

4.1 – Basic Matrix Operations

Write your questions and thoughts here!

What is a matrix?

A matrix is...

Pizza Delivery Problem:

	Gina's	Vin's	Toni's	Sal's
Pizza	\$12	\$10	\$11	\$13
Drinks	\$1.50	\$1	\$0.50	\$1
Salad	\$4	\$4.50	\$3.50	\$3

The same information can be organized into a matrix:

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

Matrix Dimensions:

The dimensions of a matrix are read _____ by _____.

What are the dimensions of the following matrices?

$\begin{bmatrix} 5 & -9 & 5 & 1 \\ -2 & 7 & -6 & 1 \\ 11 & -15 & 0 & 4 \end{bmatrix}$	$\begin{bmatrix} 1 & -1 \\ x & 5 \end{bmatrix}$	$\begin{bmatrix} 2 & 5 & -1 \\ -5 & 1 & 100 \end{bmatrix}$	$\begin{bmatrix} 5 & -1 \\ 1 & x \\ y & 2 \\ 4 & 5 \end{bmatrix}$
____ x ____	____ x ____	____ x ____	____ x ____



Elements (or entries):

If the following matrix is called matrix **A**, then **A** is the element in row 1 column 2.

$$A = \begin{bmatrix} 5 & -9 & 5 & 1 \\ -2 & 7 & -6 & 1 \\ 11 & -15 & 0 & 4 \end{bmatrix}$$

$A_{2,1} =$ $A_{3,2} =$ $A_{1,4} =$ $A_{2,3} =$



4.1 – Basic Matrix Operations

Write your questions and thoughts here!



Adding and Subtracting Matrices:

1. To add or subtract two matrices, the dimensions _____.
2. Add (or subtract) the corresponding _____.

Evaluate.



1. $\begin{bmatrix} -3 & 5 \\ 0 & -1 \end{bmatrix} + \begin{bmatrix} 2 & -7 \\ -4 & 9 \end{bmatrix} =$ 2. $\begin{bmatrix} -2 \\ 8 \end{bmatrix} - \begin{bmatrix} 3 \\ -5 \end{bmatrix} =$ 3. $\begin{bmatrix} 4 & -2 \\ 2 & -6 \end{bmatrix} + \begin{bmatrix} 4 \\ -1 \end{bmatrix} =$

Multiplying by a scalar:

This is very simple...just _____ the scalar to each element.

Evaluate.



4. $5 \begin{bmatrix} -2 & -6 \\ 3 & 1 \end{bmatrix}$ 5. $[10 \ 3 \ -4] - 2[4 \ -5 \ -3]$

Solving for an unknown MATRIX:



6. $\begin{bmatrix} 10 & -2 \\ 4 & 0 \end{bmatrix} + X = \begin{bmatrix} 6 & -5 \\ -3 & 7 \end{bmatrix}$

Solving for an unknown ELEMENT:

7. $\begin{bmatrix} 7 & y \\ x & -6 \end{bmatrix} + \begin{bmatrix} -9 & x \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} -2 & -6 \\ 4 & -4 \end{bmatrix}$

4.1 Practice - Basic Matrix Operations

© 2012 Kuta Software LLC. All rights reserved.

Simplify. Write "undefined" for expressions that are undefined.

$$1) \begin{bmatrix} 4 & 5 \end{bmatrix} + \begin{bmatrix} 6 & -4 \end{bmatrix}$$

$$2) \begin{bmatrix} 4 & -1 \\ 3 & 3 \\ -5 & -4 \end{bmatrix} - \begin{bmatrix} 4 & -2 \\ 3 & 6 \\ -5 & -6 \end{bmatrix}$$

$$3) \begin{bmatrix} -4 & 1 \\ 6 & -3 \end{bmatrix} + \begin{bmatrix} 5 & -6 \\ 5 & -5 \end{bmatrix} - \begin{bmatrix} 2 & 0 \\ -2 & 6 \end{bmatrix}$$

