

10 = 18 + 4(3x + 7) please Help With The Answer

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Solving algebraic equations can sometimes seem challenging, especially when they involve multiple steps and variables. The equation $10 = 18 + 4(3x + 7)$ is a classic example that requires careful application of algebraic principles to find the value of x . Whether you're a student struggling with algebra or someone looking to sharpen your problem-solving skills, understanding how to approach and solve such equations is crucial. This article provides a detailed, step-by-step guide to solving the equation, along with explanations of the underlying concepts to help you grasp the process thoroughly.

Understanding the Equation: $10 = 18 + 4(3x + 7)$

Before diving into the solution, it's important to understand the structure of the equation:

- The left side is a constant, 10.
- The right side contains a constant 18 and an expression $4(3x + 7)$, which involves a coefficient (4) multiplied by a binomial ($3x + 7$).

This setup indicates that the goal is to isolate the variable x on one side of the equation to find its value.

Step-by-Step Guide to Solving the Equation

Step 1: Simplify the right side of the equation

The first step involves expanding the expression $4(3x + 7)$ using the distributive property:

$$\begin{aligned} & \backslash \\ & 4 \times 3x + 4 \times 7 = 12x + 28 \\ & \backslash \end{aligned}$$

So, the original equation becomes:

$$\begin{aligned} & \backslash \\ & 10 = 18 + 12x + 28 \\ & \backslash \end{aligned}$$

Step 2: Combine like terms on the right side

Add the constants 18 and 28:

$$10 = (18 + 28) + 12x = 46 + 12x$$

Step 3: Isolate the term with x

Subtract 46 from both sides to move constants to the left:

$$10 - 46 = 12x$$

$$-36 = 12x$$

Step 4: Solve for x

Divide both sides by 12:

$$x = \frac{-36}{12}$$

$$x = -3$$

Final Answer: The value of x is -3

Additional Tips for Solving Similar Equations

1. Always simplify both sides before isolating variables

Breaking down complex expressions through distribution and combining like terms makes the equation easier to manage.

2. Maintain balance by performing the same operation on both sides

This fundamental principle ensures the equation remains equivalent when solving for the variable.

3. Check your solution

Substitute the found value of x back into the original equation to verify correctness.

Verification:

$$10 \stackrel{?}{=} 18 + 4(3 \times -3 + 7)$$

Calculate inside the parentheses:

$$\begin{aligned} & \backslash \\ & 3 \times -3 = -9 \\ & \backslash \end{aligned}$$

Add 7:

$$\begin{aligned} & \backslash \\ & -9 + 7 = -2 \\ & \backslash \end{aligned}$$

Multiply by 4:

$$\begin{aligned} & \backslash \\ & 4 \times -2 = -8 \\ & \backslash \end{aligned}$$

Add to 18:

$$\begin{aligned} & \backslash \\ & 18 + (-8) = 10 \\ & \backslash \end{aligned}$$

Since the right side equals 10, which matches the left side, the solution $x = -3$ is correct.

Common Mistakes to Avoid

- Forgetting to distribute correctly: Ensure to multiply each term inside the parentheses by the coefficient outside.
- Misplacing signs: Pay attention to negative signs while performing operations.
- Not checking solutions: Always substitute back to verify your answer.

Understanding the Importance of Solving Such Equations

Real-world Applications

Equations like $10 = 18 + 4(3x + 7)$ aren't just academic exercises; they have practical applications in various fields:

- Finance: Calculating interest rates or investment growth.
- Physics: Determining velocity, acceleration, or other quantities.
- Engineering: Solving for unknown parameters in design equations.

Developing Problem-Solving Skills

Mastering algebraic equations enhances critical thinking and analytical skills, which are valuable in

everyday decision-making and professional situations.

Frequently Asked Questions (FAQs)

Q1: What does the equation $10 = 18 + 4(3x + 7)$ represent?

This is a linear algebraic equation representing a relationship between a constant and a variable x . Solving it helps find the value of x that makes the equation true.

Q2: Can I solve similar equations using the same steps?

Yes. The process of simplifying, distributing, combining like terms, and isolating the variable applies to most linear equations.

Q3: What if the equation involves parentheses with multiple terms?

The same principles apply. Use the distributive property to expand, then combine like terms and solve for the variable.

