Matrices and Operations

Multiplication

Part 3

Matrices and their Operations

- **Example 2**: Suppose there are three brothers X, Y and Z. They want to spend on clothes (consisting of pants 'p', shirts 'S', bush shirts 'B' and tie 'T'). **X** wants to purchase 2P, 2S, 1B and 2T. **Y** plans to buy 1P, 2P, 2P and 1T. **Z** wishes to have 3P, 3S, 0B and 5T. The prices of these products in the shop are 50, 30, 25 and 20 rupees per piece respectively. How much each of them need to spend on these clothes?

- **Solution:** Arrange the above information in matrix form.

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Matrix of quantity of clothes:

$$\begin{array}{c} \\ X \\ Y \\ Z \end{array} \begin{array}{cccc} P & S & B & T \\ \begin{bmatrix} 2 & 2 & 1 & 2 \\ 1 & 2 & 2 & 1 \\ 3 & 3 & 0 & 5 \end{bmatrix} \end{array}$$

- **Note:** Since price and quantity is to be multiplied to get total expenditure, one of these two values is to be arranged in row form and another in column form.

Matrix of Price:

$$\begin{array}{c} P \\ S \\ B \\ T \end{array} \begin{bmatrix} 50 \\ 30 \\ 25 \\ 20 \end{bmatrix}$$

- As in the above case, quantities of clothes has been arranged in columns and price in rows.

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- Now the expenditure on clothes by X, Y and Z are:

$$
\begin{array}{c} X \\ Y \\ Z \end{array}
\begin{bmatrix} 2 & 2 & 1 & 2 \\ 1 & 2 & 2 & 1 \\ 3 & 3 & 0 & 5 \end{bmatrix}
\times
\begin{bmatrix} 50 \\ 30 \\ 25 \\ 20 \end{bmatrix}
$$

$$
= \begin{array}{c} X \\ Y \\ Z \end{array}
\begin{bmatrix} 2 \times 50 + 2 \times 30 + 1 \times 25 + 2 \times 20 \\ 1 \times 50 + 2 \times 30 + 2 \times 25 + 1 \times 20 \\ 3 \times 50 + 3 \times 30 + 0 \times 25 + 5 \times 20 \end{bmatrix}
$$

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$$= \begin{matrix} X \\ Y \\ Z \end{matrix} \begin{bmatrix} 100 + 60 + 25 + 40 \\ 50 + 60 + 50 + 20 \\ 150 + 90 + 0 + 100 \end{bmatrix}$$

$$= \begin{matrix} X \\ Y \\ Z \end{matrix} \begin{bmatrix} 225 \\ 180 \\ 340 \end{bmatrix}$$

Hence, expenditure by X = 225Answer

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THANK YOU