Find The Value Of X.85% (4x + 21)x = [?]

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Introduction

Mathematics often presents us with intriguing equations that require critical thinking and problem-solving skills to decode. One such problem involves finding the value of x in the equation:

$$85\% \times (4x + 21) \times x = [?]$$

This article aims to guide you through the process of solving this type of equation systematically, exploring fundamental algebraic principles, and understanding how percentages interact with algebraic expressions. Whether you're a student preparing for exams or someone interested in sharpening your problem-solving abilities, this comprehensive guide will walk you through the steps needed to find the value of x.

Understanding the Equation

Before diving into solving the equation, it's essential to comprehend the components involved:

- Percentage (85%): Represents a fractional part of a whole, which can be rewritten as a decimal for calculations.
- Expression $(4x + 21)$: A linear expression involving the variable x.
- Variable x: The unknown value we need to determine.
- Result $[?]$: The value that the entire expression equals, which may be given or needs to be calculated.

The original equation can be viewed as:

$$85\% \times (4x + 21) \times x = \text{some value}$$

Suppose the right side is a specific number, say k. To proceed, we need to define this value or understand the context further.

Converting Percentages to Decimals

Most algebraic calculations involving percentages are simplified by converting the percentage to a decimal:

$$85\% = \frac{85}{100} = 0.85$$

Therefore, the equation becomes:

$$ 0.85 \times (4x + 21) \times x = \text{value} $$

If the question provides a specific value for the right side (e.g., 50, 100, etc.), you can substitute and solve for x.

Setting Up the Equation

Assuming the right side is a known number, say K, the equation is:

$$ 0.85 \times (4x + 21) \times x = K $$

Our goal is to find the value of x that satisfies this equation.

Step-by-Step Solution Approach

1. Expand the Equation

Begin by expanding the left side:

$$ 0.85 \times (4x + 21) \times x $$

which can be written as:

$$ 0.85 \times (4x \times x + 21 \times x) $$

Simplify inside the parentheses:

$$ 0.85 \times (4x^2 + 21x) $$

2. Distribute 0.85

Multiply each term inside the parentheses by 0.85:

$$ 0.85 \times 4x^2 + 0.85 \times 21x $$

which simplifies to:

$$ (0.85 \times 4) x^2 + (0.85 \times 21) x $$

Calculating the coefficients:

$$ 3.4 x^2 + 17.85 x $$

3. Write the Equation in Standard Quadratic Form

Now, the equation becomes:

$$ 3.4 x^2 + 17.85 x = K $$

If K is known, you can rewrite as:

$$ 3.4 x^2 + 17.85 x - K = 0 $$

This is a quadratic equation in standard form, which can be solved using quadratic formula, factoring (if possible), or completing the square.

Solving the Quadratic Equation

1. Quadratic Formula

The quadratic formula:

$$ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} $$

where $a = 3.4$, $b = 17.85$, and $c = -K$.

2. Calculate the Discriminant

Discriminant D:

$$ D = b^2 - 4ac $$

$$ D = (17.85)^2 - 4 \times 3.4 \times (-K) $$

$$ D = 319.0225 + 13.6 K $$

Note: Since $c = -K$, the term becomes positive.

3. Find x

Plugging into the quadratic formula:

$$ x = \frac{-17.85 \pm \sqrt{319.0225 + 13.6 K}}{2 \times 3.4} $$

$$ x = \frac{-17.85 \pm \sqrt{319.0225 + 13.6 K}}{6.8} $$

By substituting the specific value of K, you can compute the two possible solutions for x.

Practical Example

Suppose the value on the right side is $K = 50$. Then, the quadratic equation is:

$$ 3.4 x^2 + 17.85 x - 50 = 0 $$

Calculations:

- Discriminant:

$$ D = 319.0225 + 13.6 \times 50 $$

$$ D = 319.0225 + 680 $$

$$ D = 999.0225 $$

- Square root of D:

$$ \sqrt{999.0225} \approx 31.61 $$

- Calculating x:

$$ x = \frac{-17.85 \pm 31.61}{6.8} $$

First solution:

$$ x = \frac{-17.85 + 31.61}{6.8} = \frac{13.76}{6.8} \approx 2.025 $$

Second solution:

$$ x = \frac{-17.85 - 31.61}{6.8} = \frac{-49.46}{6.8} \approx -7.28 $$

Since negative values may not make sense depending on the context (e.g., if x represents a quantity that cannot be negative), the feasible solution might be $x \approx 2.025$.

Additional Considerations

When the Value of K Is Unknown

If your problem doesn't specify the right side, you might need to interpret the question differently or look for additional data.

Verifying the Solution

Always substitute your solution back into the original equation to verify correctness, especially when dealing with approximations.

