Algebra of Matrices Ex 5.3 Q69

Given,

A and B two square matrices of same order such that

AB = BA.

To prove : $(A+B)^2 = A^2 + 2AB + B^2$

Now, solving LHS gives,

$$(A+B)^2 = (A+B)(A+B)$$

$$= A(A+B) + B(A+B) \quad \left[\text{by dist. of matrix multiplication over addition}\right]$$

$$= A^2 + AB + BA + B^2 \quad \left[\text{by dist. of matrix multiplication over addition}\right]$$

$$= A^2 + 2AB + B^2 \quad [\text{As, } AB = BA]$$

$$= \text{RHS}$$

Hence proved.

Algebra of Matrices Ex 5.3 Q70

$$\text{Given, } A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 & 1 \\ 5 & 2 \\ -2 & 4 \end{bmatrix}, C = \begin{bmatrix} 4 & 2 \\ -3 & 5 \\ 5 & 0 \end{bmatrix}$$

$$AB = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix} \begin{bmatrix} 3 & 1 \\ 5 & 2 \\ -2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 3+5-2 & 1+2+4 \\ 9+15-6 & 3+6+12 \end{bmatrix}$$

$$AB = \begin{bmatrix} 6 & 7 \\ 18 & 21 \end{bmatrix} \qquad \text{---(i)}$$

$$AC = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix} \begin{bmatrix} 4 & 2 \\ -3 & 5 \\ 5 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 4-3+5 & 2+5+0 \\ 12-9+15 & 6+15+0 \end{bmatrix}$$

$$AC = \begin{bmatrix} 6 & 7 \\ 18 & 21 \end{bmatrix} \qquad \text{---(ii)}$$

From equation (i) and (ii)

$$AB = AC$$

Algebra of Matrices Ex 5.3 Q71

The number of items purchased by $A, B$ and $C$ are represented in matrix form as,

$$X = \begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} \text{Notebook} & \text{Pens} & \text{Pencils} \end{array} \\ \begin{bmatrix} 144 & 60 & 72 \\ 120 & 72 & 84 \\ 132 & 156 & 96 \end{bmatrix} \end{array}$$

Now, matrix formed by the cost of each items is given by,

$$Y = \begin{bmatrix} 0.40 \\ 1.25 \\ 0.35 \end{bmatrix}\begin{array}{c} \text{Note book} \\ \text{Pen} \\ \text{Pencil} \end{array}$$

Individual bill can be calculated by

$$XY = \begin{bmatrix} 144 & 60 & 72 \\ 120 & 72 & 84 \\ 132 & 156 & 96 \end{bmatrix}\begin{bmatrix} 0.40 \\ 1.25 \\ 0.35 \end{bmatrix}$$

$$XY = \begin{bmatrix} 57.60 + 75.00 + 25.20 \\ 48.00 + 90.00 + 29.40 \\ 52.80 + 195.00 + 33.60 \end{bmatrix}$$

$$XY = \begin{bmatrix} 157.80 \\ 167.40 \\ 281.40 \end{bmatrix}$$

So,

Bill of $A$ = Rs 157.80

Bill of $B$ = Rs 167.40

Bill of $C$ = Rs 281.40

Algebra of Matrices Ex 5.3 Q72

Matrix representation of stock of various types of book in the store is given by,

$$X = \begin{array}{c} \begin{array}{ccc} \text{Physics} & \text{Chemistry} & \text{Mathematics} \end{array} \\ \begin{bmatrix} 120 & 96 & 60 \end{bmatrix} \end{array}$$

Matrix representation of sellin price (Rs.) of each book is given by

$$Y = \begin{bmatrix} 8.30 \\ 3.45 \\ 4.50 \end{bmatrix}\begin{array}{c} \text{Physics} \\ \text{Chemistry} \\ \text{Mathematics} \end{array}$$

So, totaol amount recieved by the store from sellin all the items is given by,

$$XY = \begin{bmatrix} 120 & 96 & 60 \end{bmatrix}\begin{bmatrix} 8.30 \\ 3.45 \\ 4.50 \end{bmatrix}$$

$$= \left[(120)(8.30) + (96)(3.45) + (60)(4.50)\right]$$

$$= \left[996 + 331.20 + 270\right]$$

$$= \left[1597.20\right]$$

Required amount = Rs 1597.20

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