Solve The Following Simultaneous EquationUsing Any Suitable Method X+6y=2, 3x +2y =10

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When dealing with systems of equations, solving simultaneous equations is a fundamental skill in algebra that enables us to find the values of unknown variables. The system provided—X + 6y = 2 and 3x + 2y = 10—can be approached using various methods, each suitable depending on the specific problem and the user's preference. These methods include substitution, elimination, and graphing. In this comprehensive guide, we will explore each method in detail, providing step-by-step instructions, examples, and tips to efficiently solve the system.

Understanding the System of Equations

Before diving into solving methods, it is essential to understand what a system of simultaneous equations entails.

What Are Simultaneous Equations?

Simultaneous equations are a set of two or more equations with the same variables. The goal is to find the values of these variables that satisfy all equations at once.

Given Equations:

$$
\begin{cases}
X + 6y = 2 \quad \text{(Equation 1)} \\
3x + 2y = 10 \quad \text{(Equation 2)}
\end{cases}
$$

Our task is to find the values of X and y that satisfy both equations simultaneously.

Choosing the Suitable Method

The choice of method depends on factors such as the structure of the equations and personal preference. The three common methods are:

1. **Substitution Method**
2. **Elimination Method**

3. **Graphical Method**

In this guide, we will detail each method, weighing their advantages and providing step-by-step procedures.

Method 1: Substitution Method

The substitution method involves solving one of the equations for one variable and substituting this into the other equation.

Steps for Substitution Method:

1. Choose an equation to express one variable in terms of the other. Typically, it’s easier to pick an equation where the variable has a coefficient of 1.
2. Solve for that variable.
3. Substitute this expression into the other equation.
4. Solve the resulting equation for the remaining variable.
5. Back-substitute to find the other variable.

Applying the Method to Our System:

Step 1: Solve Equation 1 for X

$$
X + 6y = 2 \Rightarrow X = 2 - 6y
$$

Step 2: Substitute into Equation 2

$$
3x + 2y = 10
$$

Replace X with $(2 - 6y)$:

$$
3(2 - 6y) + 2y = 10
$$

Step 3: Simplify and solve for y

$$
6 - 18y + 2y = 10
$$

\[

$$
6 - 16y = 10
$$
$$
-16y = 10 - 6
$$
$$
-16y = 4
$$
$$
y = -\frac{4}{16} = -\frac{1}{4}
$$

Step 4: Find X using the value of y

$$
X = 2 - 6(-\frac{1}{4}) = 2 + \frac{6}{4} = 2 + \frac{3}{2} = 2 + 1.5 = 3.5
$$

Final Solution:

$$
X = 3.5, \quad y = -\frac{1}{4}
$$

Method 2: Elimination Method

The elimination method aims to eliminate one variable by adding or subtracting the equations after suitable multiplication to align coefficients.

Steps for Elimination Method:

1. Adjust the equations so that the coefficients of one variable are opposites.
2. Add or subtract the equations to eliminate that variable.
3. Solve for the remaining variable.
4. Back-substitute to find the other variable.

Applying the Method to Our System:

Step 1: Prepare the equations for elimination

Equation 1: $X + 6y = 2$

Equation 2: $3x + 2y = 10$

To align coefficients, multiply Equation 1 by 3:

$$
3X + 18y = 6
$$

Now, the system becomes:

$$
\begin{cases}
3X + 18y = 6 \quad \text{(Equation 3)} \\
3X + 2y = 10 \quad \text{(Equation 2)}
\end{cases}
$$

Step 2: Subtract Equation 2 from Equation 3 to eliminate X

$$
(3X + 18y) - (3X + 2y) = 6 - 10
$$

$$
3X - 3X + 18y - 2y = -4
$$

$$
0 + 16y = -4
$$

$$
y = -\frac{4}{16} = -\frac{1}{4}
$$

Step 3: Substitute y into one of the original equations

Using Equation 1:

$$
X + 6(-\frac{1}{4}) = 2
$$

$$
X - \frac{6}{4} = 2
$$

$$
X - \frac{3}{2} = 2
$$

$$
X = 2 + \frac{3}{2} = 2 + 1.5 = 3.5
$$

Final Solution:

$$
X = 3.5, \quad y = -\frac{1}{4}
$$

Note: Both methods yield the same solution, confirming their correctness.

Method 3: Graphical Method

The graphical method involves plotting both equations on a coordinate plane and identifying the point of intersection.

Steps for Graphical Method:

1. Rewrite each equation in slope-intercept form $y = mx + c$.
2. Plot both lines on the same graph.
3. Identify the point where the lines intersect; the coordinates of this point are the solution.