Applications of Such Equations

Understanding how to manipulate and solve equations involving percentages and

algebraic expressions is vital across various fields:

- Finance: Calculating interest rates, investments, or discounts.
- Physics: Relating percentages to physical quantities.
- Statistics: Working with percentages and proportions.
- Engineering: Analyzing systems with variable parameters.

Practice Problems

To solidify your understanding, try solving these problems:

1. Find x if $85\% \times (4x + 21) x = 100$.
2. If $85\% \times (4x + 21) x = 85$, what is the value of x?
3. Generalize the solution process for any given value on the right side.

Conclusion

Solving equations like $85\% \times (4x + 21) x = [?]$ involves understanding percentages, algebraic expansion, and quadratic solutions. By converting percentages to decimals, expanding expressions, and applying the quadratic formula, you can find the unknown variable x. Remember, always verify your solutions and consider the context of the problem to select the most meaningful answer.

Mastering these techniques enhances your problem-solving toolkit, enabling you to tackle a wide array of real-world and academic challenges involving percentages and algebra.

Frequently Asked Questions

How do I find the value of X in the equation 85% (4x + 21)x = ?

First, convert 85% to its decimal form, which is 0.85. Then, set up the equation as 0.85(4x + 21)x = ?. To find the value of X, you need to know what the right side equals or solve for X in a specific context. If the equation equals a certain number, you can set 0.85(4x + 21)x equal to that number and solve for X.

What steps are involved in solving 85% (4x + 21)x = some value?

Convert 85% to 0.85, then expand the expression: 0.85 (4x + 21) x. Simplify to get a quadratic in terms of x, then solve for x using algebraic methods like factoring, completing the square, or the quadratic formula, depending on the resulting expression.

If 85% (4x + 21)x = 34.2, how do I find X?

Convert 85% to 0.85, so the equation becomes 0.85(4x + 21)x = 34.2. Expand: 0.85 4x x + 0.85 21 x = 34.2, which simplifies to 3.4x^2 + 17.85x = 34.2. Rewrite as a quadratic equation: 3.4x^2 + 17.85x - 34.2 = 0. Then, use the quadratic formula to find the values of x.

Can I simplify the expression 85% (4x + 21)x before solving?

Yes, by converting 85% to 0.85 and then expanding the expression to obtain a quadratic in x. Simplifying the expression makes it easier to apply algebraic methods to find the value of X.

What is the importance of converting percentage to decimal in this problem?

Converting the percentage to decimal (85% to 0.85) is crucial because it allows you to perform standard algebraic operations accurately. Working with decimals ensures proper calculation and simplifies solving the equation.

Additional Resources

Find The Value Of X.85% (4x + 21)x = [?] — an intriguing algebraic puzzle that combines percentage calculations with variable expressions, challenging students and enthusiasts alike to dissect and solve for an unknown. This problem not only tests fundamental algebraic skills but also emphasizes the importance of understanding percentages, variable manipulation, and the logical steps necessary to arrive at an accurate solution. As we delve into this problem, we'll explore its structure, break down its components, and analyze the methods for solving it with precision and clarity.

Understanding the Problem: Breaking Down the Equation

At first glance, the problem presents a mixture of percentage notation and algebraic expressions, which can seem confusing. The core question is: "Find the value of X in the expression 85% (4x + 21)x = [?]".

Key elements to analyze:

- The percentage "85%"
- The algebraic expression "(4x + 21)x"
- The unknown "?" representing the value to be computed

Interpreting the expression:

The phrase "85% (4x + 21)x" indicates that we need to evaluate 85% of the expression "(4x + 21) times x". The question mark "?" signifies the resulting value after applying this percentage.

Restating the problem:

- Calculate: 85% of the product of (4x + 21) and x
- Expressed mathematically:

$$
\text{Value} = 85\% \times (4x + 21) \times x
$$

- Find: the value of X that satisfies the equation, or perhaps determine the expression's value for a particular X depending on context.

Deciphering the Mathematical Expression

Before solving, it's essential to clarify the notation and interpret the problem correctly.

What does "85%" mean?

- 85% is a percentage, which is equivalent to the decimal 0.85.
- When calculating 85% of an expression, we multiply the expression by 0.85.

The expression:

$$
(4x + 21) \times x
$$

- A product of a binomial and a variable, which simplifies to:

$$
(4x + 21) \times x = 4x^2 + 21x
$$

Putting it all together:

$$
\text{Result} = 0.85 \times (4x^2 + 21x)
$$

- The problem may ask for the value of "X" that relates to this expression, possibly setting the expression equal to a certain value or solving for X when the entire expression is

known.

Approach to Solving the Equation

Understanding the problem's structure is critical before attempting to find the value of X. The main steps are:

1. Express the given problem algebraically:

$$
\text{Result} = 0.85 \times (4x^2 + 21x)
$$

2. Determine what is being asked:

- Is the question asking for the value of X when the expression equals a certain number?
- Or is the question to compute the expression's value for a given X?