$$4) \begin{bmatrix} -5 \\ 4 \end{bmatrix} - \begin{bmatrix} -4 \\ 2 \end{bmatrix} - \begin{bmatrix} -2 \\ 1 \end{bmatrix}$$

$$5) \begin{bmatrix} 3 & -3 \end{bmatrix} + 5 \begin{bmatrix} 2 & -5 \end{bmatrix}$$

$$6) \begin{bmatrix} -6 \\ -4 \\ -2 \\ -4 \end{bmatrix} - \begin{bmatrix} 6 \\ 5 \\ 4 \\ 2 \end{bmatrix} - \begin{bmatrix} 2 \\ -1 \\ -2 \\ 0 \end{bmatrix}$$

$$7) -3 \begin{bmatrix} -4u & 0 & 2 \end{bmatrix} + \begin{bmatrix} 6 & -6v & v - 3u \end{bmatrix}$$

$$8) \begin{bmatrix} 1 \\ 3n \end{bmatrix} - 5 \begin{bmatrix} -6mn \\ m + 5n^2 \end{bmatrix}$$

Solve each equation.

$$9) \begin{bmatrix} -7 \\ 1 \\ -14 \end{bmatrix} = X + \begin{bmatrix} 3 \\ -1 \\ -8 \end{bmatrix}$$

$$10) 4C + \begin{bmatrix} 0 & -9 & -4 \end{bmatrix} = \begin{bmatrix} 20 & -1 & 20 \end{bmatrix}$$

Solve for x and y .

$$11) \begin{bmatrix} 2 & x \\ y & -1 \end{bmatrix} + \begin{bmatrix} -3 & 2 \\ x & 4 \end{bmatrix} = \begin{bmatrix} -1 & 10 \\ -5 & 3 \end{bmatrix}$$

$$12) \begin{bmatrix} -10 & -4 \\ x & -1 \end{bmatrix} + \begin{bmatrix} -5 & 8 \\ y & -10 \end{bmatrix} = \begin{bmatrix} -15 & x \\ 16 & -11 \end{bmatrix}$$

$$13) 2 \begin{bmatrix} 1 & -8 \\ 6 & y \end{bmatrix} - x \begin{bmatrix} 3 & 1 \\ 7 & -2 \end{bmatrix} = \begin{bmatrix} -4 & -18 \\ -2 & -6 \end{bmatrix}$$

$$14) x \begin{bmatrix} -5 & 3 \\ y & 3 \end{bmatrix} - \begin{bmatrix} -2 & 4 \\ x & -1 \end{bmatrix} = \begin{bmatrix} -13 & 5 \\ -3 & 10 \end{bmatrix}$$

4.1 Application

For all problems, write out your equations and show your work. No work = no credit.

- In 1996, there were 320 species of animals that were endangered in the United States and 431 plant species endangered. In that same year, there were 521 species of animals that were endangered outside the United States (foreign) and only one plant species. (*Source: 1997 Information Please Almanac*) Create a matrix that organizes this information and label the rows and columns accordingly.

- The St. Louis Cardinals defeated the Texas Rangers in the 2011 World Series in a thrilling 7-game series. The matrices below show the statistics for runs, hits, and errors for each team in each game.

		Game 1					Game 2					Game 3					Game 4		
		R	H	E			R	H	E			R	H	E			R	H	E
St. Louis	Texas	3	6	0	St. Louis	Texas	1	6	1	St. Louis	Texas	16	15	0	St. Louis	Texas	0	2	0
		2	6	0			2	5	1			7	13	3			4	6	0

		Game 5					Game 6					Game 7		
		R	H	E			R	H	E			R	H	E
St. Louis	Texas	2	7	1	St. Louis	Texas	10	13	30	St. Louis	Texas	6	7	1
		4	9	2			9	15	2			2	6	0

- Write one matrix that gives the series statistics for runs, hits, and RBIs for each team.
- Which team had the most total runs?
- Which team had the most hits?
- Which team had the most errors?