying principles, and illustrating how to arrive at the solution efficiently.

Understanding the Equation

Before diving into the solution process, it's important to understand what the equation represents and why solving for m is necessary.

The Components of the Equation

The given equation:

$$12m - 4 = 4m + 12$$

contains two expressions involving the variable m , separated by an equals sign. The left side ($12m - 4$) and the right side ($4m + 12$) are linear expressions, meaning they involve the variable m to the first power.

- Terms involving m : $12m$ and $4m$
- Constant terms: -4 and $+12$

The goal is to find the value of m that makes both sides of the equation equal.

The Importance of Isolating the Variable

Solving for m involves manipulating the equation to gather all terms containing m on one side and constants on the other. This process simplifies the equation, making it possible to directly compute the value of m .

Step-by-Step Solution Process

Let's explore the systematic approach to solving the equation $12m - 4 = 4m + 12$.

Step 1: Eliminate or Simplify Terms

To begin, one effective strategy is to eliminate the variable terms on one side. For this, we can subtract $4m$ from both sides:

$$(12m - 4) - 4m = (4m + 12) - 4m$$

This simplifies to:

$$12m - 4 - 4m = 12$$

Now, combine like terms:

$$(12m - 4m) - 4 = 12$$

which simplifies further to:

$$8m - 4 = 12$$

Step 2: Isolate the Term with the Variable

Next, we want to get rid of the constant term on the side with the variable. Add 4 to both sides:

$$8m - 4 + 4 = 12 + 4$$

Simplify:

$$8m = 16$$

Step 3: Solve for m

Now, divide both sides by 8 to isolate m :

$$8m / 8 = 16 / 8$$

which simplifies to:

$$m = 2$$

Verifying the Solution

After finding the value of m , it's essential to verify that the solution satisfies the original equation.

Substitute $m = 2$ into the original equation

Original equation:

$$12m - 4 = 4m + 12$$

Plug in $m = 2$:

$$12(2) - 4 = 4(2) + 12$$

Calculate each side:

$$24 - 4 = 8 + 12$$

Simplify:

$$20 = 20$$

Since both sides are equal, $m = 2$ is indeed the correct solution.

Understanding Why This Method Works

The approach used relies on fundamental algebraic principles:

- **Balance the equation:** Whatever operation is performed on one side must be performed on the other to maintain equality.
- **Combine like terms:** Simplify expressions to make the variable isolation straightforward.
- **Isolate the variable:** Use inverse operations (addition/subtraction, multiplication/division) to solve for the unknown.

This systematic method ensures accuracy and clarity when solving linear equations like the one discussed.

Common Mistakes and How to Avoid Them

Even simple equations can trip up learners if caution is not exercised. Here are common errors and tips to avoid them.

1. Forgetting to Perform the Same Operation on Both Sides

- Always remember to apply any addition, subtraction, multiplication, or division to both sides of the equation.

2. Sign Errors

- Be cautious with negative signs, especially when distributing or combining like terms.

3. Incorrect Simplification

- Double-check arithmetic steps to avoid mistakes in combining like terms or during calculations.

4. Skipping Verification

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

Extensions and Related Problems

Once comfortable solving equations like $12m - 4 = 4m + 12$, students can explore more complex problems.

Solving Equations with Variables on Both Sides

- Practice equations such as $3x + 5 = 2x + 9$, which involve similar steps but require careful handling of variables on both sides.

Involving Fractions and Decimals

- Equations like $(\frac{1}{2})m + 3 = 4m - 2$ introduce additional complexity, emphasizing the need for common denominators or decimal management.

Word Problems

- Applying algebra to real-world scenarios enhances understanding and application skills.

Conclusion

The solution to the equation $12m - 4 = 4m + 12$ is $m = 2$. This process illustrates the power of algebraic techniques in solving for an unknown variable, emphasizing the importance of methodical steps: simplifying, isolating the variable, and verifying the solution. Mastery of such equations forms a foundation for more advanced mathematics, including solving systems of equations, quadratic equations, and beyond. Remember, the key to success lies in understanding each step, performing operations carefully, and verifying your results to ensure accuracy.

Frequently Asked Questions

How do I solve the equation $12m - 4 = 4m + 12$ for m ?

To solve for m , first subtract $4m$ from both sides: $12m - 4m - 4 = 12$. Simplify to get $8m - 4 = 12$. Next, add 4 to both sides: $8m = 16$. Finally, divide both sides by 8: $m = 2$.

What is the value of m in the equation $12m - 4 = 4m + 12$?

The value of m is 2. By solving the equation, we find $m = 2$.

Can you walk me through the steps to solve $12m - 4 = 4m + 12$?

Certainly. Subtract $4m$ from both sides to get $8m - 4 = 12$. Then add 4 to both sides: $8m = 16$. Finally, divide both sides by 8: $m = 2$.

Is the solution to $12m - 4 = 4m + 12$ unique?

Yes, solving the equation yields a unique solution: $m = 2$.

What type of equation is $12m - 4 = 4m + 12$, and how do you approach solving it?

It's a linear equation in one variable. To solve it, isolate m by moving all m terms to one side and constants to the other, then divide to find the value of m . In this case, $m = 2$.

