



# CASIO eLearning Activities



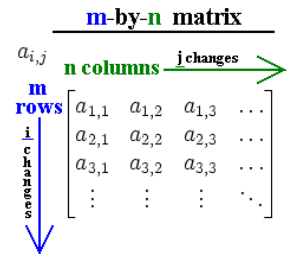
## Matrix: Addition/Subtraction and Scalar Multiplication

Matrices can be added and subtracted if they have the same dimensions (row x column). They can be altered by scalar multiplication. These operations can be done on the Casio calculator fairly easily and the process is helpful if you have lots to do with the same matrices.

Let's start with paper and pencil to add, subtract, and find scalar multiples for the following matrices.

$$\text{Matrix A} = \begin{bmatrix} 1 & 4 & 7 \\ -3 & 5 & -2 \end{bmatrix}$$

$$\text{Matrix B} = \begin{bmatrix} 4 & -9 & 2 \\ 1 & 0 & -3 \end{bmatrix}$$



**\* Note that the dimensions of each matrix are 2 x 3. This allows addition and subtraction of the matrices.**

Find Matrix A + Matrix B (add corresponding elements)  $\begin{bmatrix} 1+4 & 4+(-9) & 7+2 \\ -3+1 & 5+0 & -2-(-3) \end{bmatrix} = \begin{bmatrix} 5 & -5 & 9 \\ -2 & 5 & 1 \end{bmatrix}$

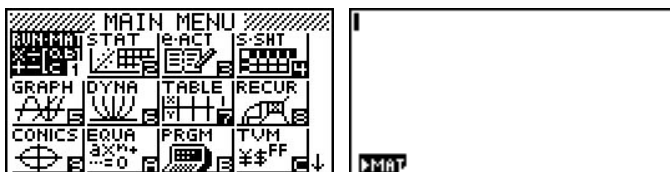
Find Matrix A – Matrix B (subtract corresponding elements)  $\begin{bmatrix} 1-4 & 4-(-9) & 7-2 \\ -3-1 & 5-0 & -2-(-3) \end{bmatrix} = \begin{bmatrix} -3 & 13 & 5 \\ -4 & 5 & 1 \end{bmatrix}$

Find 3 times Matrix A (multiply each element by 3)  $3 \begin{bmatrix} 1 & 4 & 7 \\ -3 & 5 & -2 \end{bmatrix} = \begin{bmatrix} 3 & 12 & 21 \\ -9 & 15 & -6 \end{bmatrix}$

**Now try the same operations on the calculator. It may take a little longer the first time, but once you see how to do it, it goes faster. Follow the steps below. Calculator key strokes will be given.**

1. Turn on the calculator and press Menu. Highlight “Run,Mat” on the calculator keyboard and click Execute. Then click on F1 (under the word Mat) at the bottom of the screen.

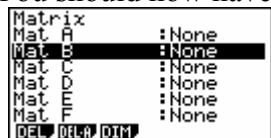
**Key strokes:** **[MENU]** **[EXE]** **[F1]**



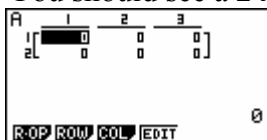
2. You will see a list of matrices down the left column. If anything is already showing as dimensions, press F1 (del), and then F1 again (yes) to clear it. Use the round blue button to scroll down to the next matrix that needs to be cleared and repeat the clear and yes procedures. **Key strokes:** **F1** **F1**



You should now have a screen with no dimensions entered for the matrices.

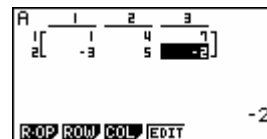


3. Scroll back up to highlight Mat A. Press 2 on the calculator keys, then press execute, press 3, press execute. Then execute again. After the second “execute”, the screen below will come up. You have entered the dimensions of the matrix A. You should see a 2 x 3 matrix with all 0’s in it.



**Key Strokes:** **2** **EXE** **3** **EXE** **EXE**

4. Begin at the top right and press 1 on the calculator keyboard, execute, then 4, execute, and continue until all elements of matrix A are in. The numbers will continue as you key and will wrap automatically to the second line.



