# **Lesson Objectives**

1. Addition or subtraction of matrices
2. Scalar multiplication of a matrix
3. Multiplying matrices

# Addition or subtraction of matrices

In order to either add or subtract matrices, they must have the **SAME dimension**.

* + - * **EXAMPLE:** Find . [6.5.7]

To find , simply add in **corresponding** positions.

* + - * **EXAMPLE:** Perform the matrix operation. [6.5-13]

This is **not defined** – they are **not** the **same** dimensions.

# **Scalar multiplication of a matrix**

A **scalar** is like a coefficient (or “multiplier”) to a matrix. It works sort of like using the distributive property – multiply **all** elements in the matrix by that scalar.

* **EXAMPLE:** If possible, use the given matrices *A* and *B* to find the following.

**(a)**  **(b)** **(c)**  [6.5.13]

**(a)**  **is undefined** because they are **not** the **same** dimensions.

**(b)**

NOTE: Multiplying by a scalar does **NOT** affect the dimensions of a matrix.

**(c)**

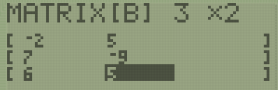
**is undefined** because they are **not** the **same** dimensions.

* **EXAMPLE:** Find the following matrices where and .

(we will be using graphing calculator)

**a.** **b.** **c.**  [6.5.15]

First, you need to enter your matrices into your calculator

1. Press **2ND,**  (MATRIX), go to EDIT, **ENTER** for matrix [A]. 
2. Enter the dimensions of matrix [A]; in this problem, it’s 3 rows × 2 columns.
3. Enter each of the elements of the matrix. 
4. Press **2ND, MODE** (QUIT).
5. Repeat the process for matrix [B]. 

Next, to call up a matrix to do a calculation:

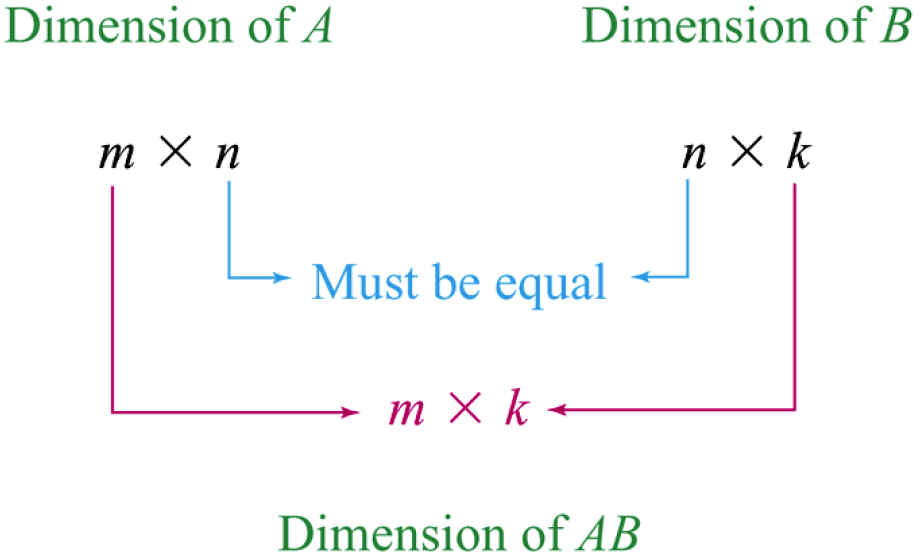
Press **2ND,**  (MATRIX), stay on NAMES, select your matrix, and press **ENTER**.

|  |  |  |
| --- | --- | --- |
| **a.** | **b.** | **c.** |
|  |  |  |
|  |  |  |

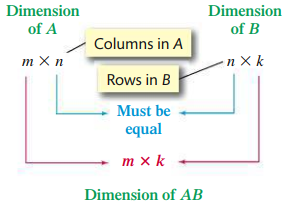
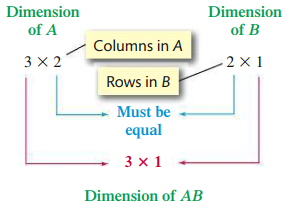
# **Multiplying matrices – do NOT do this by hand! Use your CALCULATOR!**

Multiplying matrices is different than adding or subtracting matrices in two ways:

* You **don’t** multiply corresponding positions like how add or subtract works.
* The two matrices **don’t** necessarily need to have the **same** dimensions.



**How Matrix Multiplication Works**

**NOTE: Do NOT do matrix multiplication by hand…EVER! Use CALCULATOR!!**

* **EXAMPLE:** Find (if possible) **a.** and **b.** , if [6.5.31]

,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **a.** means [A][B] on calculator. | |  | **b.** means [B][A] on calculator. | |
| First, check **dimensions** to see if multiplication even works. | | | | |
| Dimension of [A] | Dimension of [B] |  | Dimension of [B] | Dimension of [A] |
|  |  |  |  |  |
| Do inside numbers match? **YES** | |  | Do inside numbers match? **YES** | |
| If yes, look at **outside** numbers – that’s dimension of product matrix. | | | | |
| Product matrix [A][B] will be | |  | Product matrix [B][A] will be | |
| Use Calculator to find the matrix product | | | | |
|  | |  |  | |
|  | |  |  | |

* **EXAMPLE:** Find the product of the following matrices, if possible. [6.5.29]

Dimension of first matrix: Dimension of second matrix:

Do the inside numbers match? **NO** **3** and **2**

Conclusion: **The multiplication is not possible**, even though they are same dimension.

Sources Used:

1. Pearson MyLab Math *College Algebra with Modeling and Visualization, 6th Edition*, Rockswold
2. Wabbitemu calculator emulator version 1.9.5.21 by Revolution Software, BootFree ©2006-2014 Ben Moody, Rom8x ©2005-2014 Andree Chea. Website <https://archive.codeplex.com/?p=wabbit>