

Matrices (Introduction)

- a way to organize information

$$\begin{array}{c} \text{Columns} \\ \textcircled{1} \quad \textcircled{2} \quad \textcircled{3} \\ \text{Rows} \textcircled{1} \left(\begin{array}{ccc} 2 & -1 & 0 \\ \textcircled{2} \left(\begin{array}{ccc} 3 & 6 & 4 \end{array} \right) \end{array} \right)$$

This is called a 2x3 matrix

read as $\textcircled{2}$ by $\textcircled{3}$
 ↑ rows ↑ columns

each entry in the matrix is called an element

This is referred to as the order of a matrix.

If $A = \begin{pmatrix} 1 & \textcircled{5} \\ \textcircled{2} & 7 \\ 3 & \textcircled{2} \end{pmatrix}$

the order is 3x2; it has 6 elements

$$a_{21} = 2 \quad a_{32} = 2 \quad a_{12} = 5$$

↑ row ↑ column

Example

$$A = \begin{matrix} & \begin{matrix} \text{Store A} & \text{Store B} & \text{Store C} \end{matrix} \\ \begin{matrix} \text{TVs} \\ \text{Stereos} \\ \text{Cameras} \end{matrix} & \begin{pmatrix} 15 & 16 & 12 \\ 14 & 21 & 13 \\ 12 & 20 & 35 \end{pmatrix} \end{matrix}$$

$$B = \begin{matrix} & \begin{matrix} \text{Store A} & \text{Store B} & \text{Store C} \end{matrix} \\ \begin{matrix} \text{TVs} \\ \text{Stereos} \\ \text{Cameras} \end{matrix} & \begin{pmatrix} 10 & 10 & 30 \\ 8 & 15 & 21 \\ 16 & 25 & 40 \end{pmatrix} \end{matrix}$$

(Sales for September)

(Sales for October)

$$A + B = \begin{matrix} & \begin{matrix} \text{Store A} & \text{Store B} & \text{Store C} \end{matrix} \\ \begin{matrix} \text{TVs} \\ \text{Stereos} \\ \text{Cameras} \end{matrix} & \begin{pmatrix} 25 & 26 & 42 \\ 22 & 36 & 34 \\ 28 & 45 & 75 \end{pmatrix} \end{matrix}$$

You can only add matrices if they have the same order and it makes sense to do so.

↑ This matrix represents the sales for Sept and Oct.

What if November sales were double the sales for Sept?

$$2A = 2 \begin{pmatrix} 15 & 16 & 12 \\ 14 & 21 & 13 \\ 12 & 20 & 35 \end{pmatrix} = \begin{pmatrix} 30 & 32 & 24 \\ 28 & 42 & 26 \\ 24 & 40 & 70 \end{pmatrix}$$

What if we want to know the amount of money from the sales for September?

$$\begin{array}{r}
 \text{Store A} \\
 \text{Store B} \\
 \text{Store C}
 \end{array}
 \begin{pmatrix}
 \text{TVs} & \text{Stereos} & \text{Cameras} \\
 15 & 14 & 12 \\
 16 & 21 & 20 \\
 12 & 13 & 35
 \end{pmatrix}
 \times
 \begin{pmatrix}
 \text{TVs} \\
 \text{Stereos} \\
 \text{Cameras}
 \end{pmatrix}
 \begin{pmatrix}
 \$400 \\
 \$150 \\
 \$500
 \end{pmatrix}$$

$$\begin{matrix}
 (3 \times 3) & (3 \times 1) \\
 \text{match}
 \end{matrix}$$

$$\begin{array}{r}
 \text{Store A} \\
 = \text{Store B} \\
 \text{Store C}
 \end{array}
 \begin{pmatrix}
 (15)(400) + (14)(150) + (12)(500) \\
 (16)(400) + (21)(150) + (20)(500) \\
 (12)(400) + (13)(150) + (35)(500)
 \end{pmatrix}$$

← Total Sales for Sept.

$$\begin{array}{r}
 \text{Store A} \\
 = \text{Store B} \\
 \text{Store C}
 \end{array}
 \begin{pmatrix}
 14100 \\
 19550 \\
 24250
 \end{pmatrix}$$

→ Store A's sales for Sept were 14,100