

Notes for section 4.1 (read p. 104-100 (top))

Matrix: a rectangular array of variables or constants in horizontal rows and vertical columns

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Player	Attempts	Completions	Touch downs	Interceptions
Rivers	478	312	34	11
Pennington	476	321	19	7
Warner	598	401	30	14
Brees	632	413	34	17
P.Manning	555	371	27	12

$$\begin{bmatrix} 478 & 312 & 34 & 11 \\ 476 & 321 & 19 & 7 \\ 598 & 401 & 30 & 14 \\ 635 & 413 & 34 & 17 \\ 555 & 371 & 27 & 12 \end{bmatrix}$$

Dimensions of a matrix: **Rows by Columns**
R x C

EX:

$$\begin{bmatrix} 478 & 312 & 34 & 11 \\ 476 & 321 & 19 & 7 \\ 598 & 401 & 30 & 14 \\ 635 & 413 & 34 & 17 \\ 555 & 371 & 27 & 12 \end{bmatrix}$$

elements

→ dimensions 5 x 4

(5 Rows by 4 Columns)

$$\text{EX } \begin{bmatrix} 1 & 0 & 6 \\ 4 & 2 & -5 \\ -3 & 1 & -1 \\ 3 & 10 & 8 \end{bmatrix} \quad \text{dimensions } 4 \times 3$$

EX $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ dimensions 3 x 1 (Column Matrix)

EX $[5 \ 10 \ -15 \ 0]$ dimensions 1 x 4
(Row Matrix)

EX $\begin{bmatrix} 1 & 3 \\ 5 & 7x \end{bmatrix}$ dimensions 2 x 2 (Square Matrix)

EX **Zero matrix:** every element is zero

Use Matrices to solve equations

$$\text{EX: } \begin{bmatrix} y \\ 3 \end{bmatrix} = \begin{bmatrix} 3x - 2 \\ 2y + x \end{bmatrix} \rightarrow \begin{array}{l} y = 3x - 2 \\ 3 = 2y + x \end{array}$$

Solve as a system $x = 1$
 $y = 1$

$$\text{EX: } \begin{bmatrix} x & y+2 \\ 6 & z \end{bmatrix} = \begin{bmatrix} 10 & 25 \\ 2z & y-2x \end{bmatrix} \longrightarrow$$

$$\begin{aligned} x &= 10 \\ y + 2 &= 25 \\ 6 &= 2z \\ z &= y - 2x \end{aligned}$$

Solve for x, y, z
Match elements

$$\begin{aligned} x &= 10 \\ y &= 23 \\ z &= 3 \end{aligned}$$

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- a) Organize the data into a matrix
- b) Add the elements in the columns and interpret the results
- c) Add the elements in the rows and interpret result
- d) Would finding a the average of the rows or columns provide any meaningful data?

Age	Male	Female
0-19	7.1	6.6
20-39	6.8	5.9
40-59	3.2	2.2
60+	1.1	1.4

Addition of Matrices

Matrices can be added iff
they are the same dimensions

Find $A + B$ if $A = \begin{bmatrix} 6 & 4 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 1 \\ 0 & 3 \end{bmatrix}$

Add elements in the same position

$$A + B = \begin{bmatrix} & \\ & \end{bmatrix}$$

Multiplication by a SCALAR (constant)

Find 3A if $A = \begin{bmatrix} 6 & -1 & 5 & 2 \\ 7 & 3 & -2 & 8 \end{bmatrix}$

Multiply each element by the constant

$$3A = \begin{bmatrix} & & & \\ & & & \end{bmatrix}$$

$$\frac{1}{3}A = \begin{bmatrix} & & & \\ & & & \end{bmatrix}$$

Use the following matrices to answer questions #1-6.

$$T = \begin{bmatrix} -11 & 7 & 5 \\ -6 & 3 & 8 \end{bmatrix} \quad V = \begin{bmatrix} 2 & 4 \\ -1 & 0 \\ 3 & -1 \end{bmatrix} \quad U = \begin{bmatrix} 3 & 0 & -2 \\ 4 & -9 & -5 \end{bmatrix}$$

$$R = \begin{bmatrix} 1 & \frac{1}{2} \\ 0 & -\frac{1}{4} \end{bmatrix} \quad P = \begin{bmatrix} 0 & 14 \\ 2 & 21 \end{bmatrix} \quad S = \begin{bmatrix} -\frac{3}{4} & \frac{1}{2} \\ \frac{1}{14} & 0 \end{bmatrix}$$

1. Find the dimensions of U
2. Find the first row of $T + V$
3. Find the first row of $U - T$
4. Find the first row of $-4S$
5. Find the first row of UV
6. Find the first row of $4T - U$

Properties of Matrices

Commutative Property of Addition	$A + B = B + A$
Associative Property of Addition	$(A + B) + C = A + (B + C)$
Left Scalar Distributive Property	$k(A+B) = kA + kB$
Right Scalar Distributive Property	$(A + B)k = kA + kB$

Use the following matrices to prove

$$C + (A+B) = (C + A) + B$$

$$A = \begin{bmatrix} 6 & -4 \\ 3 & -5 \end{bmatrix} \quad B = \begin{bmatrix} 8 & -1 \\ -2 & 7 \end{bmatrix} \quad C = \begin{bmatrix} -4 & -6 \\ 12 & -7 \end{bmatrix}$$

