

Matrices

- There are two types of Matrices. **Coefficient matrix** & **Augmented matrix**.
- Matrices are used so that you don't need to keep writing x_1, x_2, x_3, x_4 etc.

eg

$$x_1 + 2x_2 = 5$$

$$3x_1 - 4x_3 = 2$$

$$2x_1 - x_2 + x_3 = 6$$

Coefficient matrix

$$\begin{matrix} 1 & 2 & 0 \end{matrix}$$

$$\begin{matrix} 3 & 0 & -4 \end{matrix}$$

$$\begin{matrix} 2 & -1 & 1 \end{matrix}$$

Augmented matrix

$$\begin{matrix} 1 & 2 & 0 & | & 5 \end{matrix}$$

$$\begin{matrix} 3 & 0 & -4 & | & 2 \end{matrix}$$

$$\begin{matrix} 2 & -1 & 1 & | & 6 \end{matrix}$$

with the
solutions

- The size of a matrix is **$M \times n$** . M = rows
 n = columns.

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- You can use simultaneous equations to work out linear equations.
 - With matrices, there are 3 ways. Scaling, interchange and replacement.

① Make first row = 1
 $\times \frac{1}{2}$

$$\begin{matrix} 2 & 0 & -6 & -8 \end{matrix}$$

$$\begin{matrix} 0 & 1 & 2 & 3 \end{matrix}$$

$$\begin{matrix} 3 & 6 & -2 & -4 \end{matrix}$$

$$\begin{array}{cccc} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 3 & 6 & -2 & -4 \end{array}$$

② Last row = 0
-3R₁

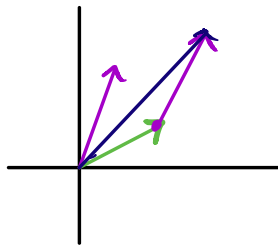
$$\begin{array}{cccc} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 6 & 7 & 8 \end{array} \quad \textcircled{8} - 6R_2$$

$$\begin{array}{cccc} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 5 & 10 \end{array}$$

Adding

$$v = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$
$$u = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

Vectors



$$u+v = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$$

Scaling vectors

$$\text{es } w = \begin{bmatrix} 4 \\ 2 \end{bmatrix} \quad 3w = 3 \begin{bmatrix} 4 \\ 2 \end{bmatrix} = \begin{bmatrix} 12 \\ 6 \end{bmatrix}$$