From the prompt, it appears the goal is to find the value of X that satisfies the expression, possibly assuming the expression equals a certain value or to analyze the expression itself.

3. Identify any additional information:

- If the question provides a specific value equal to the expression, such as:

$$
0.85 \times (4x^2 + 21x) = \text{some number}
$$

then we can proceed to solve for X.

- If not, then perhaps the task is to analyze the expression's properties or to find X that satisfies certain conditions.

Mathematical Analysis and Solution Strategies

Assuming the goal is to find the value of X given an equation, let's consider a typical scenario:

Scenario 1: The expression equals a specific value

Suppose the problem states:

$$
0.85 \times (4x^2 + 21x) = K
$$

where K is a known constant, such as 100, 85, etc.

Step-by-step solution:

- Divide both sides by 0.85:

$$
4x^2 + 21x = \frac{K}{0.85}
$$

- Rearrange into standard quadratic form:

$$
4x^2 + 21x - \frac{K}{0.85} = 0
$$

- Solve for x using the quadratic formula:

$$
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
$$

where:

- $a = 4$,
- $b = 21$,
- $c = - \frac{K}{0.85}$.

Calculating discriminant:

$$
\Delta = b^2 - 4ac = 21^2 - 4 \times 4 \times \left(-\frac{K}{0.85}\right)
$$

- The nature of solutions depends on the discriminant's value.

Scenario 2: The expression is to be maximized/minimized

If the problem asks for the maximum or minimum value of the expression as a function of X, calculus methods like differentiation would be appropriate.

Practical Examples and Calculations

To better understand, let's work through a concrete example.

Example: Find X when the expression equals 85

Suppose the problem is:

$$
0.85 \times (4x^2 + 21x) = 85
$$

Step 1: Divide both sides by 0.85:

$$
4x^2 + 21x = \frac{85}{0.85} = 100
$$

Step 2: Rearrange into quadratic form:

$$
4x^2 + 21x - 100 = 0
$$

Step 3: Apply quadratic formula:

$$
x = \frac{-21 \pm \sqrt{21^2 - 4 \times 4 \times (-100)}}{2 \times 4}
$$

Calculate discriminant:

$$
\Delta = 441 - 4 \times 4 \times (-100) = 441 + 1600 = 2041
$$

Calculate square root:

$$
\sqrt{2041} \approx 45.17
$$

Calculate solutions:

$$
x = \frac{-21 \pm 45.17}{8}
$$

- First solution:

$$
x = \frac{-21 + 45.17}{8} = \frac{24.17}{8} \approx 3.02
$$

- Second solution:

$$
x = \frac{-21 - 45.17}{8} = \frac{-66.17}{8} \approx -8.27
$$

Result:

The solutions for X are approximately 3.02 and -8.27.

Implications and Real-World Applications

Understanding such algebraic expressions has numerous practical applications:

- Financial calculations: Computing percentages of amounts, such as discounts, interest rates, or tax calculations.
- Engineering: Analyzing relationships between variables in systems, where percentages reflect efficiencies or proportions.
- Data analysis: Transforming variables with percentage adjustments, especially in normalization or scaling.

The ability to manipulate expressions like these allows professionals to model real-world problems accurately and derive meaningful solutions.

Common Pitfalls and Tips for Solving Similar Problems

When tackling problems involving percentages and algebraic expressions, students should be wary of:

- Misinterpreting percentage notation: Remember that 85% equals 0.85.
- Forgetting to convert percentages before calculations: Always convert to decimal form before multiplying.
- Overlooking the order of operations: Simplify expressions step-by-step.
- Misapplying quadratic formula: Ensure coefficients are correctly identified and discriminant calculations are accurate.
- Ignoring extraneous solutions: Check solutions in the original context to confirm their validity.

Tips for success:

- Write down each step explicitly.
- Double-check calculations, especially discriminants and square roots.
- Interpret the problem carefully to understand what is being asked.
- Use graphing tools or calculators for complex quadratic solutions.

Conclusion: The Significance of Solving for X in Percentage-Related Expressions

The problem "Find The Value Of X.85% (4x + 21)x = [?]" exemplifies the intersection of percentage calculations and algebraic manipulation. Whether approached through direct algebra, quadratic solutions, or contextual interpretation, such problems reinforce fundamental mathematical skills essential in academic and real-world contexts.

By understanding how to convert percentages, simplify algebraic expressions, and apply the quadratic formula, learners develop a robust toolkit for solving a wide range of mathematical challenges. As we have seen through detailed analysis and concrete examples, solving for X not only yields a numerical answer but also deepens comprehension of how percentages and algebraic formulas intertwine.

In essence, mastering such problems enhances critical thinking, analytical reasoning, and numerical literacy—skills indispensable in today's data-driven world.

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