

Name \_\_\_\_\_

**Algebra 2**  
**Lesson 4-3**  
**Matrix Multiplication**

Consider doubling the cost of movie tickets as shown below.

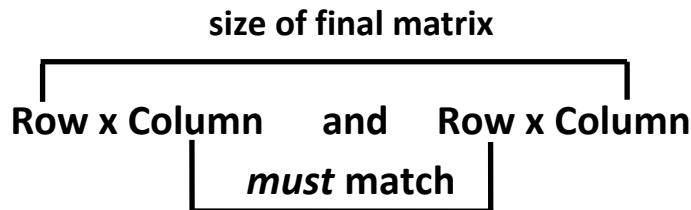
Children	\$3.50	<b>doubles to</b> →	Children	\$7.00
Adult	\$8.50		Adult	\$17.00
Sr. Citizens	\$5.50		Sr. Citizens	\$11.00

Mathematically,  $2 \times [3.50 \quad 6.25 \quad 5.50] = [7.00 \quad 17.00 \quad 11.00]$

Notice that every entry was doubled. In general, multiplying or dividing a matrix by a constant factor is called **scaler** multiplication. The word “scaler” comes from the root word “scale.”

**Example:** Simplify  $-3 \times \begin{bmatrix} 3 & -2 & 5 \\ 4 & 0 & -1 \end{bmatrix} = \begin{bmatrix} -9 & 6 & -15 \\ -12 & 0 & 3 \end{bmatrix}$

Matrix multiplication is a bit more complicated. To multiply two matrices the column size of the first matrix must match the row size of the second matrix. In other words:



To multiply two matrices:

1. Check for a “match” and note the “order;” No match means no multiplication is possible
2. Multiply **first row** of left matrix with **first column** of right matrix. Now sum up all products. Repeat multiplication of **first row** of left matrix with **second column** of right matrix. Sum up products. This will become your first row of the product matrix.
3. Repeat until all **rows** of left matrix have been multiplied with all **columns** of the right matrix.

To multiply matrices with a graphing calculator:

1. Check for “match.” remember, no match means no multiplication is possible.
2. Press  $(2^{\text{nd}} \text{ x}^{-1})$  **MATRIX ENTER**>> **EDIT** and then **ENTER**.
3. Input size (row **ENTER** then enter column **ENTER**) of first matrix.
4. Input matrix elements. Press **ENTER** after every entry. **QUIT**.
5. Repeat steps 2, 3, and 4 for second matrix. **QUIT**.
6. Press **MATRIX ENTER** x (multiply) v (down) **MATRIX (B) ENTER**.

**EXAMPLE:** Multiply the matrices

$$\begin{bmatrix} 3 & 2 & 0 \\ -1 & 4 & -2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 4 & 0 \\ -2 & 3 & 2 \\ 1 & 0 & -3 \end{bmatrix}$$

**Answer:**  $\begin{bmatrix} -1 & 18 & 4 \\ -11 & 8 & 14 \end{bmatrix}$

Dimensions  $\begin{bmatrix} 2 \times 3 & 3 \times 3 \end{bmatrix}$

Dimensions are  $2 \times 3$