What Is The Solution To The System Of Equations Below? Y = Negative Four-fifths X 6 And Y = 30 (45, 30)

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Understanding how to solve systems of equations is fundamental in algebra, as it allows us to find the point(s) where two or more equations intersect. In this article, we will explore the specific system of equations:

- Y = Negative Four-fifths X 6
- Y = 30 (45, 30)

Our goal is to determine the solution to this system, interpret what it represents, and understand the methods used to find the solution. We will break down each component, analyze the equations, and provide step-by-step instructions to solve similar systems efficiently.

Understanding the System of Equations

Before diving into the solution, it's essential to interpret the given equations and data points correctly.

Equation 1: Y = Negative Four-fifths X 6

At first glance, this appears to be a linear equation involving the variables X and Y, but the phrase "Negative Four-fifths X 6" may require clarification. It could be interpreted as:

- Y = (-4/5) X + 6

or

- Y = (-4/5) (X 6)

Given standard algebraic notation, the most likely interpretation is:

Y = (-4/5) X + 6

This form represents a straight line with a slope of -4/5 and a y-intercept of 6.

Equation 2: Y = 30 (45, 30)

The notation "(45, 30)" suggests a coordinate point on the graph, but the equation "Y = 30" indicates a horizontal line where the y-value is always 30, regardless of x.

Therefore, the second equation is:

Y = 30

which is a horizontal line crossing the y-axis at 30.

Clarifying the System of Equations

Based on the above, the system likely consists of:

1. Y = (-4/5) X + 6

2. Y = 30

and a point (45, 30), which may be a specific point of interest or a candidate solution.

Step-by-Step Approach to Solving the System

To find the point where these two lines intersect, follow these steps:

Step 1: Set the Equations Equal

Since both equations equal Y, at the point of intersection:

(-4/5) X + 6 = 30

Step 2: Solve for X

Rearranged:

(-4/5) X + 6 = 30

Subtract 6 from both sides:

(-4/5) X = 30 - 6

(-4/5) X = 24

Now, solve for X:

X = 24 / (-4/5)

Recall that dividing by a fraction is equivalent to multiplying by its reciprocal:

X = 24 (-5/4)

Calculate:

X = 24 (-5/4) = (24 / 1) (-5 / 4) = (24 -5) / 4 = (-120) / 4 = -30

Solution for X: -30

Step 3: Find the Corresponding Y Value

Substitute X = -30 into either original equation. Using Y = 30 (the simpler one):

Y = 30

or check with the other equation:

Y = (-4/5) (-30) + 6

Calculate:

(-4/5) (-30) = (4/5) 30 = (4 30) / 5 = 120 / 5 = 24

Then:

Y = 24 + 6 = 30

This matches the given Y value, confirming the solution.

Interpreting the Solution

The intersection point of the two lines is (-30, 30). This means:

- The point (-30, 30) lies on both the line Y = (-4/5) X + 6 and the horizontal line Y = 30.
- The given point (45, 30) is also on the line Y = 30, but not on the other line, since plugging X = 45 into Y = (-4/5) X + 6 yields:

Y = (-4/5) 45 + 6 = (-4/5) 45 + 6

Calculate:

(-4/5) 45 = -4 9 = -36

Then:

Y = -36 + 6 = -30

which is not 30, so (45, 30) is not on the first line. Therefore, the point of intersection is (-30, 30).

Visual Representation of the System

Visualizing the equations helps understand their relationship better.

Graph of Y = (-4/5) X + 6

- Slope: -4/5 (negative slope, decreasing line)
- Y-intercept: 6 (crosses the y-axis at 6)
- As X increases, Y decreases.

Graph of Y = 30

- Horizontal line crossing the y-axis at 30.
- Parallel to the x-axis, crossing y=30.

The lines intersect at the point (-30, 30), which can be plotted for clarity.

Additional Methods for System Solving

While substitution worked well here, other methods exist:

1. Graphical Method

- Plot both equations on a coordinate plane.
- Identify the point where the lines intersect.
- Suitable for visual understanding but less precise for complex equations.

