

Use The Distributive Property To Solve The Equation $\frac{2}{3} (6a + 9) = 20.4$

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When working with algebraic expressions, understanding how to apply the distributive property is essential for solving equations efficiently. In this article, we'll explore how to use the distributive property to solve the equation $\frac{2}{3} (6a + 9) = 20.4$. By breaking down each step, you'll gain confidence in tackling similar algebraic problems using this fundamental property.

Understanding the Distributive Property

Before diving into solving the equation, it's important to review what the distributive property entails and how it applies to algebra.

What Is The Distributive Property?

The distributive property states that for all numbers a , b , and c :

- $a(b + c) = ab + ac$
- It allows us to distribute a multiplication across addition or subtraction inside parentheses.

This property is useful because it simplifies expressions and helps isolate variables when solving equations.

Why Use The Distributive Property?

Applying the distributive property:

- Simplifies complex expressions
- Prepares equations for further operations
- Clarifies the steps needed to isolate the variable

In the context of the equation $\frac{2}{3} (6a + 9) = 20.4$, distributing helps eliminate parentheses and makes the equation easier to solve.

Step-by-Step Solution of $\frac{2}{3} (6a + 9) = 20.4$

Let's now walk through solving the equation using the distributive property.

Step 1: Apply the Distributive Property

Start by distributing $\frac{2}{3}$ to both terms inside the parentheses:

1. Multiply $\frac{2}{3}$ by $6a$:

$$\left[\frac{2}{3} \times 6a = \frac{2 \times 6a}{3} = \frac{12a}{3} = 4a \right]$$

2. Multiply $\frac{2}{3}$ by 9 :

$$\left[\frac{2}{3} \times 9 = \frac{2 \times 9}{3} = \frac{18}{3} = 6 \right]$$

Now, rewrite the original equation with the distributed terms:

$$\left[4a + 6 = 20.4 \right]$$

Step 2: Isolate the Variable Term

Subtract 6 from both sides to get all variable terms on one side:

$$\left[4a + 6 - 6 = 20.4 - 6 \right]$$
$$\left[4a = 14.4 \right]$$

Step 3: Solve for the Variable

Divide both sides by 4 to isolate a:

$$a = \frac{14.4}{4} = 3.6$$

Final answer:

$$\boxed{a = 3.6}$$

Tips for Using The Distributive Property Effectively

Applying the distributive property correctly is crucial for solving algebraic equations. Here are some tips:

1. Always Distribute to All Terms

When you see parentheses multiplied by a coefficient, distribute that coefficient to every term inside the parentheses to avoid mistakes.

2. Simplify Before and After Distribution

Simplify fractions or coefficients before distributing when possible. After distributing, combine like terms to streamline solving.

3. Check Your Work

After solving for the variable, substitute your answer back into the original equation to verify correctness.

Additional Examples of Using The Distributive Property

Practicing with similar equations can solidify your understanding.

Example 1: Solve $\frac{3}{4} (8x - 4) = 9$

Solution:

Distribute $\frac{3}{4}$:

$$\frac{3}{4} \times 8x = \frac{3 \times 8x}{4} = \frac{24x}{4} = 6x$$

$$\frac{3}{4} \times (-4) = -3$$

Rewrite:

$$6x - 3 = 9$$

Add 3 to both sides:

$$6x = 12$$

Divide by 6:

$$x = 2$$

Answer: $x = 2$

Example 2: Solve $\frac{5}{2} (2y + 6) = 15$

Solution:

Distribute $\frac{5}{2}$:

$$\frac{5}{2} \times 2y = \frac{5 \times 2y}{2} = 5y$$

$$\frac{5}{2} \times 6 = \frac{5 \times 6}{2} = 15$$

\]

Rewrite:

\[

$$5y + 15 = 15$$

\]

Subtract 15 from both sides:

\[

$$5y = 0$$

\]

Divide both sides by 5:

\[

$$y = 0$$

\]

Conclusion: Mastering The Distributive Property

Using the distributive property to solve equations like $\frac{2}{3}(6a + 9) = 20.4$ is an essential skill in algebra. It simplifies complex expressions, helps isolate variables, and paves the way for straightforward solutions. Remember to distribute carefully, simplify your expressions, and verify your answers to ensure accuracy. With practice, applying the distributive property will become second nature, empowering you to solve a wide range of algebraic equations confidently.

