**Solving Simultaneous Equations with Matrix Mathematics**

Given a set of three equations with three unknowns, we could solve for the unknowns through a process of substitution and elimination using algebra. For situations with a small number of simultaneous equations, we can also use matrix mathematics to solve for the unknowns.

Consider the following system of equations:

$$\begin{aligned} 4x + y - z &= 10 \\ -x + 3y + 2z &= 4 \\ x - y - z &= -1 \end{aligned}$$

This system can be represented by three matrices

$$A = \begin{bmatrix} 4 & 1 & -1 \\ -1 & 3 & 2 \\ 1 & -1 & -1 \end{bmatrix} \qquad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \qquad B = \begin{bmatrix} 10 \\ 4 \\ -1 \end{bmatrix}$$

We can then write the system of equations:

$AX = B$

We know from matrix mathematics that a matrix times its inverse yields the identify matrix:

$A^{-1}A = 1$

Multiplying both sides of the system by $A^{-1}$ we get:

$A^{-1}AX = A^{-1}B$ or $X = A^{-1}B$

Use the matrix inverse function **inv** in MATLAB or the **numpy.linalg.inv** or **scipy.linalg.inv** in Python to solve this system of equations using this approach.