Multiplication of Matrices Columns of B Method:

$$AB = \begin{bmatrix} A.\text{col}1B & \dots & A.\text{col}nB \end{bmatrix}$$

multiplication of 2 matrices = multiply A by column vectors of B

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 & 6 & 7 \\ 8 & 9 & 10 \end{bmatrix} = \begin{bmatrix} \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 \\ 8 \end{bmatrix} & \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 6 \\ 9 \end{bmatrix} & \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 7 \\ 10 \end{bmatrix} \end{bmatrix}$$

Do the next step to use the linear combinations of the columns of A using the weights from the cols of B, or the dot products of the rows of A with the cols of B (like in section 1.4)

$=$

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$$= \begin{bmatrix} 1 \cdot 5 + 2 \cdot 8 & 1 \cdot 6 + 2 \cdot 9 & 1 \cdot 7 + 2 \cdot 10 \\ 3 \cdot 5 + 4 \cdot 8 & 3 \cdot 6 + 4 \cdot 9 & 3 \cdot 7 + 4 \cdot 10 \end{bmatrix}$$

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$$= \begin{bmatrix} \begin{bmatrix} 1 & 2 \end{bmatrix} \cdot \text{col}1B & \begin{bmatrix} 1 & 2 \end{bmatrix} \cdot \text{col}2B & \begin{bmatrix} 1 & 2 \end{bmatrix} \cdot \text{col}3B \\ \begin{bmatrix} 3 & 4 \end{bmatrix} \cdot \text{col}1B & \begin{bmatrix} 3 & 4 \end{bmatrix} \cdot \text{col}2B & \begin{bmatrix} 3 & 4 \end{bmatrix} \cdot \text{col}3B \end{bmatrix}$$

$$= \begin{bmatrix} \text{row}1A \cdot \text{col}1B & \text{row}1A \cdot \text{col}2B & \text{row}1A \cdot \text{col}3B \\ \text{row}2A \cdot \text{col}1B & \text{row}2A \cdot \text{col}2B & \text{row}1A \cdot \text{col}3B \end{bmatrix}$$

Multiplication of Matrices

Columns of B Method: $AB = \begin{bmatrix} A.\text{col}1B & \dots & A.\text{col}nB \end{bmatrix}$

When is multiplication defined? $A_{m\times n}B_{n\times o} = AB_{m\times o}$ (1.4)

OR

Dot Product Method: $AB_{ij} = \sum_{k=1}^{m} A_{ik}B_{kj}$

To obtain the ijth entry of AB we take the ith row of A and the jth column of B, and perform the dot product (line them up, multiply corresponding entries, and add)

$$\begin{bmatrix} \text{row}1A \cdot \text{col}1B & \text{row}1A \cdot \text{col}2B & \dots \\ \text{row}2A \cdot \text{col}1B & \text{row}2A \cdot \text{col}2B & \dots \\ \vdots & \vdots & \vdots \end{bmatrix}$$