Select ALL The Correct Answers. Select All Equations That Have The Solution X = 7. 3(x - 5) = 1 + 5(x

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Understanding the Importance of Solving Equations Correctly

Mathematics is a fundamental subject that underpins many fields, from engineering and physics to economics and computer science. Among the core skills in mathematics is solving equations, which involves finding the value(s) of variables that satisfy the given relationships. When dealing with algebraic equations, it's essential to understand the methods for solving and verifying solutions to ensure accuracy.

In this article, we will focus on evaluating multiple equations to determine which ones have the solution x = 7. The core question is: Given a set of equations, which ones are satisfied when x equals 7? Specifically, we will analyze the equation:

$3(x - 5) = 1 + 5(x)$

and other similar equations, to identify all that have x = 7 as a solution.

Step-by-Step Approach to Solving Equations

Before we delve into the specific equations, it's important to understand the general process for solving linear equations:

1. Simplify Both Sides of the Equation

- Expand expressions where necessary.
- Combine like terms to simplify the equation.

2. Isolate the Variable

- Use inverse operations to get the variable terms on one side.
- Move constants to the other side of the equation.

3. Solve for the Variable

- Divide or multiply as needed to solve for the variable.
- Check the solution by substituting it back into the original equation.

4. Verify the Solution

- Substitute the candidate solution into the original equation.
- Confirm whether both sides are equal.

Analyzing the Given Equation: $3(x - 5) = 1 + 5(x)$

Let's apply the steps above to the provided equation to verify whether $x = 7$ is a solution.

Step 1: Expand Both Sides

- Left side: $3(x - 5) = 3x - 15$
- Right side: $1 + 5x$

Step 2: Write the simplified equation

$3x - 15 = 1 + 5x$

Step 3: Rearrange to isolate x

- Subtract $3x$ from both sides:
$(3x - 3x) - 15 = 1 + 5x - 3x$
- Simplifies to:
$-15 = 1 + 2x$

- Subtract 1 from both sides:

-15 - 1 = 2x
- Simplifies to:
-16 = 2x

- Divide both sides by 2:
x = -8

Step 4: Verify if x = 7 satisfies the equation

- Substitute x = 7 into the original:
Left: 3(7 - 5) = 3(2) = 6
Right: 1 + 5(7) = 1 + 35 = 36

- Since 6 ≠ 36, x = 7 is not a solution.

Conclusion: The equation 3(x - 5) = 1 + 5(x) has the solution x = -8, not x = 7.

Evaluating Multiple Equations for x = 7

Suppose we are given a set of equations, and need to identify which equations are satisfied when x = 7. Here are some common types of equations you might encounter:

1. Linear equations in one variable
2. Quadratic equations
3. Rational equations
4. Absolute value equations
5. Equations with special structures

In this context, we will focus on linear equations similar to the main example. Let's consider some sample equations and analyze whether x = 7 solves them.

Sample Equations and Their Solutions

Equation 1: 2x + 3 = 17

- To verify if x = 7 is a solution:
- Substitute x = 7:
2(7) + 3 = 14 + 3 = 17
- Since both sides equal 17, x = 7 is a solution.

Equation 2: 4x - 5 = 25

- Substitute x = 7:
4(7) - 5 = 28 - 5 = 23
- Since 23 ≠ 25, x = 7 is not a solution.

Equation 3: x/2 + 3 = 6.5

- Substitute x = 7:
7/2 + 3 = 3.5 + 3 = 6.5
- Both sides equal 6.5, so x = 7 is a solution.

Equation 4: 3(x - 5) = 1 + 5x

- As previously calculated, x = -8 is the solution.
- Therefore, x = 7 is not a solution here.

Equation 5: 5x - 10 = 25

- Substitute x = 7:
5(7) - 10 = 35 - 10 = 25
- Both sides equal 25, so x = 7 is a solution.

Equation 6: 6x + 4 = 46

- Substitute x = 7:
6(7) + 4 = 42 + 4 = 46
- Both sides equal 46, so x = 7 is a solution.

Equation 7: $x^2 - 49 = 0$

- Substitute $x = 7$:
$7^2 - 49 = 49 - 49 = 0$
- The equation is satisfied, so $x = 7$ is a solution.

Equation 8: $x/3 = 2$

- Substitute $x = 7$:
$7/3 \neq 2$
- Therefore, $x = 7$ is not a solution.

Summary of Which Equations Have $x = 7$ as a Solution

Based on the tests above, the equations that are satisfied when $x = 7$ are:

- $2x + 3 = 17$
- $x/2 + 3 = 6.5$
- $5x - 10 = 25$
- $6x + 4 = 46$
- $x^2 - 49 = 0$

The equations that are not satisfied when $x = 7$ are:

- $4x - 5 = 25$
- $3(x - 5) = 1 + 5x$
- $x/3 = 2$

Understanding How to Verify Solutions Systematically

Verifying whether a candidate solution works involves substituting that value into the original equation and checking for equality. Here are some tips:

1. Always write down the original equation clearly.
2. Substitute the candidate value carefully, respecting order of operations.
3. Calculate both sides separately to avoid errors.
4. Check if both sides are equal within acceptable margins of error (especially for decimal approximations).
5. If both sides are equal, the candidate solution is valid.
6. If not, discard the candidate and try to solve for the variable explicitly.

Strategies for Solving Equations in Practice

While verifying solutions is straightforward, solving equations often requires strategic approaches to simplify the process and avoid mistakes.

1. Expand and Simplify

- Always expand parentheses first.
- Combine like terms to simplify the equation.

2. Use Inverse Operations

- Addition and subtraction to move constants.

- Multiplication and division to isolate the variable.

3. Check for Special Cases

- Zero denominators in rational equations.
- Negative signs and their impact on the solution.
- Absolute value equations which might have multiple solutions.

4. Use Graphical Methods

- Plotting equations can give visual confirmation of solutions.
- Particularly helpful for complex equations or systems.

5. Use Algebraic Techniques

- Factoring quadratics or higher-degree polynomials.
- Applying quadratic formula when necessary.
- Using substitution or elimination in systems of equations.

Common Mistakes to Avoid When Solving Equations

Identifying and avoiding errors is crucial for accurate solutions:

- Forgetting to distribute multiplication over parentheses.