*Q1: Solve For X.(8x + 2)(9x + 3)

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Mathematics is a fundamental subject that underpins many scientific and practical applications. Among the core topics in algebra, solving equations involving polynomials and binomials is essential for developing problem-solving skills and understanding advanced mathematical concepts. One common type of problem involves solving for an unknown variable, often represented as "x," within algebraic expressions.

In this article, we will explore the problem: **Q1: Solve For X.(8x + 2)(9x + 3)**. We will discuss the necessary algebraic principles, step-by-step methods to find the value of x, and tips for mastering similar problems. Whether you're a student preparing for exams or an enthusiast looking to strengthen your algebra skills, this comprehensive guide aims to provide clarity and confidence.

Understanding the Problem: What Does "Solve For X" Mean?

Before diving into the solution, it’s crucial to understand what "solve for x" entails. In algebra, solving for x means finding the value or values of the variable x that make the equation true. Typically, problems will present an expression or equation involving x, and the goal is to isolate x on one side of the equation.

In the case of the expression **(8x + 2)(9x + 3)**, the problem often involves either simplifying the expression or setting it equal to a value (like zero) and solving for x. Since the problem states "Solve For X," it generally implies an equation where this expression equals some value, often zero or a specific number.

For example, a typical problem might be:

- Example 1: Solve for x in the equation $(8x + 2)(9x + 3) = 0$
- Example 2: Simplify the expression $(8x + 2)(9x + 3)$ and solve for x if it equals a certain value.

In this guide, we'll focus on the most common interpretation: solving for x when the expression equals zero, which is a fundamental step in algebra.

Step-by-Step Approach to Solving (8x + 2)(9x + 3) = 0

To solve the equation (8x + 2)(9x + 3) = 0, we utilize the Zero Product Property, which states that if the product of two factors is zero, then at least one of the factors must be zero.

Step 1: Set Each Factor Equal to Zero

Given:

(8x + 2)(9x + 3) = 0

Apply the Zero Product Property:

- 8x + 2 = 0
- 9x + 3 = 0

Step 2: Solve Each Equation Separately

Equation 1: 8x + 2 = 0

- Subtract 2 from both sides:

8x = -2

- Divide both sides by 8:

x = -2 / 8

- Simplify:

x = -1/4

Equation 2: 9x + 3 = 0

- Subtract 3 from both sides:

9x = -3

- Divide both sides by 9:

x = -3 / 9

- Simplify:

x = -1/3

Solution Summary:

The solutions to the equation $(8x + 2)(9x + 3) = 0$ are:

- $x = -1/4$
- $x = -1/3$

These are the values of x that satisfy the original equation.

Extending Beyond Zero: Solving for X When the Expression Equals a Number

Often, you might encounter problems where $(8x + 2)(9x + 3)$ equals a specific number other than zero. For example:

- $(8x + 2)(9x + 3) = k$, where k is a constant.

To solve such equations, the general steps include:

Step 1: Expand the Expression

Use the distributive property (FOIL method for binomials):

$(8x + 2)(9x + 3) = 8x\ 9x + 8x\ 3 + 2\ 9x + 2\ 3$

Calculations:

- $8x\ 9x = 72x^2$
- $8x\ 3 = 24x$
- $2\ 9x = 18x$
- $2\ 3 = 6$

Combine:

$72x^2 + (24x + 18x) + 6 = 72x^2 + 42x + 6$

Step 2: Set the Expanded Expression Equal to the Given Number

Suppose the equation is:

$72x^2 + 42x + 6 = k$

Step 3: Rearrange to Standard Quadratic Form

Subtract k from both sides:

$72x^2 + 42x + (6 - k) = 0$

This is a quadratic equation in x, which can be solved using:

- Factoring (if possible)
- Completing the square
- Quadratic formula

Step 4: Apply the Quadratic Formula

The quadratic formula:

$x = [-b \pm \sqrt{(b^2 - 4ac)}] / (2a)$

Where:

- $a = 72$
- $b = 42$
- $c = 6 - k$

Substitute these values to find the solutions.

How to Simplify and Solve the Quadratic Equation

Let's suppose the specific value k = 0 (as in the initial problem). The quadratic becomes:

$72x^2 + 42x + 6 = 0$

Divide the entire equation by the greatest common factor if needed to simplify calculations.

