

6-2-1 Matrix Multiplication

Look at Matrix size before you start
Size is important

multiply $A \cdot B$

$M \times C$ $C \times N$

↑ same ↑

size of result

columns in A = rows in B

add the products of the elements
of a row in a (r) to corresponding
column in b (c). $AB = X$

Sum of the products is element X_{rc}
resultant element ——— ↑
row of Matrix A ↑
column of Matrix B ↑

Example A

multiply AB $A = \begin{bmatrix} 3 & -1 \\ 4 & 0 \end{bmatrix}$ $B = \begin{bmatrix} -2 & 0 & 6 \\ 3 & 5 & 1 \end{bmatrix}$

$AB = X$ 2×2 2×3

$$X = \begin{bmatrix} (-6-3)_{11} & (0-5)_{12} & (18-1)_{13} \\ (-8+0)_{21} & (0+0)_{22} & (24+0)_{23} \end{bmatrix}$$

$$= \begin{bmatrix} -9 & -5 & 17 \\ -8 & 0 & 24 \end{bmatrix}$$

Real-World Example 2 Multiply Matrices

VOTING The percent of voters of different ages who were registered as Democrats, Republicans, or Independents in a recent city election are shown. Use this information to determine whether there were more male voters registered as Democrats than there were female voters registered as Republicans.

Distribution by Party and Age (%)

Party	18-25	26-40	41-50	50+
Democrat	0.55	0.50	0.35	0.40
Republican	0.30	0.40	0.45	0.55
Independent	0.15	0.10	0.20	0.05

Distribution by Age and Gender

Age	Female	Male
18-25	18,500	16,000
26-40	20,000	24,000
41-50	24,500	22,500
50+	16,500	14,000

$$\text{PARTY} \times \text{Gender} \begin{matrix} \text{D} \\ \text{R} \\ \text{I} \end{matrix} \begin{matrix} \text{F} \\ \text{M} \end{matrix} \begin{bmatrix} 35350 & 31275 \\ 33650 & 32225 \\ 10500 & 10000 \end{bmatrix}$$

Yes → there are more Male Dems than Female Rep.s.