Select The Two Values Of X That Are Roots Of This Equation.3x + 1 = 5x

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Understanding how to find the roots of an equation is a fundamental skill in algebra. In this article, we will explore the process of solving the linear equation $3x + 1 = 5x$, identify its roots, and discuss the importance of roots in mathematics. Whether you are a student learning algebra for the first time or someone looking to deepen your understanding, this comprehensive guide will provide clarity and step-by-step instructions.

What Are Roots of an Equation?

Definition of Roots

In algebra, the roots of an equation are the values of the variable that satisfy the equation, making it true when substituted back into the original expression. These solutions are also known as zeros or solutions of the equation.

Why Are Roots Important?

Roots are crucial because they help us understand the behavior of functions, solve real-world problems involving equations, and analyze graphs. For example, in quadratic equations, roots determine the points where the graph intersects the x-axis.

Understanding the Given Equation: 3x + 1 = 5x

Equation Breakdown

The equation $3x + 1 = 5x$ is a linear equation, meaning it graphs as a straight line. Solving for x involves isolating the variable on one side of the equation to find its value(s).

Equation Components

- Coefficients: Numbers multiplying the variable, such as 3 and 5.
- Constant term: The standalone number, 1 in this case.
- Variable: The letter x, representing the unknown we want to find.

Step-by-Step Solution to Find the Roots

Step 1: Write the Original Equation

Start with the given equation:
$$ 3x + 1 = 5x $$

Step 2: Rearrange the Equation

The goal is to gather all terms containing x on one side and constants on the other. To do this, subtract 3x from both sides:
$$ 3x + 1 - 3x = 5x - 3x $$
$$ 1 = 2x $$

Step 3: Isolate the Variable

Divide both sides by 2 to solve for x:
$$ \frac{1}{2} = x $$
or
$$ x = \frac{1}{2} $$

Step 4: Verify the Solution

Substitute $x = \frac{1}{2}$ back into the original equation:
$$ 3 \times \frac{1}{2} + 1 = 5 \times \frac{1}{2} $$
Calculate:
$$ \frac{3}{2} + 1 = \frac{5}{2} $$
Express 1 as $\frac{2}{2}$:
$$ \frac{3}{2} + \frac{2}{2} = \frac{5}{2} $$
Sum:
$$ \frac{5}{2} = \frac{5}{2} $$
Since both sides are equal, $x = \frac{1}{2}$ is a valid root.

Are There Multiple Roots?

Since the original equation is linear, it typically has only one root. Indeed, solving the equation confirms this:
- The only solution is $x = \frac{1}{2}$.

Therefore, this equation has a single root, not two. The phrase "select the two values of x" might be a misunderstanding or a prompt for a different type of equation (like quadratics which can have two roots). For this linear case, only one root exists.

Understanding the Misconception: Why Only One Root?

Linear vs. Quadratic Equations

- Linear equations are first-degree equations with only one solution (except in special cases like infinite solutions).
- Quadratic equations are second-degree equations and can have up to two real roots.

Example of a Quadratic Equation with Two Roots

Consider $x^2 - 5x + 6 = 0$:
- Factoring gives $(x - 2)(x - 3) = 0$
- Roots are $x = 2$ and $x = 3$

In contrast, our original linear equation only yields $x = \frac{1}{2}$.

Graphical Interpretation of the Equation

Graph of the Equation 3x + 1 = 5x

The line represented by the equation intersects the x-axis at the root(s). Since the equation simplifies to $x = \frac{1}{2}$, the graph intersects the x-axis at $x = 0.5$.

Visualizing the Solution

Plotting the line:
- Slope: Derived from the coefficients; rearranged as $y = 3x + 1$
- The line intersects the x-axis where $y = 0$:

$$0 = 3x + 1$$

$$3x = -1$$

$$x = -\frac{1}{3}$$

Note: This is the x-intercept of the line, but not necessarily the solution to the original equation. The original equation is an equality set, and the root is at $x = \frac{1}{2}$.

Alternative Equations with Two Roots

If you are interested in equations with two roots, quadratic equations are the perfect example. Here is a brief overview:

Quadratic Equation Form

$$ ax^2 + bx + c = 0 $$
where $a \neq 0$.

Finding Roots of Quadratic Equations

- Factoring Method
- Quadratic Formula
- Completing the Square

Quadratic Formula

$$
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
$$
The discriminant $D = b^2 - 4ac$ determines the nature of roots:
- If $D > 0$, two real roots.
- If $D = 0$, one real root (a repeated root).
- If $D < 0$, two complex roots.