Additional Resources

What Is The Answer To This Equation? $12m - 4 = 4m + 12$

Mathematics often presents us with equations that challenge our understanding and problem-solving skills. Among these, linear equations are fundamental, serving as building blocks for more complex mathematical concepts. One such equation that invites exploration is:

$$12m - 4 = 4m + 12$$

This seemingly straightforward algebraic statement encapsulates the essence of solving for an unknown variable, m . In this detailed review, we will dissect this equation methodically, uncover its solution, analyze the implications of each step, and reflect on the broader significance of solving such equations in mathematical reasoning.

Understanding the Equation: A Foundation for Problem Solving

Before delving into the solution, it's essential to understand the structure and components of the equation.

Equation Breakdown:

- $12m$: A term involving the variable m multiplied by 12.
- -4 : A constant subtracting 4 from the term.
- $=$ (equals sign): Indicates equality between the two expressions.
- $4m$: A similar term involving m , but multiplied by 4.
- $+12$: A constant adding 12 to the right side.

This equation is linear in m , meaning the variable appears to the first power and can be isolated through algebraic manipulations.

Why Solve Equations?

Solving equations like this allows us to find specific values that satisfy a given condition, which is fundamental in various fields—from physics and engineering to economics and computer science. The process enhances logical reasoning, critical thinking, and quantitative literacy.

Step-by-Step Solution Process

To find the value of m that satisfies the equation, we apply algebraic principles systematically.

Step 1: Simplify both sides

Often, equations are simplified initially by combining like terms, but in this case, both sides are already in simplified form.

Step 2: Isolate the variable term

Our goal is to get all terms involving m on one side and constants on the other.

Equation: $12m - 4 = 4m + 12$

Subtract $4m$ from both sides:

$$(12m - 4m) - 4 = 4m - 4m + 12$$

Simplify:

$$8m - 4 = 0 + 12$$

which simplifies further to:

$$8m - 4 = 12$$

Step 3: Isolate the term with m

Add 4 to both sides:

$$8m - 4 + 4 = 12 + 4$$

Simplify:

$$8m = 16$$

Step 4: Solve for m

Divide both sides by 8:

$$8m / 8 = 16 / 8$$

which yields:

$$m = 2$$

Verification of the Solution

It's crucial to verify that the found value $m=2$ satisfies the original equation.

Substitute $m=2$ into the original:

Left Side: $12(2) - 4 = 24 - 4 = 20$

Right Side: $4(2) + 12 = 8 + 12 = 20$

Since both sides equal 20, the solution $m=2$ is valid.

Implications and Broader Context

Having established that $m=2$ solves the equation, it's instructive to explore the significance of this solution, the nature of linear equations, and their applications.

The Significance of Solving Linear Equations

Linear equations are fundamental in modeling real-world situations where relationships between variables are proportional or additive. For example:

- Calculating distances or speeds in physics.
- Budgeting expenses in finance.
- Programming algorithms involving linear relationships.

Finding the correct value of an unknown variable enables accurate predictions, optimizations, and understanding of systems.

Common Pitfalls and Misconceptions

When solving equations like $12m - 4 = 4m + 12$, students often make errors such as:

- Forgetting to perform the same operation on both sides.
- Incorrectly combining like terms.
- Confusing addition and subtraction steps.

Being vigilant with algebraic rules ensures correct solutions.

Variations and Complexities

While this particular equation is straightforward, more complex equations may involve:

- Variables on both sides with different coefficients.
- Multiple variables.
- Quadratic or higher-degree terms.

Each introduces additional steps and considerations, emphasizing the importance of foundational skills demonstrated here.

Real-World Applications of Solving Equations

Understanding and solving equations like $12m - 4 = 4m + 12$ have practical significance.

Example 1: Financial Planning

Suppose m represents the number of units sold, and the equation models revenue or costs. Finding m helps determine break-even points or profit margins.

Example 2: Physics and Engineering

Variables may represent distance, time, or force. Solving for these variables aids in designing systems or predicting behaviors.

Example 3: Computer Science

Algorithms often involve equations to optimize performance or resource allocation. Mastery of solving equations enhances coding and algorithm development.

Conclusion: The Value of Equation Solving in Mathematical Literacy

The question, "What Is The Answer To This Equation? $12m - 4 = 4m + 12$," encapsulates a fundamental mathematical skill: solving for an unknown. Through methodical steps—simplification, isolation, and verification—we find that $m=2$ satisfies the equation.

This process underscores the importance of algebraic reasoning, critical thinking, and systematic problem-solving. Mastering such techniques empowers individuals across disciplines to analyze, interpret, and manipulate quantitative data effectively.

In a world increasingly driven by data and mathematical literacy, developing proficiency in solving equations is not just an academic exercise but a vital skill for informed decision-making and innovation.

References and Further Reading:

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- Blitzer, R. (2018). Algebra and Trigonometry. Pearson.
- National Council of Teachers of Mathematics. (2014). Principles to Actions: Ensuring Mathematical Success for All.

Final Note: Whether in academic settings, professional environments, or everyday life, the ability to solve equations like $12m - 4 = 4m + 12$ is a foundational skill that opens doors to deeper mathematical understanding and practical problem-solving.

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