# Algebra 2 <br> Lesson 4-1: Organizing Data into Matrices 

Mrs. Snow, Instructor

A matrix is a rectangular array of numbers arranged in rows by columns. Mountains of real world data may be quickly processed when arranged in this rectangular format.

Each element or entry in a matrix has a specific location or address, read as a "row by column" location.
Example: $\begin{array}{ccc}3 & -2 & 5 \\ 4 & 0 & 1\end{array}$ The entry in the $2^{\text {nd }}$ row, $3^{\text {rd }}$ column, is identified as $\mathbf{e}_{23}=\mathbf{1}$.

The size or dimension of a matrix is simply the number of rows by the numbers of columns: $R x C$. Thus, the size of the matrix in the example above is 2 by 3 or $2 \times 3$. Two matrices are equal if and only if they are the same size and their corresponding matrix elements are identical or equivalent.

Consider the data sets below for Aaron's Service Center.

| Auto Parts |  |  |
| :--- | :--- | :--- |
| Store \# $\mathbf{2 0 1 0}$ <br> 103 $\$ 143,000$ <br> 205 $\$ 217,000$$\$ 198,000$ |  |  |
| 135 | $\$ 93,000$ | $\$ 135,000$ |

Mechanic Services

| Store \# | $\mathbf{2 0 1 0}$ | $\mathbf{2 0 1 1}$ |
| :--- | :--- | :--- |
| 103 | $\$ 245,000$ | $\$ 305,000$ |
| 205 | $\$ 486,000$ | $\$ 475,000$ |
| 135 | $\$ 204,000$ | $\$ 193,000$ |

What is Aaron's total revenue (parts + service) for Store \#103 in 2010?
total revenue=parts+ services
$R=$

$$
143,000+245,000=\$ 388,000
$$

What is Aaron's total revenue (parts + service) for Store \#205 in2011?
total revenue=parts+ services
$R=$
$195,000+475,000=\$ 670,000$

What is Aaron's total revenue (parts + service) for Store \#103 in 2011?
total revenue=parts+ services
$R=$
$135,000+193,000=\$ 328,000$

Notice that order of the entries is important. Each store has a specific set of data. High speed computers can now add millions of such entries in seconds. This process is called matrix addition or subtraction. Matrix addition/subtraction is the process of adding or subtracting corresponding entries. Thus, Aaron's Service Center data can be translated (in thousands of dollars) into matrix form (numerical data is transferred into the matrix):
$\left[\begin{array}{cc}\text { Parts } \\ \left.\begin{array}{cc}143 & 188 \\ 217 & 195 \\ 93 & 135\end{array}\right]+\left[\begin{array}{cc}245 & 305 \\ 486 & 475 \\ 205 & 193\end{array}\right]=\left[\begin{array}{cc}(143+245) & (188+305) \\ (217+486) & (195+475) \\ (93+205) & (135+193)\end{array}\right]=\left[\begin{array}{ll}388 & 493 \\ 703 & 670 \\ 298 & 328\end{array}\right]\end{array}\right.$

Matrix operations also obey the commutative and associative properties as well as the additive identity and additive inverse.

1. a) convert the data set into a matrix
b) What are the dimensions of the matrix?
c) The entry $\mathrm{n}_{32}$ is $\qquad$
2004 Men's Olympic Gymnastics Individual Medal Winners

| Gymnast | Floor <br> Exercise | Pommel <br> Horse | Still <br> Rings | Vault | Parallel <br> Bars | Horizontal <br> Bars |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Paul <br> Hamm | 9.725 | 9.700 | 9.587 | 9.137 | 9.837 | 9.837 |
| Dae Eun <br> Kim | 9.650 | 9.537 | 9.712 | 9.412 | 9.775 | 9.725 |
| Tae- <br> Young <br> Yang | 9.512 | 9.650 | 9.725 | 9.700 | 9.712 | 0.475 |

2. The data represents a manufacturer's shipment records
a) Display the data in matrix form, with columns representing years.
b) What $a_{23}$ ?
c) How many CDs were sold over the 6-year period?
d) How many CDs and DVDs were sold in 2001?

| Type | $\mathbf{1 9 9 8}$ | $\mathbf{1 9 9 9}$ | $\mathbf{2 0 0 0}$ | $\mathbf{2 0 0 1}$ | $\mathbf{2 0 0 2}$ | $\mathbf{2 0 0 3}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| CD | 847.0 | 938.9 | 942.5 | 881.9 | 803.3 | 745.9 |
| DVD | 0.5 | 2.5 | 3.3 | 7.9 | 10.7 | 17.5 |

3. Solve each equation for the variable (corresponding elements are equal)
$\left[\begin{array}{ccc}3 x+2 & 5 & 2 a \\ -18 & 6 & 5 y+3\end{array}\right]=\left[\begin{array}{lll}8 & 2 n-10 & 0 \\ c & 3 k & -7\end{array}\right]$