**Key strokes:** **1** **EXE** **4** **EXE** **7** **EXE** **-** **3** **EXE** **5** **EXE** **-** **2** **EXE**

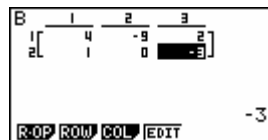
5. Press Exit to go back to the list. **Key strokes:** **EXIT**

6. Scroll down to highlight Mat B and press 2, execute, 3, execute, execute to get the all zeroes screen again for the B matrix.

**Key strokes:** **2** **EXE** **3** **EXE** **EXE**

7. Key in the elements of matrix B as you did in step #4. When finished, press Exit.

**Key strokes:** **4** **EXE** **-** **9** **EXE** **2** **EXE** **1** **EXE** **0** **EXE** **-** **3** **EXE** **EXIT**

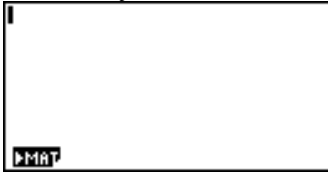


(You should see this screen and then press exit.)

You have now entered both Matrix A and Matrix B and have them ready to work with. If you want more matrices put in, follow the steps from #3 to #7 with new matrices highlighted.

Now we will do the operations of addition, subtraction, and multiplication. The matrices do not have to be re-entered each time as we work with them. They will stay there until you change them.

8. Once you have entered the matrices and hit exit, press exit again to take you back to the run screen.



9. Press OPTN (options – next to the yellow shift key). You will see a list of things at the bottom of the screen. **Key strokes:** **OPTN**

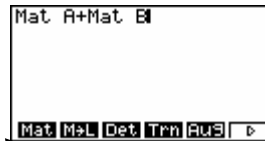


10. Click on Mat and you will see this screen.

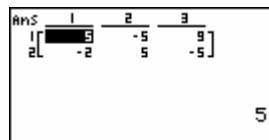


11. Click on Mat on this screen and you will see the word Mat appear at the top of the screen.

12. Type A by pressing the red “Alpha” button and then “X, Θ, T” (a red A is shown above that button). You will see Mat A on the screen. **Key strokes:** **ALPHA** **X,Θ,T**



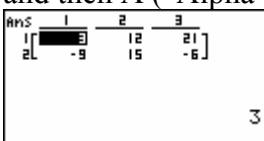
Press + and then click on Mat again, then type in B (press red “Alpha” and then the “log” button). **Key strokes:** **+** **Mat** **ALPHA** **log**



13. Now press execute. Compare this with the answer you found above. It should be the same. If not, go back through the steps and try again.

14. To now subtract Matrix A – Matrix B, press AC (all clear) twice and begin at step #11. Change the + to a - in #12.

15. To multiply 3 times Matrix A, press AC twice to clear the last computation. Type 3, click on matrix, and then A (“Alpha”, “X, Θ, T”).Execute. Compare this answer to the one above for multiplication.



**Practice:** Use the calculator to find described matrices. Remember to begin by entering the elements of each matrix. See steps #1 - #7. Determine what the dimensions of the matrices are by counting the number of rows and the number of columns. Dimensions are given as “row x column”. Write your answer below the problem.

$$\text{Matrix } A = \begin{bmatrix} -5 & 2 \\ 1 & -8 \\ 4 & 3 \end{bmatrix}$$

$$\text{Matrix } B = \begin{bmatrix} 7 & -4 \\ 3 & -6 \\ 12 & -9 \end{bmatrix}$$

$$\text{Matrix } C = \begin{bmatrix} 10 & 2 \\ -5 & 9 \\ -1 & 0 \end{bmatrix}$$

1. Matrix A + Matrix B

2. Matrix A – Matrix C

3. 4 times Matrix B

4. 3 times Matrix A + 2 times Matrix B

5. Matrix C – 4 times Matrix A

6. Matrix A + Matrix B – Matrix C

7. the sum of Matrix A and Matrix C

8. Matrix C + 3 times Matrix A

9. twice Matrix C – 3 times Matrix A

10. Matrix B – Matrix A