Step 1: Simplify the coefficients:

- Both 72, 42, and 6 are divisible by 6:

$(72/6)x^2 + (42/6)x + (6/6) = 0$

Results in:

$12x^2 + 7x + 1 = 0$

Step 2: Apply quadratic formula:

$a = 12, b = 7, c = 1$

Calculate the discriminant:

$D = b^2 - 4ac = 7^2 - 4 12 1 = 49 - 48 = 1$

Since $D > 0$, there are two real solutions:

$x = [-7 \pm \sqrt{1}] / (2 12)$

Calculate:

$x = [-7 \pm 1] / 24$

Solution 1:

$x = (-7 + 1) / 24 = (-6) / 24 = -1/4$

Solution 2:

$x = (-7 - 1) / 24 = (-8) / 24 = -1/3$

These solutions match the earlier solutions, confirming the process.

Common Mistakes and Tips for Solving Such Problems

When tackling algebraic problems involving binomials like $(8x + 2)(9x + 3)$, students often make mistakes. Here are common pitfalls and how to avoid them:

1. Forgetting to Use the Zero Product Property

- Tip: Always check if the equation equals zero before applying the property. Remember, (factor) = 0 only when the entire product equals zero.

2. Incorrect Expansion of Binomials

- Tip: Use the FOIL method carefully:

- First: $8x 9x = 72x^2$
- Outer: $8x 3 = 24x$
- Inner: $2 9x = 18x$
- Last: $2 3 = 6$

- Combine like terms correctly: $24x + 18x = 42x$

3. Simplification Errors

- Always simplify fractions and coefficients.

4. Misapplying the Quadratic Formula

- Double-check the values of a, b, c.
- Compute the discriminant carefully.
- Simplify radicals correctly.

5. Ignoring Multiple Solutions

- Remember that quadratic equations can have two solutions.
- Always list all solutions after solving.

Practice Problems to Master Solving (8x + 2)(9x + 3) Equations

Practice is crucial to mastering algebraic solving techniques. Here are some problems to try:

1. Solve for x: (8x + 2)(9x + 3) = 0

2. Solve for x: (8x + 2)(9x + 3) = 72

3. Find all x such that (8x + 2)(9x + 3) = 18

4. If (8x + 2)(9x + 3) = 0, what are the solutions?

5. Expand and then solve: (8x + 2)(9x + 3) = 100

Conclusion: Mastering the Art of Solving Binomial Equations

Understanding how to solve equations like (8x + 2)(9x + 3) is fundamental for progressing in algebra and higher mathematics. The key steps involve expanding the binomials, setting the expression equal to a value (comm

Frequently Asked Questions

How do I expand the expression (8x + 2)(9x + 3)?

To expand (8x + 2)(9x + 3), apply the distributive property (FOIL): 8x 9x + 8x 3 + 2 9x + 2 3, which simplifies to 72x^2 + 24x + 18x + 6. Combining like terms gives 72x^2 + 42x + 6.

What is the value of X if (8x + 2)(9x + 3) equals zero?

Set each factor equal to zero: 8x + 2 = 0 or 9x + 3 = 0. Solving these gives x = -⅓ or x = -½.

Can I factor (8x + 2)(9x + 3) further?

Since the expression is already factored as the product of two binomials, further factoring isn't necessary unless you want to factor out common factors. For example, factor out 2 from 8x + 2 to get 2(4x + 1), and 3 from 9x + 3 to get 3(3x + 1), but the original form is acceptable.

How is solving for X different when dealing with expanded versus factored forms?

When the expression is expanded, you typically set the quadratic equal to zero and solve using factoring, quadratic formula, or completing the square. When factored, you set each factor equal to zero directly, making solving for X more straightforward.

What real-world problems can be modeled using the expression (8x + 2)(9x + 3)?

This type of expression can model scenarios involving the multiplication of two linear quantities, such as calculating total area when dimensions depend linearly on a variable, or combined costs where each component varies linearly with X.

Additional Resources

Q1: Solve For X.(8x + 2)(9x + 3)

Mathematics often presents puzzles that challenge our understanding of algebraic principles. One such problem is the expression (8x + 2)(9x + 3), which invites us to find the value of x that satisfies certain conditions—or to simply expand and simplify the expression itself. In this article, we will delve into the process of solving for x, exploring the steps in detail, understanding the underlying concepts, and providing clarity on how to approach similar algebraic expressions.

Understanding the Expression

Before jumping into calculations, it’s essential to understand what the expression (8x + 2)(9x + 3) represents.

