

$$\begin{pmatrix} \bullet \\ \bullet \\ \bullet \\ \vdots \\ \bullet \end{pmatrix} = X$$

$$A = \left(\begin{array}{c|c|c} | & | & | \\ \hline | & | & | \\ \hline | & | & | \end{array} \right) \begin{pmatrix} \bullet \\ \bullet \\ \bullet \\ \vdots \\ \bullet \end{pmatrix} = B$$

\uparrow \uparrow \uparrow \uparrow
 C_1 C_2 C_n

$$x_1 C_1 + \underline{x_2 C_2} + \dots + x_n C_n = B$$

Each column of A has length m

There are n columns.

Using the n entries of X as coefficients we obtain B as a linear combination of the columns of A with coefficients from X .

Thus, B is an $m \times 1$ vector just as is each column of A .

Matrix Multiplication 1b