MATRIX: a rectangular array of numbers. It has the same number of **elements** (each value in the matrix) in each of its rows, and each column shares the same number of elements.
Matrix = singular, Matrices = plural

- Matrices are a way to organize data.

Malcolm wants to attend one of three Iowa Universities next year. He has gathered information about tuition (T), room and board (R/B), and enrollment (E) for the universities.

- Use a matrix to organize the information
- Which university's total cost is the lowest?

Iowa State University: T- $3132, R/B- $4432, E- $26,845
University of Iowa: T- $3204, R/B- $4597, E- $28,311
University of Northern Iowa: T- 3130, R/B- $4149, E- $14,106

Rows (Colleges)
Columns (Costs)

	T	R/B	E
ISU	3132	4432	26845
UI	3204	4592	28311
UNI	3130	4149	14106

The University of Northern Iowa has the lowest cost.

- The data in a matrix is organized so that each position in the matrix has a purpose.

- A matrix can be described by its dimensions. A matrix with m rows and n colums is an m x n matrix (read "m by n")

*** **ORDER MATTERS** (just like coordinates) ROWs then COLUMNs

- Note on notation: Matrix: named with an uppercase letter
  Element: named with the lower case letter of the matrix it belongs to as well as a subscript of it's location in the matrix
  [Brackets indicate dealing with matrices]

College Example: Matrix C (3 x 3), UI R/B element = c_{22}

Special Name Matrices:

Row Matrix: A matrix that has only one row $[2 \;\; 3 \;\; 4 \;\; 5]$ (1 x 4)

Column Matrix: A matrix that only has one column $\begin{bmatrix} 3 \\ 5 \\ 7 \end{bmatrix}$ (3 x 1)

Square Matrix: A matrix that has the same number of rows and columns

$\begin{bmatrix} 1 & 2 \\ 8 & 5 \end{bmatrix}$ (2 x 2) $\quad \begin{bmatrix} 3 & 7 & 8 \\ 9 & 6 & 5 \\ 3 & 4 & 1 \end{bmatrix}$ (3 x 3) $\quad [2]$ (1 x 1)

Zero Matrix: Every element in the matrix is 0. Can be any dimension. $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ (3 x 1)

Equal Matrices: Two matrices are considered equal matrices if they have the same dimension and if each element of one matrix is equal to the corresponding element of the other matrix.

Examples of Not Equal Matrices

$\begin{bmatrix} 6 & 3 \\ 0 & 9 \\ 1 & 3 \end{bmatrix}$ (3 x 2) $\neq$ $\begin{bmatrix} 6 & 0 & 1 \\ 3 & 9 & 3 \end{bmatrix}$ (2 x 3) Different Dimensions

$\begin{bmatrix} 1 & 2 \\ 8 & 5 \end{bmatrix}$ (2 x 2) $\neq$ $\begin{bmatrix} 1 & 8 \\ 2 & 5 \end{bmatrix}$ (2 x 2) Same dimensions but corresponding elements are not equal

Examples of Equal Matrices

$$\begin{bmatrix} 3 & 4 \\ 7 & 8 \\ 9 & 5 \end{bmatrix} = \begin{bmatrix} 3 & 4 \\ 7 & 8 \\ 9 & 5 \end{bmatrix}$$

(3 x 2) (3 x 2)

Same dimension and corresponding elements are equal

Solving and Equation involving Matrices

$$\begin{bmatrix} y \\ 3 \end{bmatrix} = \begin{bmatrix} 3x-2 \\ 2y+x \end{bmatrix}$$ Since the two equations are equal, corresponding elements are equal. When you write the sentences to show equality, two linear equations are formed.

Y = 3x – 2
3 = 2y + x

Solve using substitution.

Y = 3x – 2
3 = 2y + x sub 3x – 2 in for y in the 2nd equation

3 = 2(3x – 2) + x distribute
3 = 6x – 4 + x combine like terms
3 = 7x – 4 solve for x add 4 to both sides
7 = 7x divide both sides by 7

x = 1

Sub x = 1 into 1st equation: y = 3x – 2

Y = 3(1) – 2
Y = 3 – 2
Y = 1

(1, 1) = solution
x, y

4-1 Algebra 2 Notes

EX: $\begin{bmatrix} 4x & 3y \end{bmatrix} = \begin{bmatrix} 12 & -1 \end{bmatrix}$

4x = 12
3y = -1

x = 3
y = -1

Concept check: pg. 156
#1-10 in class
hwk # 11-25 odds, check answers in the back. Must see all your work!!

- Problems written out
- Work done step-by-step
- Answer circled, underlined, or boxed