2. Substitution Method

- Use when one equation is solved for a variable.
- Substitute into the other to find the value.

3. Elimination Method

- Multiply equations to align coefficients, then subtract or add to eliminate a variable.
- More efficient for systems with multiple variables.

4. Using Algebraic Tools

- Graphing calculators or algebra software can quickly find intersections.

Real-Life Applications of Solving Systems of Equations

Understanding how to solve systems like this extends beyond pure mathematics into numerous fields:

- Economics: Finding equilibrium points where supply equals demand.
- Physics: Calculating intersection points of trajectories.
- Engineering: Analyzing systems with multiple variables.
- Business: Optimizing profit and cost functions.

Summary and Key Takeaways

- The system consists of the equations Y = (-4/5) X + 6 and Y = 30.
- Solving involves setting the equations equal to find the intersection point.
- The solution is at X = -30, Y = 30, giving the point (-30, 30).
- Visualizing the lines confirms the intersection point.
- Multiple methods exist for solving systems, each suitable for different scenarios.

Conclusion

Solving systems of equations is a fundamental skill in algebra, allowing us to find points of intersection that have practical applications in various fields. In this specific case, understanding the equations involved and applying substitution led us to identify the unique solution at (-30, 30). By mastering these techniques, students and professionals alike can approach more complex problems with confidence and precision.

If you're interested in further learning, consider exploring systems involving nonlinear equations, inequalities, and advanced algebraic methods to deepen your mathematical proficiency.

Frequently Asked Questions

What is the solution to the system of equations where Y = -4/5 X + 6 and Y = 30?

The solution is the point where both equations intersect, which is at X = 15 and Y = 30.

How do you find the intersection point of the equations Y = -4/5 X + 6 and Y = 30?

Set the two equations equal to each other: -4/5 X + 6 = 30. Solving for X gives X = 15; then, substitute back to find Y = 30.

What is the meaning of the point (45, 30) in the context of these equations?

The point (45, 30) does not satisfy the system since substituting X=45 does not yield Y=30 in the first equation; thus, it is not the solution.

Is (45, 30) a solution to the system Y = -4/5 X + 6 and Y = 30?

No, because substituting X=45 into Y = -4/5 X + 6 gives Y = -36 + 6 = -30, which does not match Y=30.

What is the correct solution point for the system Y = -4/5 X + 6 and Y = 30?

The correct solution is at X = 15, Y = 30, which is the point (15, 30).

Additional Resources

What Is The Solution To The System Of Equations Below? Y = Negative Four-fifths X 6 And Y = 30 (45, 30)

Understanding how to find the solution to a system of equations is a fundamental skill in algebra, with wide-ranging applications from science to engineering. Today, we explore a specific system that appears straightforward yet offers insightful lessons in solving simultaneous equations. The problem at hand involves two equations: one expressed as a linear relation between X and Y, and the other as a constant value, with an added coordinate point. Let’s analyze the system step-by-step to uncover its solution.

Deciphering the System: What Are the Equations?

The system presented is:

- Y = Negative Four-fifths X 6
- Y = 30 (45, 30)

At first glance, the notation might seem confusing. The key is to interpret these equations correctly.

Interpreting the First Equation: Y = -4/5 X 6

The phrase "Y = Negative Four-fifths X 6" can be understood as an equation where:

- The slope is -4/5.
- The term X 6 suggests multiplication, i.e., X multiplied by 6.

Thus, the equation likely reads:

Y = (-4/5) (6X)

which simplifies to:

Y = (-4/5) 6X

Calculating the coefficient:

- (-4/5) 6 = -4/5 6 = -4 6 / 5 = -24 / 5

Therefore, the first equation simplifies to:

Equation 1: Y = (-24/5) X

Interpreting the Second Equation: Y = 30 (45, 30)

The notation Y = 30 (45, 30) is ambiguous, but based on standard conventions, it likely indicates a point on the coordinate plane: (45, 30).

