

Solve This Equation: $3y - 4 = 6 - 2y$

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When it comes to algebra, solving equations is a fundamental skill that helps develop logical thinking and problem-solving abilities. Whether you're a student learning algebra for the first time or someone brushing up on your math skills, understanding how to solve equations like $3y - 4 = 6 - 2y$ is essential. In this article, we will explore the step-by-step process to solve this specific equation, delve into the concepts behind each step, and provide helpful tips to enhance your algebraic skills.

Understanding the Equation: $3y - 4 = 6 - 2y$

Before diving into solving the equation, it's important to understand what the equation represents and the basic principles involved. The given equation is a linear algebraic equation involving a single variable, y .

Equation Overview:

- The left side has the term $3y$ minus 4.
- The right side has the constant 6 minus $2y$.

The goal is to find the value of y that makes this equation true—that is, to find the value of y that satisfies the equality.

Why Is Solving This Equation Important?

Solving equations like $3y - 4 = 6 - 2y$ is a foundational skill in algebra. It helps in:

- Developing logical reasoning.
- Understanding how to manipulate algebraic expressions.
- Applying similar techniques in more complex math problems.
- Preparing for advanced topics such as inequalities, systems of equations, and calculus.

Step-by-Step Solution Process

Let's proceed through the solution methodically, ensuring clarity at each stage.

Step 1: Write Down the Equation

Start with the original equation:

$$3y - 4 = 6 - 2y$$

Step 2: Gather Like Terms

The goal is to isolate y on one side of the equation. To do this, move all terms containing y to one side, and constants to the other.

Approach:

- Add $(2y)$ to both sides to bring y terms to the left.
- Add 4 to both sides to move constants to the right.

Mathematically:

$$3y - 4 + 2y = 6 - 2y + 2y$$

$$(3y + 2y) - 4 = 6 + 0$$

$$5y - 4 = 6$$

Step 3: Isolate the Variable Term

Next, add 4 to both sides to eliminate the constant on the left:

$$5y - 4 + 4 = 6 + 4$$

$$5y = 10$$

\]

Step 4: Solve for y

Divide both sides by 5 to solve for y:

$$\begin{aligned} & \backslash[\\ y &= \frac{10}{5} \\ & \backslash] \end{aligned}$$

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

Solution:

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

Verification of the Solution

It's always good practice to verify your solution by substituting the value back into the original equation.

Original equation:

$$\backslash[3y - 4 = 6 - 2y \backslash]$$

Substitute $(y = 2)$:

$$\begin{aligned} & \backslash[\\ 3(2) - 4 &= 6 - 2(2) \\ & \backslash] \end{aligned}$$

Calculate each side:

$$\begin{aligned} & \backslash[\\ 6 - 4 &= 6 - 4 \\ & \backslash] \end{aligned}$$

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

Since both sides are equal, the solution $(y = 2)$ is correct.

Common Mistakes to Avoid When Solving Equations

While solving equations like this, novices often make certain errors. Being aware of these can help prevent mistakes:

- **Incorrectly moving terms:** Remember to perform the same operation on both sides of the equation.
- **Sign errors:** Watch out for signs when adding or subtracting terms, especially negatives.
- **Dividing by zero:** Ensure that when dividing, the divisor isn't zero, which would make the solution invalid.
- **Not checking the solution:** Always substitute your answer back into the original equation to verify correctness.

Practice Problems to Reinforce Learning

To solidify your understanding, try solving these similar equations:

1. $4x + 5 = 3x + 10$
2. $2a - 7 = 3a + 2$
3. $-5b + 4 = 9 - 2b$
4. $6c - 3 = 2c + 9$
5. $7d + 8 = 3d + 16$

Tip: Always follow the step-by-step approach:

- Simplify both sides.
- Gather like terms.
- Isolate the variable.

- Solve for the variable.
- Verify your solution.

