Applications of Matrices

(1) Business Matrix S gives the number of three types of cars sold in March by two car dealers, and matrix P gives the profit for each type of car sold.

$$S = \begin{array}{c} \\ \text{compact} \\ \text{mid-size} \\ \text{full-size} \end{array} \begin{array}{c} \begin{array}{cc} \text{dealer} & \\ 1 & 2 \end{array} \\ \begin{bmatrix} 18 & 15 \\ 24 & 17 \\ 16 & 20 \end{bmatrix} \end{array} \qquad P = \begin{array}{c} \text{profit} \\ \\ \end{array} \begin{array}{c} \begin{array}{ccc} \text{compact} & \text{mid-size} & \text{full-size} \end{array} \\ \begin{bmatrix} \$400 & \$650 & \$900 \end{bmatrix} \end{array}$$

Which matrix is defined, SP or PS? Find this matrix and interpret its elements.

$(1\times3)(3\times2)$

$= 1\times2$

$\begin{bmatrix} 37{,}200 & 35{,}050 \end{bmatrix}$

SO DEALER 1 MADE \$37,200
DEALER 2 MADE \$35,050

(2) Business Matrix P gives the monthly production schedule for three models of calculators. Matrix M gives the number of components needed to construct each model. Matrix R gives the number of relays needed for each component.

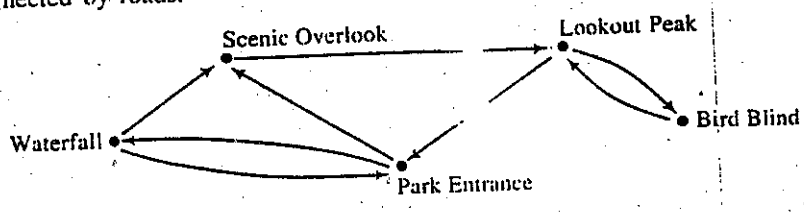
$$P = \begin{array}{c} \\ \text{scientific} \\ \text{business} \\ \text{graphing} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Jan.} & \text{Feb.} & \text{Mar.} \end{array} \\ \begin{bmatrix} 500 & 600 & 600 \\ 200 & 200 & 200 \\ 100 & 300 & 400 \end{bmatrix} \end{array}$$

$$M = \begin{array}{c} \\ \text{scientific} \\ \text{business} \\ \text{graphing} \end{array} \begin{array}{c} \begin{array}{ccc} \text{components} & & \\ A & B & C \end{array} \\ \begin{bmatrix} 2 & 1 & 2 \\ 2 & 1 & 4 \\ 2 & 5 & 6 \end{bmatrix} \end{array} \qquad R = \begin{array}{c} \\ \text{relay x} \\ \text{relay y} \end{array} \begin{array}{c} \begin{array}{ccc} \text{components} & & \\ A & B & C \end{array} \\ \begin{bmatrix} 5 & 3 & 2 \\ 6 & 4 & 3 \end{bmatrix} \end{array}$$

a. Explain why the product PM is defined, but not meaningful.
b. Find M^tP. Use your answer to tell how many A components will be needed in March.
c. Explain why MR is not defined.
d. Find RM^t. What information does this product give?
e. Find RM^tP. What information does this product give?

$\begin{bmatrix} 5 & 3 & 2 \\ 6 & 4 & 3 \end{bmatrix} \begin{bmatrix} 2 & 2 & 2 \\ 1 & 1 & 5 \\ 2 & 4 & 6 \end{bmatrix} = \begin{bmatrix} 17 & 21 & 37 \\ 22 & 28 & 50 \end{bmatrix}$

(3) The diagram below indicates how various sites in a park are connected by roads.



a. Write the matrix M that models this network. Label the rows and columns in alphabetical order.
b. Find M^2. Which site has the greatest number of two-step paths to the other sites?

	B	L	P	S	W
(B) Bird Blind	0	1	0	0	0
(L) Lookout Peak	1	0	1	0	0
(P) Park Entrance	0	0	0	1	1
(S) Scenic Overlook	0	1	0	0	0
(W) Waterfall	0	0	1	1	0

matrix squared

	B	L	P	S	W
B	1	0	1	0	0
L	0	1	0	1	1
P	0	1	1	1	0
S	1	0	1	0	0
W	0	1	0	1	1

To <u>other</u> sites

Bird Blind 1

Lookout Peak 2

Park Entrance 2

Scenic Overlook 2

Waterfall 2

} all of these