The Nature of the Expression

- Product of Binomials: The expression is a product of two binomials, each containing the variable x. Binomials are algebraic expressions with two terms.
- Variables and Coefficients: The terms include constants (numbers) and the variable x, multiplied by coefficients 8 and 9, respectively.

The Goal of the Problem

Given this expression, the typical objectives are:

- To expand the expression into a simplified quadratic form.
- To solve for x if the expression is set equal to a value or zero.
- To analyze the roots or solutions of the resulting quadratic.

In this context, since the problem is posed as "Solve for x", it implies we are to find the value(s) of x that satisfy a certain condition, often the equation:

$(8x + 2)(9x + 3) = 0$

or perhaps, the expanded form equated to some value. For the purpose of this article, we'll assume the goal is to find the x values that make the expression equal to zero, which is a common interpretation in algebra.

Step 1: Expand the Binomials

The first crucial step is to expand $(8x + 2)(9x + 3)$ into a quadratic expression, which involves applying the distributive property, often called FOIL (First, Outer, Inner, Last).

Applying the FOIL Method

1. First Terms: Multiply the first terms of each binomial:
- $8x\ 9x = 72x^2$

2. Outer Terms: Multiply the outer terms:
- $8x\ 3 = 24x$

3. Inner Terms: Multiply the inner terms:
- $2\ 9x = 18x$

4. Last Terms: Multiply the last terms:
- $2\ 3 = 6$

Combining the Results

Adding all these together, we get:

$72x^2 + 24x + 18x + 6$

Now, combine like terms:

- $24x + 18x = 42x$

Resulting quadratic expression:

$72x^2 + 42x + 6$

Step 2: Setting the Equation to Zero

If the goal is to solve for x when the expression equals zero, the equation becomes:

$72x^2 + 42x + 6 = 0$

This is a quadratic equation, and solving it involves methods such as factoring, completing the square, or applying the quadratic formula. Given the coefficients, the quadratic formula is most straightforward.

Step 3: Applying the Quadratic Formula

The quadratic formula provides solutions for any quadratic equation in the form:

$ax^2 + bx + c = 0$

The solutions are:

$x = [-b \pm \sqrt{(b^2 - 4ac)}] / (2a)$

Identifying Coefficients

From our quadratic:

- $a = 72$
- $b = 42$
- $c = 6$

Calculating the Discriminant

The discriminant (D) determines the nature of the roots:

$D = b^2 - 4ac$

Calculating each term:

- $b^2 = 42^2 = 1764$
- $4ac = 4\ 72\ 6 = 4\ 432 = 1728$

Therefore:

$D = 1764 - 1728 = 36$

Since $D > 0$, there are two real and distinct solutions.

Step 4: Computing the Roots

Using the quadratic formula:

$x = [-b \pm \sqrt{D}] / (2a)$

Plug in the known values:

$x = [-42 \pm \sqrt{36}] / (2\ 72)$

Calculate the square root:

$\sqrt{36} = 6$

Now, find each solution:

First root:

$x = [-42 + 6] / 144 = (-36) / 144 = -1/4$

Second root:

$x = [-42 - 6] / 144 = (-48) / 144 = -1/3$

Final Answer:

The solutions to the equation $(8x + 2)(9x + 3) = 0$ are:

$x = -1/4$ and $x = -1/3$

Broader Implications and Applications

While the above solution explicitly addresses the case when the expression equals zero, similar techniques are applicable in various contexts:

- Factorization Problems: Recognizing when an expression can be factored directly, saving time.
- Graphing Quadratics: Understanding roots helps in plotting the parabola represented by the quadratic.
- Solving Real-World Problems: Many applications involve setting algebraic expressions equal to certain values to find unknown quantities.

Additional Tips for Solving Similar Problems

- Always expand carefully: Use the FOIL method for binomials to avoid errors.
- Check for common factors: Simplify coefficients before applying the quadratic formula if possible.
- Calculate the discriminant first: It provides insight into the nature of solutions.
- Be precise with arithmetic: Small mistakes can lead to incorrect roots.

Conclusion

The process of solving for x in the expression (8x + 2)(9x + 3) involves systematic expansion, identification of coefficients, application of the quadratic formula, and interpretation of solutions. By breaking down the problem into manageable steps, students and enthusiasts can develop confidence in handling similar algebraic challenges. Whether in academic settings or real-world applications, mastering these fundamental techniques enhances problem-solving skills and builds a solid foundation in algebra.

Remember, the key to success in algebra is patience, precision, and practice. As you encounter more problems like this, your ability to analyze and solve complex expressions will become more intuitive and efficient.

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