Advanced Tips for Solving Equations

As you gain confidence, consider the following advanced techniques:

- Handling multi-step equations: Equations involving parentheses, fractions, or multiple variables.
- Using algebraic properties: Distributive property, combining like terms, and inverse operations.
- Solving inequalities: Similar to equations but with inequalities signs ($>$, $<$, $\geq$, $\leq$).
- Applying equations in real-world contexts: Word problems that translate into algebraic equations.

Conclusion: Mastering the Art of Solving Equations

Solving the equation $3y - 4 = 6 - 2y$ illustrates core algebra principles such as isolating variables, maintaining balance, and verifying solutions. By following a systematic approach, practicing regularly, and understanding the underlying concepts, you can develop proficiency in solving a wide variety of algebraic equations.

Remember, the key steps involve:

1. Writing down the original equation.
2. Moving all variable terms to one side.
3. Moving constants to the other side.
4. Dividing to isolate the variable.
5. Verifying your answer.

With these strategies, you'll be well-equipped to tackle similar equations confidently and efficiently. Happy solving!

Frequently Asked Questions

How do I start solving the equation $3y - 4 = 6 - 2y$?

Begin by adding $2y$ to both sides to gather y terms on one side: $3y + 2y - 4 = 6$. This simplifies to $5y - 4 = 6$.

What is the next step after combining like terms in the equation $5y - 4 = 6$?

Add 4 to both sides to isolate the term with y : $5y = 6 + 4$, which simplifies to $5y = 10$.

How do I solve for y in $5y = 10$?

Divide both sides by 5 to find y : $y = 10 / 5$, so $y = 2$.

What is the solution to the equation $3y - 4 = 6 - 2y$?

The solution is $y = 2$.

Can I check my answer $y = 2$ in the original equation?

Yes. Substitute $y = 2$ into the original equation: $3(2) - 4 = 6 - 2(2)$. This simplifies to $6 - 4 = 6 - 4$, which is true, confirming the solution.

What are common mistakes to avoid when solving this type of linear equation?

Common mistakes include forgetting to distribute when necessary, not isolating the variable properly, or making calculation errors when combining like terms.

How do I verify if the solution $y = 2$ is correct?

Plug $y = 2$ back into the original equation and see if both sides are equal. If they balance, the solution is correct.

Is the solution $y = 2$ unique for the equation $3y - 4 = 6 - 2y$?

Yes. Since it's a linear equation, it has only one unique solution, which is $y = 2$.

Additional Resources

Solve This Equation: $3y - 4 = 6 - 2y$

Introduction: The Significance of Solving Linear Equations

Mathematics, often regarded as the language of science and logic, hinges critically on the ability to solve equations. Among these, linear equations stand as the foundational building blocks, essential for understanding more complex mathematical structures. The equation $3y - 4 = 6 - 2y$ exemplifies a typical linear equation that invites a systematic approach to uncover its solution. Its resolution not only sharpens algebraic skills but also reinforces problem-solving strategies applicable across scientific disciplines, engineering, economics, and beyond.

In this analysis, we will meticulously dissect the process of solving $3y - 4 = 6 - 2y$, exploring the rationale behind each step, uncovering common pitfalls, and contextualizing its relevance in mathematical literacy.

Understanding the Equation: Context and Components

Before diving into solution strategies, it is crucial to understand the structure and components of the equation:

- The equation is linear in the variable y .
- It contains constants (-4 , 6) and variable terms ($3y$, $-2y$).
- The goal is to isolate y and determine its value that satisfies the equality.

The general form of a linear equation in one variable is:

$$a y + b = c y + d$$

In our case, $3y - 4 = 6 - 2y$, which aligns with the general structure, facilitating the application of standard algebraic techniques.

Step-by-Step Solution Approach

The process of solving $3y - 4 = 6 - 2y$ can be broken down into a sequence of

logical steps:

1. Eliminate Variable Terms from One Side

The initial step involves gathering all terms containing y on one side of the equation to simplify the process. Here, the variable term $-2y$ is on the right side, while $3y$ is on the left.

