Concept –Application of Matrices

Matrices can be useful to quickly complete many types of calculations. Some terminology you need to remember when working with matrices is;

When asked to find the product, _____, when looking the the sum _____

and to find the difference _____

Eg: Neo and Trinity work in retail,selling DVDs and Games. One week the store has a special sales promotion. One free cinema ticket is given with each DVD purchased. Two cinema tickets are given with the purchase of each computer game.

The number of DVDs and games sold by Neo and Trinity are given in matrix S.

The selling price of a DVD and a game, together with the number of free tickets is given by matrix P.

$$S = \begin{matrix} \\ \text{Neo} \\ \text{Trinity} \end{matrix} \begin{matrix} \begin{matrix} \text{DVD} & \text{Games} \end{matrix} \\ \begin{bmatrix} 7 & 4 \\ 5 & 6 \end{bmatrix} \end{matrix} \qquad P = \begin{matrix} \\ \text{DVD} \\ \text{Games} \end{matrix} \begin{matrix} \begin{matrix} \$ & \text{Tickets} \end{matrix} \\ \begin{bmatrix} 20 & 1 \\ 30 & 2 \end{bmatrix} \end{matrix}$$

Find the matrix product and interpret the information it provides.

Sometimes we need to know the sum of the rows, or of the columns of a matrix. To find this using matrix arithmetic summing matrices can be used.

The only value in a summing matrix is _____.

If the sum of columns is required then multiply _____.

If the sum of rows is required then multiply _____.

Eg: The number of sales made by three employees over five days is shown in matrix S. Show how a summing matrix can be used to find the total number of sales for the week.

$$S = \begin{matrix} \\ \textit{Stuart} \\ \textit{Alan} \\ \textit{Martin} \end{matrix} \begin{matrix} \begin{matrix} \textit{Mon} & \textit{Tues} & \textit{Wed} & \textit{Thur} & \textit{Fri} \end{matrix} \\ \begin{bmatrix} 16 & 19 & 22 & 27 & 29 \\ 18 & 24 & 23 & 22 & 31 \\ 11 & 20 & 27 & 26 & 30 \end{bmatrix} \end{matrix}$$

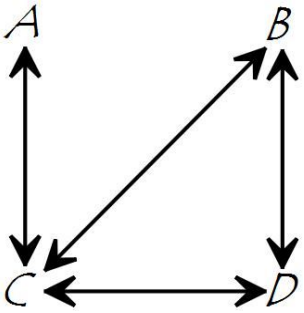
Concept –Communication or Connection Matrices

When raising a matrix to a power the process is the same as with scalars. If M is a matrix then

M^2 = _____ and M^5 = _____.
Only square matrices can be raised to powers like this.

Combining matrices and directed networks can be applied to friendships, travel between towns and other types of two-way connections.

Eg: Four towns are connected by buses as shown in this network diagram.



The double headed arrows mean _____.

These arrows are known as _____.

The matrix representation of this network would be

In this example the sum of the rows (or columns) will tell us _____.

B^2 is a matrix which shows us the two step bus connections between each town. Find B^2.

The three step and four step links could be calculated in a similar way if required.

Worked Example

Find a communication or connection network and draw this below. Represent this network with a matrix and use a summing matrix to add the rows or columns. Then find the three step communication links of the matrix.