Q4: How do I handle equations where the variable appears on both sides?

Bring all variable terms to one side by adding or subtracting, then solve for x as usual.

Conclusion

Solving the equation $10 = 18 + 4(3x + 7)$ involves a clear process rooted in fundamental algebraic principles. By systematically expanding, simplifying, and isolating the variable, you find that $x = -3$. Understanding each step not only helps in solving this specific problem but also builds a strong foundation for tackling a wide range of algebraic equations. Remember to check your solutions to ensure accuracy, and apply these techniques to more complex problems with confidence. Whether for academic purposes or practical applications, mastering such equations is an essential skill that enhances your overall mathematical proficiency.

Frequently Asked Questions

How do I solve the equation $10 = 18 + 4(3x + 7)$?

First, expand the expression: $10 = 18 + 4 \cdot 3x + 4 \cdot 7$, which simplifies to $10 = 18 + 12x + 28$. Combine like terms: $10 = 46 + 12x$. Subtract 46 from both sides: $10 - 46 = 12x$, so $-36 = 12x$. Divide both sides by 12: $x = -36 / 12$, thus $x = -3$.

What is the first step to solve for x in the equation $10 = 18 +$

$4(3x + 7)$?

The first step is to expand the parentheses: $4(3x + 7)$ becomes $12x + 28$, so rewrite the equation as $10 = 18 + 12x + 28$.

Why do I need to expand the term $4(3x + 7)$ in the equation?

Expanding the term allows you to simplify the equation and combine like terms, making it easier to isolate and solve for x .

Can I simplify the equation $10 = 18 + 12x + 28$ without expanding?

No, it's best to expand first to combine like terms. If you try to simplify without expanding, it can lead to confusion or mistakes. Expanding ensures clarity.

What is the value of x in the equation $10 = 18 + 4(3x + 7)$?

The value of x is -3 .

Is this a linear equation, and how do I know?

Yes, it's a linear equation because the variable x appears only to the first power, and after simplifying, the equation is linear in form.

What common mistakes should I avoid when solving this equation?

Avoid forgetting to distribute the 4 across $(3x + 7)$, mixing up signs when moving terms to the other side, and dividing by coefficients incorrectly. Double-check each step.

How can I verify that $x = -3$ is the correct solution?

Substitute $x = -3$ back into the original equation: $10 = 18 + 4(3(-3) + 7)$. Calculate inside the parentheses: $3(-3) + 7 = -9 + 7 = -2$. Then, $4(-2) = -8$. So, the right side is $18 - 8 = 10$, which matches the left side, confirming the solution is correct.

Additional Resources

$10 = 18 + 4(3x + 7)$ - A Deep Dive into Solving Linear Equations

Understanding and solving equations is fundamental in mathematics, serving as the building blocks for more advanced concepts in algebra, calculus, and beyond. The equation $10 = 18 + 4(3x + 7)$ exemplifies a typical linear algebra problem that, when broken down systematically, reveals the value of the unknown variable x . This article explores the equation in detail, offering a comprehensive analysis of how to approach such problems, the underlying principles involved, and the step-by-step process to find the solution. Whether you're a student brushing up on algebra or an

enthusiast keen to deepen your understanding, this review aims to clarify the concepts and techniques necessary to master similar equations.

Understanding the Equation: Breaking Down the Components

Before diving into the solution, it's essential to understand what the equation represents and the significance of its components.

The Equation in Context

The equation:

$$10 = 18 + 4(3x + 7)$$

is a linear equation with one variable, x . The goal is to find the specific value of x that satisfies this equality. Equations like this are commonly encountered in various fields, such as physics (where they might model relationships between quantities), economics, engineering, and everyday problem-solving.

Dissecting the Equation

- Left Side (LHS): The constant term 10.
- Right Side (RHS): A sum of a constant 18 and a product $4(3x + 7)$.
- Expression inside parentheses: $(3x + 7)$, which is a linear expression involving x .

The structure indicates that the equation has a linear form, with the unknown x multiplied by constants and combined with constants to produce an equality.

Step-by-Step Solution Process

The core of solving equations like $10 = 18 + 4(3x + 7)$ lies in systematically isolating x through algebraic manipulations. The process involves applying inverse operations—addition, subtraction, multiplication, and division—in a logical sequence.

