Name________________________________

Algebra 2

Lesson 4-2

Adding and Subtracting Matrices

In Lesson 4-1 we looked at Aaron's Service Center and the revenue generated. To get the total revenue for 1997 at Store #103, we added the auto parts sales to the mechanic services to get the total revenue $388,000. By putting this information into a matrix we were able to add the information off the matrix. When we have a huge amount of data, computers can quickly add/subtract the data when it is in matrix form and add all columns and rows. While humans are slower than a computer, we too can add/subtract matrices so to get new information about a particular set of data.

Rules for Matrix Addition:

1. To add two matrices, they must have the same dimensions.
2. Add corresponding elements together.

Example:

$$A= \begin{bmatrix} 2 & 4 & -1 \\ -3 & 0 & 6 \end{bmatrix} \qquad B= \begin{bmatrix} 0 & 4 & -3 \\ 7 & -5 & 1 \end{bmatrix}$$

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

Properties of Matrix Addition:

If A, B, and C are m x n matrices (m rows and n columns) then:

1. A + B is an m x n matrix — Closure Property
2. A + B = B + A — Commutative Property of Addition
3. (A + B) C = A + (B + C) — Associative Property of Addition
4. There is a unique matrix O such that O + A = A + O = A — Additive Property of Addition
5. For each A there exists a unique opposite, - A, A + (-A) = O — Additive Inverse Property

Rules for Matrix Subtraction:

1. To subtract two matrices, they must have the same dimensions.
2. Add corresponding elements together.

Example:

$$A= \begin{bmatrix} 2 & 4 & -1 \\ -3 & 0 & 6 \end{bmatrix} \qquad B= \begin{bmatrix} 0 & 4 & -3 \\ 7 & -5 & 1 \end{bmatrix}$$

$$A+B= \begin{bmatrix} 2 & 4 & -1 \\ -3 & 0 & 6 \end{bmatrix} - \begin{bmatrix} 0 & 4 & -3 \\ 7 & -5 & 1 \end{bmatrix} = \begin{bmatrix} 2-0 & 4-4 & -1- (-3) \\ -3-7 & 0- (-5) & 6-1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 2 \\ -10 & 5 & 5 \end{bmatrix}$$

4-2

1. Solve

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

2. Solve

$$\begin{bmatrix} 2 & -3 & 5 \\ 0 & 6 & -3 \end{bmatrix} - \begin{bmatrix} 5 & 2 & 0 \\ 1 & 3 & 5 \end{bmatrix} = \begin{bmatrix} \quad & \quad & \quad \\ \quad & \quad & \quad \end{bmatrix}$$

3.

$$\begin{bmatrix} 2 & -3 & 4 \\ 5 & 6 & -7 \end{bmatrix} + \mathbf{X} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 2 \end{bmatrix} \qquad \mathbf{X} = \begin{bmatrix} \quad & \quad & \quad \\ \quad & \quad & \quad \end{bmatrix}$$