Research: Combining Methods for Solving Linear Equations

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Abstract: This research explores methods for solving linear equations, focusing on integrating the Balance Method with other methods such as substitution and elimination. The goal is to simplify solutions and reduce complexity, making it ideal for solving systems with multiple variables. Two practical examples are presented to illustrate how different methods can be combined step by step, emphasizing how the Balance Method can be applied to linear equations. The results show that combining these methods helps expedite solution finding and simplify calculations, especially in equations with simple coefficients.

Keywords: Balance Method, **system of equations,** variable ,elimination

1.Introduction:

Linear equations are equations where variables are raised to the first power (i.e., there are no exponents or roots). These equations can be either single or part of a system containing multiple equations. The number of variables can range from one to many. Linear equations are widely used in various fields such as economics, engineering, physics, and business calculations.

To solve systems of linear equations, several well-known methods are used, such as elimination, substitution, and matrix methods. This research focuses on the Balance Method as a new concept and combines it with other methods like substitution or elimination to solve linear systems. Two practical examples are provided to explain how these methods can be combined.

1.1. The Balance Method:

The Balance Method is a simple approach that involves "balancing" the equation. In other words, we perform mathematical operations on both sides of the equation while keeping the equation balanced, without the need for complicated manipulations. This method is typically used in equations with one variable, but it can be integrated with other methods like substitution or elimination for solving linear systems.

Basic Steps of the Balance Method:

1. Isolate the variable we wish to solve for.
2. Perform arithmetic operations (such as addition, subtraction, multiplication, or division) on both sides of the equation while maintaining balance.
3. Solve the simplified equation to obtain the variable's value.

1.2. Combining the Balance Method with Substitution:

When solving systems of equations with more than one variable, the Balance Method can be combined with substitution to solve the system step by step.

2.Example

1:The system of equations:
$2x+y=10$(Equation 1)
1) $3x-y=5$(Equation 2)

Steps:

1. Isolate the variable: From Equation 1, we want to isolate y:

   $y=10-2x$ $y = 10 - 2x$ $y=10-2x$

2. Substitute: Now, substitute the value of y into Equation 2:

   $3x-(10-2x)=5$ $3x - (10 - 2x) = 5$ $3x-(10-2x)=5$

   Expanding the equation:

   $3x-10+2x=5$ $3x - 10 + 2x = 5$ $3x-10+2x=5$

   Simplify the equation:

5x−10=55x - 10 = 55x−10=5

3. Balance the equation: Add 10 to both sides to balance the equation:

   5x=155
   x=15

4. Solve the equation:

5. Find y: Now substitute x=3x back into Equation 1:

   y=10−2(3)=10−6=4y
    = 4

The solution is:

15=5x

x=3,y=4

3. Combining the Balance Method with Elimination:

The Elimination Method relies on eliminating one variable by adding or subtracting the equations, while the Balance Method helps maintain the equation's balance after performing arithmetic operations.

2:The system of equations:

 4x+2y=20(Equation 1)

3x−2y=6(Equation 2)

Steps:

1. Balance the equations: Notice that the coefficients of yyy in both equations are 2 and -2, so we can eliminate yyy by adding the two equations:

   (4x+2y)+(3x−2y)=20+6(4x + 2y) + (3x - 2y) = 20 + 6(4x+2y)+(3x−2y)=20+6

   This simplifies to:

   7x=26   ,   x=26/7

2. Solve the equatx=7/26

3. Find y: Substitute x=26/7 back into Equation 1 to find y:

   = 140/7-20=2y

   Solve for y:

   Y=18/7

3.Conclusion:

In this research, we presented the Balance Method and how it can be combined with substitution and elimination methods to solve systems of linear equations. These methods are effective and straightforward for solving simple to moderate linear equations and provide flexibility in handling equations with multiple variables.

Using the Balance Method along with substitution or elimination simplifies the solution process and makes it more intuitive. The two examples demonstrate how the combination of these methods leads to quick and accurate solutions.

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