

$$A = \begin{bmatrix} a_{11} & \dots & a_{1m} \\ \vdots & & \vdots \\ a_{k1} & \dots & a_{km} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} & \dots & b_{1n} \\ \vdots & & \vdots \\ b_{m1} & \dots & b_{mn} \end{bmatrix}$$

$$AB = \begin{bmatrix} c_{11} & \dots & c_{1m} \\ \vdots & & \vdots \\ c_{k1} & \dots & c_{km} \end{bmatrix}$$

$$c_{ij} = \begin{bmatrix} a_{i1} & a_{i2} & \dots & a_{im} \end{bmatrix} \cdot \begin{bmatrix} b_{1j} \\ b_{2j} \\ \vdots \\ b_{mj} \end{bmatrix} = a_{i1}b_{1j} + a_{i2}b_{2j} + \dots + a_{im}b_{mj}$$

**Example.**

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

**Example.**

- Acme Inc. makes two types of widgets: **WG1** and **WG2**.
- Each widget must go through two processes: **assembly** and **testing**.
- The number of hours required to complete each process is as follows:

	<b>assembly</b>	<b>testing</b>
<b>WG1</b>	3	1
<b>WG2</b>	7	3

- Acme Inc. has three plants in New York, Texas, and Minnesota.
- Hourly cost (in dollars) of each process in each plant is as follows:

	<b>NY</b>	<b>TX</b>	<b>MN</b>
<b>assembly</b>	10	15	12
<b>testing</b>	15	20	15

**Problem.** What is the cost of producing each type of widgets in each plant?