ALGEBRA I ACTIVITY 10:
USING MATRICES TO ENTER DATA AND PERFORM OPERATIONS
TIalgebra.com

ACTIVITY OVERVIEW:
In this activity we will
- Enter data about ticket sales into matrices
- Add matrices and store the result in a matrix
- Multiply matrices to determine profit

	Child	Adult	Senior
Twn 1	308	115	79
Twn 2	175	33	52
Twn 3	95	68	17

The table above shows the number of tickets sold for a Disney re-release of Snow White for the Friday night showing at the Big Cinema in three towns. For example, in Town 1 there were 308 children, 115 adults, and 79 senior citizens in attendance.

Enter this data into Matrix A. Press [2nd][x⁻¹] to access the **MATRIX** menu. Right arrow to **EDIT** and select **1: [A].**

```
NAMES MATH EDIT
1:[A]
2:[B]
3:[C]
4:[D]
5:[E]
6:[F]
7↓[G]
```

Define Matrix A as a 3 row by 3 column matrix by typing over the dimensions in the top line. Press [ENTER] to see this screen.

```
MATRIX[A] 3 ×3
[ 0      0      0    ]
[ 0      0      0    ]
[ 0      0      0    ]


1,1=0
```

Type in the data as it is shown in the table above. Use arrow keys or [ENTER] to move from cell to cell.

```
MATRIX[A] 3 ×3
[ 308    115    79   ]
[ 175    33     52   ]
[ 95     68     17   ]


3,3=17
```

Next enter data about Saturday's sales into Matrix B. Press `2nd` `x⁻¹` to access the **MATRIX** menu. Right arrow to **EDIT** and select **2: [B].**	NAMES MATH **EDIT** 1:[A] 3×3 2:[B] 3:[C] 4:[D] 5:[E] 6:[F] 7↓[G]
Enter the data as shown. According to this table, how many senior citizens bought tickets in Town 2? How many children's tickets were sold in Town 3?	MATRIX[B] 3 ×3 [119 48 19] [88 29 29] [54 41 **3**] 3,3=3
Big Cinema makes a profit of $3.00 from each child's ticket, $4.00 from each adult ticket, and $3.50 from each senior citizen ticket. Enter this data into Matrix C. Press `2nd` `x⁻¹` to access the **MATRIX** menu. Right arrow to **EDIT** and select **3: [C].** The profit matrix will have 3 rows and 1 column.	MATRIX[C] 3 ×1 [0] [0] [0]
Enter the profit information. Later this matrix will be used to calculate the profit for each town during the weekend.	MATRIX[C] 3 ×1 [3] [4] [**3.5**] 3,1=3.5
Press `2nd` `MODE` to return to the home screen to perform operations with the matrices. What operation will tell the number of each type of ticket sold in each town for the entire weekend? To access Matrix A for use in this operation, press `2nd` `x⁻¹` and select **1: [A]**. This will paste **[A]** onto the home screen.	**NAMES** MATH EDIT 1:[A] 3×3 2:[B] 3×3 3:[C] 3×1 4:[D] 5:[E] 6:[F] 7↓[G]
Press `+`. Then press `2nd` `x⁻¹` and select **2: [B]**. This will paste **[B]** onto the home screen. This is preparing to instruct the calculator to add matrices A and B. To store the result as a matrix, press `STO▸` (see next step before continuing).	[A]+[B]→■

	NAMES MATH EDIT
	1: [A] 3×3
	2: [B] 3×3
	3: [C] 3×1
	4 [D]
	5: [E]
	6: [F]
	7↓[G]

Press ⌊2nd⌋⌊x⁻¹⌋ and select **4: [D]**. This will paste **[D]** onto the home screen.

```
[A]+[B]→[D]
```

This instruction tells the calculator to add matrices A and B and store the resulting matrix in matrix D. Press ⌊ENTER⌋.

```
[A]+[B]→[D]
   [[427 163  98]
    [263  62  81]
    [149 109  20]]
■
```

What do the entries in the resulting matrix mean? (This matrix is stored in Matrix D. To check press ⌊2nd⌋⌊x⁻¹⌋ and observe that Matrix D now has dimensions 3 x 3 displayed.)

```
[D]*[C]■
```

The profit matrix, matrix C, can be used to determine the amount of profit the Big Cinema in each town made over the weekend from ticket sales. The quantity matrix, matrix D, must have the same number of columns as the profit matrix has rows in order to be able to multiply them. Enter the operation as shown. This instructs the calculator to multiply the quantity matrix by the profit matrix.

```
[D]*[C]
      [[2276. ]
       [1320.5]
       [953   ]]
```

Press ⌊ENTER⌋. What was the profit in Town 1? How was this number determined by the calculator?

$[(427 \times \$3)+(163 \times \$4)+(98 \times \$3.50) = \$2,276.00]$

The resulting matrix can be converted to a table as shown.

	Profit
Town 1	$2,276.00
Town 2	$1,320.50
Town 3	$ 953.00

| What happens if you try to multiply the matrices in the wrong order? | ```
[D]*[C]
        [[2276  ]
         [1320.5]
         [953    ]]
[C]*[D]
``` |
| Why does this error occur? | ```
ERR:DIM MISMATCH
1:Quit
2:Goto
``` |