Applying the Method to Our System:

Step 1: Rewrite equations in slope-intercept form

Equation 1:

$$
X + 6y = 2
$$

$$
6y = 2 - X
$$

$$
y = \frac{2 - X}{6} = -\frac{1}{6}X + \frac{1}{3}
$$

Equation 2:

$$
3x + 2y = 10
$$

$$
2y = 10 - 3x
$$

$$
y = -\frac{3}{2}x + 5
$$

Step 2: Plot the lines

Plot the lines based on their slope and intercept:

- Line 1: $y = -\frac{1}{6}X + \frac{1}{3}$
- Line 2: $y = -\frac{3}{2}X + 5$

Step 3: Find the intersection point

Graphically, the intersection point is where the two lines cross. To find this analytically, set the two expressions for y equal:

$$
-\frac{1}{6}X + \frac{1}{3} = -\frac{3}{2}X + 5
$$

Multiply through by 6 to clear denominators:

$$
- X + 2 = -9X + 30
$$

Bring all terms to one side:

$$
- X + 2 + 9X - 30 = 0
$$

$$
8X - 28 = 0
$$

$$
8X = 28
$$

$$
X = \frac{28}{8} = \frac{7}{2} = 3.5
$$

Substitute X back into one of the equations:

$$
y = -\frac{1}{6} \times 3.5 + \frac{1}{3}
$$

$$
y = -\frac{3.5}{6} + \frac{1}{3} = -\frac{7}{12} + \frac{1}{3}
$$

$$
\frac{1}{3} = \frac{4}{12}
$$

$$
y = -
$$

Frequently Asked Questions

What method can be used to solve the simultaneous equations X + 6Y = 2 and 3X + 2Y = 10?

You can use substitution, elimination, or matrix methods such as Cramer's rule to solve these equations.

How do you solve the simultaneous equations X + 6Y = 2 and 3X + 2Y = 10 using elimination?

Multiply the first equation by 3 to get 3X + 18Y = 6, then subtract the second equation (3X + 2Y = 10) to eliminate X and solve for Y.

What is the solution to the system of equations X + 6Y = 2 and 3X + 2Y = 10?

The solution is X = 4, Y = -1/3.

Can substitution be used to solve these equations? If

so, how?

Yes. Solve one equation for one variable (e.g., X = 2 - 6Y), then substitute into the other to find Y, and then find X.

What are the steps to solve the equations using the substitution method?

First, express X in terms of Y from the first equation: X = 2 - 6Y. Substitute into the second equation: 3(2 - 6Y) + 2Y = 10. Solve for Y, then find X.

Is it possible to solve these equations graphically? How?

Yes. Plot both equations on a graph and identify the point of intersection, which gives the solution (X, Y).

What is the importance of choosing a suitable method for solving simultaneous equations?

Choosing the appropriate method simplifies calculations, reduces errors, and makes solving more efficient depending on the specific equations.

How do you verify the solution obtained for the simultaneous equations?

Substitute the values of X and Y back into both original equations to check if they satisfy both equations.

Additional Resources

Solve The Following Simultaneous Equation Using Any Suitable Method: X + 6y = 2, 3x + 2y = 10

When tackling systems of simultaneous equations, understanding the various methods available to find solutions is crucial for both students and professionals alike. In this comprehensive guide, we will explore how to solve the simultaneous equations X + 6y = 2 and 3x + 2y = 10 using multiple approaches, including substitution, elimination, and graphical methods. By the end of this article, you'll have a clear understanding of each method's advantages, step-by-step instructions, and when to apply them effectively.

Understanding the Problem

The problem involves solving two linear equations:

1. X + 6y = 2
2. 3x + 2y = 10

Our goal is to find the values of x and y that satisfy both equations simultaneously. These equations represent straight lines on a coordinate plane, and their solution corresponds to the point where these lines intersect.

Why Multiple Methods?

Different methods for solving simultaneous equations can be advantageous depending on the specific system:

- Substitution Method: Useful when one of the equations is easily rearranged to express one variable in terms of the other.
- Elimination Method: Effective when coefficients are aligned to cancel out one variable.
- Graphical Method: Provides a visual understanding of the solution, especially for real-world applications.

We'll explore each method in detail, starting with substitution.

