Algebra of Matrices Ex 5.3 Q73

Given,

The cost per contact (in paise) is given by

$$A=\begin{bmatrix}40\\100\\50\end{bmatrix}\begin{bmatrix}\text{Telephone}\\\text{Housecall}\\\text{Letter}\end{bmatrix}$$

The number of contact of each type made in two cities X and y is given by.

$$B=\begin{matrix}\text{Telephone}&\text{Housecall}&\text{Letter}\end{matrix}\\\begin{bmatrix}1000&500&5000\\3000&1000&10000\end{bmatrix}$$

Total amount spent by the group in the two cities X and y can be given by

$$BA=\begin{bmatrix}1000&500&5000\\3000&1000&10000\end{bmatrix}\begin{bmatrix}40\\100\\50\end{bmatrix}$$

$$=\begin{bmatrix}40000+50000+250000\\120000+100000+500000\end{bmatrix}$$

$$=\begin{bmatrix}340000\\720000\end{bmatrix}\begin{matrix}X\\Y\end{matrix}$$

Hence,

Amount spend on X = Rs 3400

Amount spend on Y = Rs 7200

Algebra of Matrices Ex 5.3 Q74

(a) Let Rs x be invested in the first bond. Then, the sum of money invested in the second bond will be Rs $(30000-x)$.

It is given that the first bond pays 5% interest per year and the second bond pays 7% interest per year.

Therefore, in order to obtain an annual total interest of Rs 1800, we have:

$$\begin{bmatrix}x&(30000-x)\end{bmatrix}\begin{bmatrix}\frac{5}{100}\\\frac{7}{100}\end{bmatrix}=1800\qquad\left[\text{S.I. for 1 year}=\frac{\text{Principal}\times\text{Rate}}{100}\right]$$

$$\Rightarrow\frac{5x}{100}+\frac{7(30000-x)}{100}=1800$$

$$\Rightarrow 5x+210000-7x=180000$$

$$\Rightarrow 210000-2x=180000$$

$$\Rightarrow 2x=210000-180000$$

$$\Rightarrow 2x=30000$$

$$\Rightarrow x=15000$$

Thus, in order to obtain an annual total interest of Rs 1800, the trust fund should invest Rs 15000 in the first bond and the remaining Rs 15000 in the second bond.

(b) Let Rs x be invested in the first bond. Then, the sum of money invested in the second bond will be Rs $(30000-x)$.
Therefore, in order to obtain an annual total interest of Rs 2000, we have:

$$\begin{bmatrix} x & (30000-x) \end{bmatrix} \begin{bmatrix} \frac{5}{100} \\ \frac{7}{100} \end{bmatrix} = 2000$$

$$\Rightarrow \frac{5x}{100} + \frac{7(30000-x)}{100} = 2000$$
$$\Rightarrow 5x + 210000 - 7x = 200000$$
$$\Rightarrow 210000 - 2x = 200000$$
$$\Rightarrow 2x = 210000 - 200000$$
$$\Rightarrow 2x = 10000$$
$$\Rightarrow x = 5000$$
Thus, in order to obtain an annual total interest of Rs 2000, the trust fund should invest Rs 5000 in the first bond and the remaining Rs 25000 in the second bond

Algebra of Matrices Ex 5.3 Q75

The cost for each mode per attempt is represented by 3 x 1 matrix:

$$A = \begin{bmatrix} 50 \\ 20 \\ 40 \end{bmatrix}$$

The number of attempts made in the three villages X, Y, and Z are represented by a 3 x 3 matrix:

$$B = \begin{bmatrix} 400 & 300 & 100 \\ 300 & 250 & 75 \\ 500 & 400 & 150 \end{bmatrix}$$

The total cost incurred by the prganization for the three villages seperately is given by matrix multiplication

$$BA = \begin{bmatrix} 400 & 300 & 100 \\ 300 & 250 & 75 \\ 500 & 400 & 150 \end{bmatrix} \begin{bmatrix} 50 \\ 20 \\ 40 \end{bmatrix}$$

$$BA = \begin{bmatrix} 400 \times 50 + 300 \times 20 + 100 \times 40 \\ 300 \times 50 + 250 \times 20 + 75 \times 40 \\ 500 \times 50 + 400 \times 20 + 150 \times 40 \end{bmatrix}$$

$$= \begin{bmatrix} 30,000 \\ 23,000 \\ 39,000 \end{bmatrix}$$

Note: The answer given in the book is incorrect.