- To consolidate, add $2y$ to both sides:

$$3y - 4 + 2y = 6 - 2y + 2y$$

- Simplify:

$$(3y + 2y) - 4 = 6 + 0$$

- Which results in:

$$5y - 4 = 6$$

2. Isolate the Variable Term

Next, eliminate the constant term -4 from the left side by adding 4 to both sides:

$$- 5y - 4 + 4 = 6 + 4$$

- Simplify:

$$5y = 10$$

3. Solve for y

Finally, divide both sides by the coefficient of y , which is 5 :

$$- y = 10 / 5$$

- Simplify:

$$y = 2$$

Verification of the Solution

Solving an equation is incomplete without verifying the solution. Substitute $y = 2$ back into the original equation:

Original Equation: $3y - 4 = 6 - 2y$

Substitute $y = 2$:

- Left side:

$$3(2) - 4 = 6 - 4 = 2$$

- Right side:

$$6 - 2(2) = 6 - 4 = 2$$

Since both sides equal 2, the solution $y = 2$ is verified.

Deeper Insights: Why This Method Works

Understanding why the algebraic manipulations lead to the solution is crucial for mastery:

- Maintaining Equality: Adding or subtracting the same number from both sides preserves the equality, a fundamental property used throughout.
- Combining Like Terms: Grouping similar terms reduces complexity, allowing for straightforward isolation of the variable.
- Dividing by the Coefficient: Since the variable's coefficient is not zero, dividing both sides by it yields the variable's value directly.

This systematic approach exemplifies the elegance and logic underpinning algebra.

Potential Pitfalls and Common Misconceptions

While the steps seem straightforward, several errors can occur:

1. Sign Errors

- Misplacing negative signs when moving terms across the equals sign can lead to incorrect solutions. For example, forgetting to change the sign when subtracting or adding terms.

2. Dividing by Zero

- Attempting to divide both sides by zero (which occurs if the coefficient of y is zero) results in an undefined operation. Recognizing when an equation has infinitely many solutions or none is vital.

3. Overlooking Verification

- Failing to substitute back into the original equation can leave errors unnoticed, especially in more complex equations.

4. Misapplication of Operations

- Performing operations on only one side, rather than both, violates algebraic rules and leads to incorrect solutions.

Broader Implications and Applications

The ability to solve $3y - 4 = 6 - 2y$ transcends pure mathematics:

- Educational Foundation: Developing algebraic skills foundational for calculus, statistics, and higher mathematics.
- Real-world Modeling: Equations like these appear in physics (e.g., balancing forces), economics (e.g., cost-revenue models), and engineering (e.g., circuit analysis).
- Critical Thinking: Enhances logical reasoning and problem-solving capabilities essential for scientific inquiry.

Alternative Strategies and Extensions

While straightforward algebra suffices here, other methods can be employed:

- Graphical Approach: Plotting y on both sides as functions and locating their intersection point.
- Matrix Methods: For systems of equations, matrix algebra can be practical, though overkill for a single linear equation.
- Parameterization: Introducing parameters for more complex equations, although unnecessary in this case.

Conclusion: Mastery of Linear Equations as a Mathematical Skill

The process of solving $3y - 4 = 6 - 2y$ exemplifies the core principles of algebra, emphasizing systematic problem-solving, attention to detail, and verification. Mastery of such linear equations forms the foundation for understanding more complex mathematical concepts, problem-solving in diverse fields, and developing analytical thinking.

By dissecting this equation thoroughly—analyzing each step, recognizing potential errors, and appreciating its broader context—we reinforce the importance of foundational skills. As mathematical literacy advances, so does our capacity to interpret, model, and influence the world around us.

In essence, solving equations like $3y - 4 = 6 - 2y$ is not merely an academic exercise but an integral component of rational thought and scientific understanding, essential for students, educators, and professionals alike.

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