Step 1: Simplify the Equation

Begin by expanding the RHS to remove parentheses:

$$10 = 18 + 4(3x + 7)$$

Distribute the 4 across the parentheses:

$$10 = 18 + 4 \cdot 3x + 4 \cdot 7$$

Calculate the multiplications:

$$10 = 18 + 12x + 28$$

Now, combine like terms (constants 18 and 28):

$$10 = (18 + 28) + 12x$$

Which simplifies to:

$$10 = 46 + 12x$$

Step 2: Isolate the Variable Term

Subtract 46 from both sides to move constants to one side:

$$10 - 46 = 12x$$

Calculate:

$$-36 = 12x$$

Step 3: Solve for x

Divide both sides by 12 to isolate x:

$$x = -36 / 12$$

Simplify:

$$x = -3$$

Final Answer:

The solution to the equation $10 = 18 + 4(3x + 7)$ is:

$$x = -3$$

Analytical Insights and Common Pitfalls

While the steps above seem straightforward, there are common errors that students or learners might encounter when solving similar equations. Understanding these pitfalls can enhance problem-solving skills.

1. Distributive Property Misapplication

Incorrectly distributing the multiplication over parentheses can lead to wrong answers. For example, failing to multiply each term inside the parentheses by 4 results in an incorrect expansion.

Correct: $4(3x + 7) = 12x + 28$

Incorrect: $4 \cdot 3x + 7 = 12x + 7$ (which is wrong because $4 \cdot 7 \neq 7$)

2. Sign Errors During Subtraction or Addition

Be cautious when moving terms across the equality sign, especially with negative signs. For example, subtracting 46 from both sides requires attention to signs.

3. Dividing by Zero

In equations where the coefficient of x becomes zero (e.g., when solving for x in equations like $0x = c$), it's important to recognize that either the equation has infinitely many solutions or none.

4. Ignoring the Order of Operations

Always perform multiplication before addition/subtraction unless parentheses dictate otherwise.

The Broader Significance of the Equation

While at face value, this is a simple algebraic exercise, equations like $10 = 18 + 4(3x + 7)$

demonstrate the importance of algebra in modeling real-world phenomena. For instance:

- In Physics: Equations involving linear relationships (such as distance, speed, and time) often resemble this form.
- In Economics: Budget constraints and profit models can be expressed as linear equations.
- In Data Analysis: Linear models help in understanding relationships between variables.

The ability to manipulate and solve such equations is foundational for analytical thinking and quantitative reasoning.

Extensions and Variations

Understanding how to solve a basic linear equation opens doors to tackling more complex problems. Here are some variations and extensions:

1. Equations with Multiple Variables

Equations like $10 = 18 + 4(3x + 7) + 2y$ involve multiple variables and require systems of equations for solutions.

2. Quadratic Equations

Equations involving x^2 , such as $ax^2 + bx + c = 0$, require quadratic formula or factoring techniques.

3. Inequalities

Replacing the '=' sign with '<' or '>' introduces inequalities, which are essential in optimization problems.

4. Equations with Fractions

Handling equations like $(1/2)x + 3 = 7$ involves clearing denominators and careful algebraic manipulation.

Practical Applications and Educational Implications

Mastering the solution of equations like $10 = 18 + 4(3x + 7)$ has broad educational and practical implications.

- Educational Significance: Developing algebraic skills enhances logical reasoning, problem-solving, and prepares students for higher mathematics.
- Real-World Relevance: Many professions require the ability to model and solve equations, from engineering to finance.
- Technological Integration: Computer algebra systems and calculators often automate such solutions, but understanding the underlying process fosters better comprehension.

Conclusion: Embracing the Power of Algebra

The seemingly simple equation $10 = 18 + 4(3x + 7)$ encapsulates the essence of algebraic problem-solving—a systematic approach to uncovering unknowns through logical steps. Its solution, $x = -3$, showcases the importance of distribution, combining like terms, and inverse operations. More than just an isolated problem, this equation exemplifies the broader utility of algebra in various disciplines and everyday situations. By mastering such fundamental techniques, learners equip themselves with critical analytical tools that extend far beyond the classroom, fostering a mindset capable of tackling complex, real-world challenges with confidence and clarity.

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