Summary and Final Thoughts

- The equation $3x + 1 = 5x$ has only one root, which is $x = \frac{1}{2}$.
- Roots are values of x that satisfy the equation.
- Linear equations typically have a single root unless they are inconsistent or identity equations.
- Quadratic and higher-degree equations can have multiple roots, including complex roots.

Key Takeaways

- Always simplify the equation to isolate the variable.
- Verify your solutions by substitution.
- Recognize the differences between linear and quadratic equations and their roots.
- Use appropriate methods (factoring, quadratic formula) for higher-degree equations with multiple roots.

Conclusion

While the initial prompt suggests finding two roots of the equation $3x + 1 = 5x$, the solution confirms only one root exists for this linear equation: $x = \frac{1}{2}$. Understanding the nature of equations and their roots is essential for mastering algebra and solving a wide array of mathematical problems. Remember that the method of solving depends on the type of equation, and accurate verification ensures the correctness of your solutions.

Frequently Asked Questions

What are the roots of the equation 3x + 1 = 5x?

The roots are x = -0.5 and x = 1.

How do you find the values of x that satisfy 3x + 1 = 5x?

Subtract 3x from both sides to get 1 = 2x, then divide both sides by 2 to find x = 0.5.

Are there two roots for the equation 3x + 1 = 5x?

No, the equation has only one solution: x = 0.5.

What is the correct way to solve 3x + 1 = 5x?

Subtract 3x from both sides to get 1 = 2x, then divide both sides by 2 to find x = 0.5.

Can the equation 3x + 1 = 5x have more than one root?

No, it is a linear equation and has only one root, x = 0.5.

What is the value of x that makes 3x + 1 = 5x true?

The value is x = 0.5.

Is x = -0.5 a root of the equation 3x + 1 = 5x?

No, x = -0.5 does not satisfy the equation; the only root is x = 0.5.

How do I verify the root x = 0.5 for 3x + 1 = 5x?

Substitute x = 0.5 into the equation: 3(0.5) + 1 = 5(0.5), which simplifies to 1.5 + 1 = 2.5 and 2.5 = 2.5, so it is a root.

What is the simplified form of the solution for 3x + 1 = 5x?

Simplify to 1 = 2x, then solve for x to get x = 0.5.

Does the equation 3x + 1 = 5x have two roots?

No, it has only one root, x = 0.5, because it's a linear equation.

Additional Resources

Understanding and Solving the Equation: "Select The Two Values Of X That Are Roots Of This Equation. 3x + 1 = 5x"

When approaching algebraic equations, the goal is to find the values of the variable that satisfy the equality. In this case, the given equation is:

\[3x + 1 = 5x \]

This is a linear equation, and the process of solving involves isolating the variable \(x\) on one side of the equation. Before diving into the solution, it's essential to understand what it means for a value of \(x\) to be a root of an equation.

What Does It Mean for a Value of \(x\) to be a Root?

In algebra, a root (or solution) of an equation is a value that, when substituted into the equation, makes the statement true. For the linear equation \(3x + 1 = 5x\), the root(s) are the value(s) of \(x\) that satisfy this equality.

Key Points:
- Roots are the solutions to the equation.
- Substituting a root into the original equation results in a true statement.
- Equations can have one root, multiple roots, or no roots depending on their nature.

Step-by-Step Solution of the Equation \(3x + 1 = 5x\)

Let's proceed with solving this equation systematically.

Step 1: Write Down the Equation
\[
3x + 1 = 5x
\]

Step 2: Bring all terms containing \(x\) to one side
Subtract \(3x\) from both sides:
\[
3x + 1 - 3x = 5x - 3x
\]
Simplifies to:
\[
1 = 2x

$$

Step 3: Solve for x
Divide both sides by 2:
$$
x = \frac{1}{2}
$$

Final Answer:
$$
x = \frac{1}{2}
$$

This indicates that there is only one root for this linear equation, which is $x = \frac{1}{2}$.

Clarifying the Question: "Select The Two Values Of X"

The question asks to select the two values of x that are roots of the given equation. Since the solution process yields only one root, it suggests a few possibilities:

- The question might be a trick or a test to assess understanding.
- The equation might be part of a larger set or an intentionally simplified example.
- It could be referring to the possibility of multiple roots in other types of equations (quadratic, cubic, etc.).

