

Concept – Simultaneous Equations

Simultaneous equations _____

If there are two unknowns then _____ for three unknowns

In the past solving simultaneous equations has involved lots of algebra and some people have found this quite difficult. Matrices make solving these types of equations easier.

Step 1: Write the equations.

Make sure that the letters are in the same order on the left of the equals sign and a constant is on the right of the equals sign.

Step 2: Make the matrices

First, write a square coefficient matrix. With two unknowns it will be a 2x2 matrix, three unknowns will be a 3x3 matrix.

Next will be a column matrix for all the unknowns.

Then after the equals sign will be a column matrix for the constants.

Step 3: Rearrange the matrices

Move the square matrix to the other side of the equals sign. To do this pre-multiply the constants matrix by the inverse of the square matrix.

Step 4: Complete the matrix multiplication

You can do this by hand just for kicks, but most of the time you should do this with CAS.

Step 5: Answer the question.

Write the solution you have found in a format which answers the question asked.

Eg1: What is the value of y in these simultaneous equations?

$$\begin{aligned}4x - 2y + 3z &= 1 \\x + 3y - 4z &= -7 \\3x + y + 2z &= 5\end{aligned}$$

Some things to remember include:

When the letter is written on its own, the coefficient of that letter _____.

When a letter is not in the equation, the coefficient of that letter is _____.

Eg2: Solve this system of simultaneous equations.

$$3r + s - 7t = 15$$

$$r + t - 12s = 0$$

$$5s - 4t = 8$$

Worked Example

Choose a 2x2 matrix. Calculate its determinant and inverse by hand, showing each step of the process.