By mastering this property, you lay a solid foundation for more advanced algebra topics and problem-solving techniques. Keep practicing with different equations, and soon you'll find solving algebraic expressions to be a smooth and manageable process.

Frequently Asked Questions

What is the first step to solve the equation $\frac{2}{3}(6a + 9) = 20.4$ using the distributive property?

The first step is to distribute the $\frac{2}{3}$ to both $6a$ and 9 , multiplying each term inside the parentheses by $\frac{2}{3}$.

How do you distribute $\frac{2}{3}$ in the equation $\frac{2}{3}(6a + 9)$?

You multiply $\frac{2}{3}$ by $6a$ and by 9 separately: $(\frac{2}{3}) 6a$ and $(\frac{2}{3}) 9$.

What is the result of distributing $\frac{2}{3}$ over $6a$ and 9 in the equation?

Distributing gives $(\frac{2}{3}) 6a = 4a$ and $(\frac{2}{3}) 9 = 6$, so the equation becomes $4a + 6 = 20.4$.

How do you isolate the variable 'a' after distribution?

Subtract 6 from both sides to get $4a = 20.4 - 6$, which simplifies to $4a = 14.4$.

What is the next step after isolating $4a$ in the equation?

Divide both sides by 4 to solve for a : $a = 14.4 / 4$.

What is the value of 'a' after solving the equation?

$a = 3.6$.

Why is it important to distribute the $\frac{2}{3}$ before solving for 'a'?

Distributing simplifies the equation by eliminating parentheses, making it easier to isolate and solve for 'a'.

Can you verify your solution by substituting 'a' back into the original equation?

Yes, substitute $a = 3.6$ into the original equation: $\frac{2}{3}(6 \cdot 3.6 + 9)$ and check if the result equals 20.4 .

Additional Resources

Use The Distributive Property To Solve The Equation $\frac{2}{3}(6a + 9) = 20.4$

Mathematics often appears intimidating, especially when dealing with equations that involve fractions and algebraic expressions. However, with the right approach and understanding of fundamental properties, solving such

equations becomes manageable and even straightforward. One of the essential tools in an algebraist's toolkit is the distributive property, which simplifies expressions and allows for systematic problem-solving. In this article, we will explore how to effectively use the distributive property to solve the equation:

$$\frac{2}{3} (6a + 9) = 20.4$$

This example not only demonstrates the practical application of the distributive property but also emphasizes the importance of breaking down complex equations into simpler parts. Whether you're a student brushing up on algebra or someone seeking a clearer understanding of mathematical principles, this step-by-step guide aims to clarify the process in a clear, detailed, and reader-friendly manner.

Understanding the Distributive Property

Before we delve into solving the specific equation, it's crucial to understand what the distributive property is and why it's a powerful tool in algebra.

Definition of the Distributive Property

The distributive property states that for all real numbers a , b , and c :

$$a(b + c) = a b + a c$$

In words, multiplying a sum by a number is the same as multiplying each addend by that number and then adding the results. This property allows us to remove parentheses in algebraic expressions and simplify equations.

Why Is the Distributive Property Important?

- Simplifies complex expressions: It turns expressions involving parentheses into a sum or difference, making them easier to manipulate.
- Facilitates solving equations: It enables the distribution of coefficients across terms, allowing for the isolation of variables.
- Prepares for further operations: Once expressions are expanded, combining like terms and solving for variables becomes straightforward.