In the context of this linear equation, only one root exists: $x = \frac{1}{2}$. Therefore, the statement about selecting two roots is either incorrect or references a different equation.

Exploring the Nature of Roots in Different Equations

To deepen our understanding, let's explore how roots are determined in various types of equations.

1. Linear Equations:
- Have the form $ax + b = 0$.
- Always have exactly one root (unless the equation reduces to a tautology or contradiction).
- Example: $2x + 3 = 0$ → $x = -\frac{3}{2}$.

2. Quadratic Equations:
- Have the form $ax^2 + bx + c = 0$.
- Can have zero, one, or two real roots depending on the discriminant $D = b^2 - 4ac$.
- $D > 0$: Two real roots.
- $D = 0$: One real root (a repeated root).
- $D < 0$: No real roots (complex roots).

3. Cubic and Higher-Degree Equations:
- Can have up to n roots for an n-degree polynomial.
- Roots may be real or complex, and some may be repeated.

Applying the Concept: Why Only One Root in Our Equation?

Since $3x + 1 = 5x$ is linear:

- Number of roots: Exactly one.
- Solution: $x = \frac{1}{2}$.

The equation is straightforward, and the process of solving confirms that only this value satisfies the equation.

Addressing the Original Question: "Select The Two Values Of X"

Given the nature of the problem, here are important considerations:

- Possibility 1: The question is incorrect or incomplete.

- The equation has only one root; thus, asking for two roots is a trick or a test of understanding.

- Possibility 2: The question aims to assess understanding of equations that have multiple roots.

- For example, in quadratic equations such as $x^2 - 5x + 6 = 0$, roots are $x=2$ and $x=3$.

- Possibility 3: The question is designed to highlight the difference between linear and quadratic equations.

Extending the Problem: What if the Equation Were Different?

Suppose we modify the equation to a quadratic form:

$$
x^2 - 3x - 4 = 0
$$

- To find roots, we factor or use the quadratic formula:

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

where $a=1$, $b=-3$, $c=-4$.

Calculations:

$$
x = \frac{3 \pm \sqrt{(-3)^2 - 4 \times 1 \times (-4)}}{2}

\]
\[
x = \frac{3 \pm \sqrt{9 + 16}}{2}
\]
\[
x = \frac{3 \pm \sqrt{25}}{2}
\]
\[
x = \frac{3 \pm 5}{2}
\]

Thus, the roots are:

- \(x = \frac{3 + 5}{2} = \frac{8}{2} = 4\)
- \(x = \frac{3 - 5}{2} = \frac{-2}{2} = -1\)

In this case, two roots are found, matching the question’s request.

Summary: Key Takeaways for the Equation \(3x + 1 = 5x\)

- The equation is linear, and solving yields only one root: \(x = \frac{1}{2}\).
- The root is unique, so it's not possible to select two roots.
- For equations of higher degree, multiple roots are possible, and solving involves different techniques like factoring, quadratic formula, synthetic division, or numerical methods.
- The question might be testing the understanding that linear equations have only one solution.

Practical Applications and Importance of Roots

Understanding roots is fundamental in many areas of mathematics and applied sciences:

1. Engineering:
- Roots of equations determine system stability, resonance frequencies, etc.

2. Physics:
- Roots indicate points where certain conditions are met, such as zero displacement in oscillations.

3. Economics:
- Roots help find equilibrium points in models.

4. Computer Science:
- Algorithms often involve solving equations to optimize or analyze systems.

Final Thoughts and Recommendations

- When tackling an equation, always identify its degree to determine the maximum number of roots.

- Use appropriate methods: factoring, quadratic formula, completing the square, or numerical approaches.
- Be cautious about the types of solutions expected; linear equations typically have only one solution unless they are identities or contradictions.

Conclusion

In conclusion, for the specific equation:

$$ 3x + 1 = 5x $$

- The only solution is:

$$
x = \frac{1}{2}
$$

- There are not two roots; hence, the instruction to "select the two values of x" seems to be a trick or a misstatement.

- Understanding the nature of the equation and the properties of roots is crucial in algebra and beyond.

- Always verify the solutions by substituting back into the original equation to confirm their validity.

In essence, mastering the process of solving equations and understanding roots forms the backbone of algebra, enabling you to approach more complex mathematical problems with confidence.

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