

Step-1

We have given about the Block multiplication

$$\begin{bmatrix} A & B \end{bmatrix} \begin{bmatrix} C \\ D \end{bmatrix} = [AC + BD]$$

We have to confirm this with an example.

Step-2

$$\text{Let } (A \ B) = (1 \ 2), (C \ D) = (2 \ 3)$$

$$\text{Then by definition } \begin{bmatrix} A & B \end{bmatrix} \begin{bmatrix} C \\ D \end{bmatrix} = [AC + BD]$$

$$\begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} 2 \\ 3 \end{bmatrix} = [1.2 + 2.3]$$

$$= [8]$$

Step-3

$$\text{Now } \left[\begin{array}{cc|c} x & x & x \\ x & x & x \\ \hline x & x & x \end{array} \right] \left[\begin{array}{cc|c} x & x & x \\ x & x & x \\ \hline x & x & x \end{array} \right]$$

$$\left[\begin{array}{cc|c} 1 & 1 & 1 \\ 1 & 1 & 1 \\ \hline 1 & 1 & 1 \end{array} \right] \left[\begin{array}{cc|c} 1 & 1 & 1 \\ 1 & 1 & 1 \\ \hline 1 & 1 & 1 \end{array} \right] = (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$(111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$(111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad (111) \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

Step-4

$$\begin{aligned}
&= \begin{pmatrix} 1.1+1.1+1.1 & 1.1+1.1+1.1 & 1.1+1.1+1.1 \\ 1.1+1.1+1.1 & 1.1+1.1+1.1 & 1.1+1.1+1.1 \\ 1.1+1.1+1.1 & 1.1+1.1+1.1 & 1.1+1.1+1.1 \end{pmatrix} \\
&= \begin{pmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{pmatrix}
\end{aligned}$$

Hence Block multiplication is succeeded.