Step-by-Step Solution of the Equation

Let's now turn our attention to solving the equation:

$$\frac{2}{3} (6a + 9) = 20.4$$

Our goal is to find the value of the variable 'a'. We will break down the process into clear, manageable steps.

Step 1: Apply the Distributive Property

The first step is to distribute the fraction $\frac{2}{3}$ across the terms inside the parentheses:

$$\frac{2}{3} 6a + \frac{2}{3} 9$$

Calculate each term separately:

- $\frac{2}{3} 6a$
- $\frac{2}{3} 9$

Calculations:

- $\frac{2}{3} 6a = (2 \cdot 6a) / 3 = (12a) / 3 = 4a$
- $\frac{2}{3} 9 = (2 \cdot 9) / 3 = 18 / 3 = 6$

Therefore, the original equation transforms into:

$$4a + 6 = 20.4$$

Step 2: Isolate the Variable Term

To solve for 'a', we need to get rid of the constant term on the left side. Subtract 6 from both sides:

$$4a + 6 - 6 = 20.4 - 6$$

Simplify:

$$4a = 14.4$$

Step 3: Solve for the Variable

Now, divide both sides of the equation by 4 to isolate 'a':

$$(4a) / 4 = 14.4 / 4$$

Simplify:

$$a = 3.6$$

Result: The solution to the equation is $a = 3.6$.

Verifying the Solution

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

Original equation:

$$\frac{2}{3} (6a + 9) = 20.4$$

Substitute $a = 3.6$:

$$\frac{2}{3} (6 \cdot 3.6 + 9)$$

Calculate inside parentheses:

$$6 \cdot 3.6 = 21.6$$

Add 9:

$$21.6 + 9 = 30.6$$

Multiply by $\frac{2}{3}$:

$$\left(\frac{2}{3}\right) 30.6 = (2 \cdot 30.6) / 3 = 61.2 / 3 = 20.4$$

Since the left side equals the right side (20.4), our solution is verified.

Additional Tips for Using the Distributive Property Effectively

While the above example demonstrates a straightforward application, here are some tips to enhance your proficiency:

- Always simplify fractions early: Reducing fractions can make calculations more manageable.
- Distribute carefully: Remember to multiply every term inside parentheses by the coefficient outside.
- Keep track of signs: When dealing with negative numbers, be attentive to signs during distribution.
- Combine like terms after distribution: This simplifies the equation further before solving for the variable.
- Verify your solutions: Substituting back into the original equation helps

catch potential errors.

Common Mistakes to Avoid

Understanding what to watch out for can prevent common errors:

- Ignoring the distribution: Forgetting to distribute the coefficient across all terms inside the parentheses often leads to incorrect solutions.
- Incorrectly multiplying fractions: Always multiply numerators and denominators separately.
- Mismanaging signs: Be cautious with negative coefficients or terms.
- Forgetting to simplify: Failing to reduce fractions or combine like terms can complicate the process unnecessarily.

Real-World Applications of the Distributive Property

Though this example is purely algebraic, the distributive property has broad applications:

- Financial calculations: Distributing interest rates across different investments.
- Physics: Calculating forces or velocities that involve distributed components.
- Computer science: Optimizing algorithms that handle distributed data or operations.

Understanding how to manipulate expressions using the distributive property enhances problem-solving skills across various fields.

Conclusion

Mastering the use of the distributive property is vital for solving many algebraic equations efficiently. By applying the property to distribute coefficients across parentheses, simplifying expressions, and systematically isolating variables, students and professionals alike can tackle complex problems with confidence. The example discussed—solving $\frac{2}{3}(6a + 9) = 20.4$ —illustrates the power of this property in transforming a seemingly complicated equation into a straightforward calculation. With practice and attention to detail, leveraging the distributive property becomes an intuitive and invaluable approach to algebraic problem-solving.

Remember, the key steps involve understanding the property, applying it carefully, simplifying expressions, and verifying your solutions. As you

encounter more equations, keep these principles in mind, and you'll find that many algebraic challenges become significantly more approachable.

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