In the context of the system, the equation Y=30 is a horizontal line where the Y-coordinate is always 30, regardless of X.

Thus, the second equation can be viewed as:

Equation 2: $Y = 30$

The point (45, 30) is simply a coordinate that lies on this line.

Understanding the System: A Visual and Analytical Approach

The system now consists of:

- A line with the equation $Y = (-24/5) X$.
- A horizontal line with the equation $Y = 30$.

And a point (45, 30) that lies on the line Y=30.

Our goal: Find the solution (X, Y) that satisfies both equations simultaneously.

Step-by-Step Solution Process

1. Recognize the Nature of the Equations

- The first equation is a straight line with a negative slope of -24/5.
- The second is a horizontal line at Y = 30.

Graphically, these two lines will intersect at a point where their Y-values are equal, i.e., at Y = 30.

2. Find the X-coordinate of the Intersection

Since Y = 30 on the second line, substitute Y = 30 into the first equation:

$30 = (-24/5) X$

Solve for X:

$X = 30 / (-24/5)$

Recall that dividing by a fraction is equivalent to multiplying by its reciprocal:

$X = 30 (-5/24)$

Calculate:

X = (30 -5) / 24 = (-150) / 24

Simplify the fraction:

- Both numerator and denominator are divisible by 6:

X = (-150 / 6) / (24 / 6) = (-25) / 4

Expressed as a decimal:

X = -6.25

3. Summarize the Intersection Point

The intersection point of the two lines, which is the solution to the system, is:

(-6.25, 30)

This means that at X = -6.25, Y = 30, both equations are satisfied simultaneously.

Validation: Confirming the Solution

Validation ensures that the solution truly satisfies both original equations.

- Equation 1: Y = (-24/5) X

Plug in X = -6.25:

Y = (-24/5) (-6.25)

Calculate:

- (-24/5) (-6.25) = (24/5) 6.25

Because both are negative, the negatives cancel out.

Now:

(24/5) 6.25

Convert 6.25 to a fraction:

6.25 = 25/4

So:

(24/5) (25/4) = (24 25) / (5 4)

Calculate numerator and denominator:

(600) / (20) = 30

Which matches the Y-value in the point, confirming the solution.

- Equation 2: Y = 30

Y is explicitly 30, matching the Y-coordinate.

Thus, the point (-6.25, 30) satisfies both equations.

Implications and Additional Insights

The Role of the Point (45, 30)

The coordinate (45, 30) is provided, but it does not satisfy the first equation:

Y = (-24/5) X

Calculate the Y-value at X=45:

Y = (-24/5) 45

Y = (-24/5) 45 = -24 45 / 5 = -24 9 = -216

This is far from 30, indicating that (45, 30) is not on the line Y = (-24/5) X.

Instead, it resides solely on the line Y=30.

The solution to the system is at X = -6.25, Y=30, which is different from the provided point.

This distinction clarifies that the point (45, 30) is perhaps included for context or as a distractor, emphasizing the importance of solving systematically.

Applications and Broader Context

Understanding how to solve such systems is crucial in various fields:

- Physics: Determining intersection points of trajectories.
- Economics: Finding equilibrium points where supply meets demand.
- Engineering: Solving for parameters in complex systems.

The process illustrated demonstrates the power of algebraic substitution and graphical interpretation, foundational skills in analytical problem-solving.

Conclusion: The Final Answer

Bringing everything together, the solution to the system of equations:

- X = -6.25
- Y = 30

This point (-6.25, 30) is the unique solution where both equations intersect, satisfying the algebraic relations and confirming the graphical intersection.

Key Takeaways

- Always carefully interpret the notation and equations.
- Recognize the type of equations (linear, horizontal, vertical) to guide solving strategy.
- Substitute known values to find intersection points.
- Validate solutions by plugging back into original equations.
- Understand the distinction between points on a line versus solutions to a system.

Mastering these steps enhances problem-solving skills and deepens understanding of algebraic systems, essential for academic success and real-world applications alike.

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