Algebra of Matrices Ex 5.3 Q76

Let F be the family matrix and R be the requirement matrix. Then,

$$F = \begin{matrix} \\ \text{Family A} \\ \text{Family B} \end{matrix} \begin{matrix} \begin{matrix} \text{Men} & \text{Women} & \text{Children} \end{matrix} \\ \begin{bmatrix} 4 & 6 & 2 \\ 2 & 2 & 4 \end{bmatrix} \end{matrix}$$

$$R = \begin{matrix} \\ \text{Men} \\ \text{Women} \\ \text{Children} \end{matrix} \begin{matrix} \begin{matrix} \text{Calories} & \text{Portein} \end{matrix} \\ \begin{bmatrix} 2400 & 45 \\ 1900 & 55 \\ 1800 & 33 \end{bmatrix} \end{matrix}$$

The requirement of calories and protein of each of the two families is given by the product matrix FR, as matrix F has number of columns equal to number of rows of R thus ,

$$FR = \begin{bmatrix} 4 & 6 & 2 \\ 2 & 2 & 4 \end{bmatrix} \begin{bmatrix} 2400 & 45 \\ 1900 & 55 \\ 1800 & 33 \end{bmatrix}$$

$$FR = \begin{bmatrix} 4\times 2400+6\times 1900+2\times 1800 & 4\times 45+6\times 55+2\times 33 \\ 2\times 2400+2\times 1900+4\times 1800 & 2\times 45+2\times 55+4\times 33 \end{bmatrix}$$

$$FR = \begin{matrix} \\ \text{Family A} \\ \text{Family B} \end{matrix} \begin{matrix} \begin{matrix} \text{Calories} & \text{Protein} \end{matrix} \\ \begin{bmatrix} 24600 & 576 \\ 15800 & 332 \end{bmatrix} \end{matrix}$$

we can say that balanced diet having the required amount of calories and protein must be taken by each of the family.

Algebra of Matrices Ex 5.3 Q77

The cost per contact (in paisa) is given in matrix A as

$$A = \begin{bmatrix} 140 \\ 200 \\ 150 \end{bmatrix} \begin{matrix} \text{Telephone} \\ \text{House calls} \\ \text{Letters} \end{matrix}$$

The number of contacts of each type made in two cities X and Y is given in the matrix B as

$$B = \begin{matrix} \\ \text{City X} \\ \text{City Y} \end{matrix} \begin{matrix} \begin{matrix} \text{Telephone} & \text{House calls} & \text{Letters} \end{matrix} \\ \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} \end{matrix}$$

The total amout of money spent by party in each of the city for the election is given by the matrix multiplication :

$$BA = \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} \begin{bmatrix} 140 \\ 200 \\ 150 \end{bmatrix}$$

$$= \begin{bmatrix} 1000\times 140+500\times 200+5000\times 150 \\ 3000\times 140+1000\times 200+10000\times 150 \end{bmatrix}$$

$$= \begin{matrix} \\ \text{City X} \\ \text{City Y} \end{matrix} \begin{bmatrix} 990000 \\ 2120000 \end{bmatrix}$$

The total amout of money spent by party in each of the city for the election in rupees is given by

$$= \left(\frac{1}{100}\right) \begin{matrix} \\ \text{City X} \\ \text{City Y} \end{matrix} \begin{bmatrix} 990000 \\ 2120000 \end{bmatrix}$$

$$= \begin{matrix} \\ \text{City X} \\ \text{City Y} \end{matrix} \begin{bmatrix} 9900 \\ 21200 \end{bmatrix}$$

One sould consider social activities before casting his/her vote to the party.

********** END **********