Solving by Substitution Method

Step 1: Rearrange one equation to express one variable in terms of the other

Let's choose the first equation:

$X + 6y = 2$

Rearranged for x:

$x = 2 - 6y$

Step 2: Substitute this expression into the second equation

The second equation is:

$3x + 2y = 10$

Substitute $x = 2 - 6y$:

$3(2 - 6y) + 2y = 10$

Step 3: Simplify and solve for y

Distribute the 3:

$6 - 18y + 2y = 10$

Combine like terms:

$6 - 16y = 10$

Subtract 6 from both sides:

$-16y = 4$

Divide both sides by -16:

$y = -\frac{1}{4}$

Step 4: Find x using the value of y

Recall:

$x = 2 - 6y$

Substitute $y = -\frac{1}{4}$:

$x = 2 - 6\left(-\frac{1}{4}\right) = 2 + \frac{6}{4} = 2 + \frac{3}{2}$

Express 2 as $\frac{4}{2}$:

$x = \frac{4}{2} + \frac{3}{2} = \frac{7}{2}$

Solution using substitution:

$x = \frac{7}{2}$, $y = -\frac{1}{4}$

Solving by Elimination Method

The elimination method involves aligning coefficients to cancel out one variable. Let's see how to apply it to our equations.

Step 1: Write the equations in standard form

Original equations:

1. $X + 6y = 2$
2. $3x + 2y = 10$

Step 2: Equalize coefficients of either x or y

To eliminate x, multiply the first equation by 3:

$3(X + 6y) = 3\ 2 \rightarrow 3x + 18y = 6$

Now, our system:

- $3x + 18y = 6$
- $3x + 2y = 10$

Step 3: Subtract equations to eliminate x

Subtract the second from the first:

$(3x + 18y) - (3x + 2y) = 6 - 10$

Simplify:

$3x - 3x + 18y - 2y = -4$

Which reduces to:

$16y = -4$

Step 4: Solve for y

Divide both sides by 16:

$y = -\frac{4}{16} = -\frac{1}{4}$

Same as the previous method.

Step 5: Find x

Substitute $y = -\frac{1}{4}$ into the first original equation:

$x + 6(-\frac{1}{4}) = 2$

Simplify:

$x - \frac{6}{4} = 2$

Expressing $\frac{6}{4}$ as $\frac{3}{2}$:

$x - \frac{3}{2} = 2$

Add $\frac{3}{2}$ to both sides:

$x = 2 + \frac{3}{2}$

Express 2 as $\frac{4}{2}$:

$x = \frac{4}{2} + \frac{3}{2} = \frac{7}{2}$

Solution:

$x = \frac{7}{2}$, $y = -\frac{1}{4}$

Graphical Solution Approach

While algebraic methods give precise solutions, a graphical approach offers visual insight.

Step 1: Rewrite each equation in slope-intercept form ($y = mx + c$)

For $X + 6y = 2$, express y:

$6y = 2 - x$

$y = \frac{2 - x}{6}$

Similarly, for $3x + 2y = 10$:

$2y = 10 - 3x$

$y = \frac{10 - 3x}{2}$

Step 2: Plot both lines

- For various values of x, calculate y for both equations.
- Plot the points and draw the lines.

Step 3: Find the intersection point

The point where the two lines cross is the solution: $x = \frac{7}{2}$, $y = -\frac{1}{4}$.

Note: This visual method is useful for approximate solutions or when equations are represented graphically.

Summary of Methods

Method	Steps	Advantages	Disadvantages
Substitution	Rearrange one equation, substitute into the other	Straightforward when one variable is isolated	Can be cumbersome if equations are complex
Elimination	Multiply equations to align coefficients, subtract	Efficient with equations having similar coefficients	May involve larger numbers or fractions
Graphical	Plot both equations and identify intersection point	Visual understanding	Less precise, especially with complex equations

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Practical Tips for Solving Simultaneous Equations

- Always check your work: After finding a solution, substitute back into original equations to verify.
- Simplify fractions: To make calculations easier.
- Choose the best method based on the equations: For example, if one equation is already solved for a variable, substitution is quick.
- Be mindful of special cases: Parallel lines (no solution), coincident lines (infinite solutions).

Final Thoughts

Solving simultaneous equations like $X + 6y = 2$ and $3x + 2y = 10$ demonstrates the core techniques used in algebra to find common solutions. Whether through substitution, elimination, or graphical methods, understanding each approach enhances problem-solving skills and reinforces fundamental algebraic concepts. Practice with diverse systems to become proficient and confident in choosing the most effective method for any given problem.

Remember: The key to mastering simultaneous equations lies in understanding the relationships between the variables and selecting the most suitable method for the problem at hand. Happy solving!

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Method X 6y 2 3x 2y 10

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