

CAMBRIDGE TECHNOLOGY IN MATHS

Year 12

Matrices and applications I for the TI-83/84

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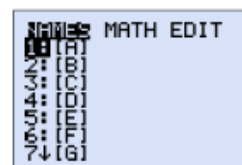
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How to enter a matrix into the TI-83/84

Enter the matrix $A = \begin{bmatrix} 2 & 3 & 0 \\ 1 & 4 & 2 \end{bmatrix}$ into a graphics calculator.

Steps

- 1 Press (2nd) [MATRIX] to open the **MATRIX** menu.



- 2 Use the arrow keys to move to the **EDIT** sub-menu and press (ENTER) to select matrix **[A]**.
Your screen should now look like that shown opposite.



- 3 To accept a matrix, the calculator needs to know its order.
It is a 2×3 matrix.

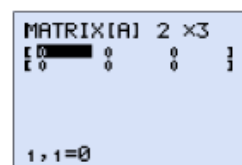
Type in 2 (ENTER) 3 (ENTER).

The calculator sets up a 2×3 matrix with each element shown as zero. Starting at the left-hand top corner and reading from left to right, enter the values of each of the matrix elements, as follows:

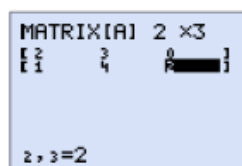
2 (ENTER) 3 (ENTER) 0 (ENTER) 1 (ENTER) 4 (ENTER) 2 (ENTER).

Your screen should now look like that shown opposite.

The matrix A is now stored in the memory of the calculator.

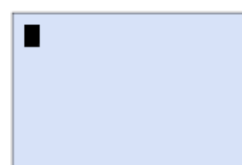


Note: The $2, 3 = 2$ in the bottom left-hand corner of the screen indicates that the element in Row 2, Column 3 is 2.

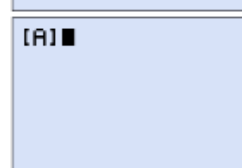


- 4 To display the matrix on the **Home** screen:

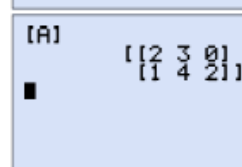
- i Press (2nd) [QUIT] to take you back to the **Home** screen and press (CLEAR) if necessary.



- ii Press (2nd) [MATRIX] 1 to paste matrix **[A]** onto the **Home** screen.



- iii Press (ENTER) to display the contents of matrix **[A]** on the **Home** screen.



Questions on entering matrices into the TI-83/84

2 Enter the following matrices into a graphics calculator and display on the Home screen.

$$\mathbf{a} \quad B = \begin{bmatrix} 1 & 0 & 3 \\ 2 & -2 & 1 \end{bmatrix} \quad \mathbf{b} \quad C = \begin{bmatrix} 4 & -4 \\ -2 & 6 \end{bmatrix} \quad \mathbf{c} \quad E = [1 \quad -1 \quad 2] \quad \mathbf{d} \quad F = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$$

How to add, subtract and scalar multiply matrices using the TI-83/84

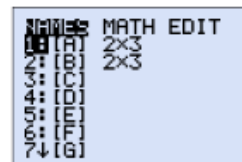
If $A = \begin{bmatrix} 2 & 3 & 0 \\ 1 & 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 3 \\ 2 & -2 & 1 \end{bmatrix}$, find:

- a $A + B$ b $A - B$ c $3A - 2B$

Steps

- 1 Enter the matrices A and B into your calculator.

Note: If you have been following the text, these matrices should already be stored in your calculator. Otherwise, refer to page 639 if you are unsure how to enter a matrix into your calculator. You can check that the matrices are in your calculator, by opening up the **MATRIX** menu (2nd **[MATRIX]**).

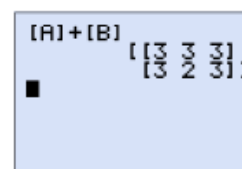
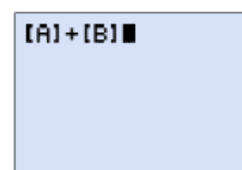


- 2 All matrix calculations are done on the **Home** screen.

If necessary, press (2nd **[QUIT]**) to take you to the **Home** screen and press **[CLEAR]**.

- a To calculate $A + B$:

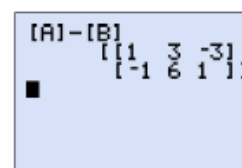
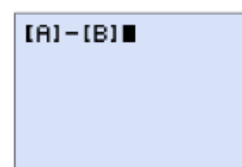
- Press (2nd **[MATRIX]** **[1]**) to paste matrix **[A]** onto the **Home** screen.
- Press **[+]** (2nd **[MATRIX]** **[2]**) to add matrix **[B]**.
- Press **[ENTER]** to evaluate.
- Write down your answer.



$$\therefore A + B = \begin{bmatrix} 3 & 3 & 3 \\ 3 & 2 & 3 \end{bmatrix}$$

- b To calculate $A - B$:

- Press (2nd **[MATRIX]** **[1]**) to paste matrix **[A]** onto the **Home** screen.
- Press **[−]** (2nd **[MATRIX]** **[2]**) to subtract matrix **[B]**.
- Press **[ENTER]** to evaluate.
- Write down your answer.



$$\therefore A - B = \begin{bmatrix} 1 & 3 & -3 \\ -1 & 6 & 1 \end{bmatrix}$$

Original location: Chapter 26 (p.646-647)

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c To calculate $3A - 2B$:

- i Press $\boxed{3}$ then $\boxed{2\text{nd}} \boxed{[\text{MATRIX}]} \boxed{1}$ to paste matrix **[A]** onto the **Home** screen.
- ii Press $\boxed{-}$ $\boxed{2} \boxed{2\text{nd}} \boxed{[\text{MATRIX}]} \boxed{2}$ to subtract two times matrix **[B]**.
- iii Press $\boxed{\text{ENTER}}$ to evaluate.
- iv Write down your answer.

The calculator screen displays the expression $3[A]-2[B]$ at the top. Below it, the matrix B is shown as $\begin{bmatrix} 4 & 9 & -6 \\ -1 & 16 & 4 \end{bmatrix}$. A cursor is visible at the bottom left of the screen.

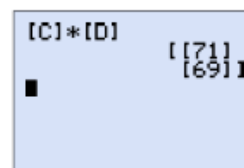
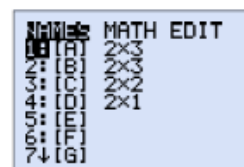
$$\therefore 3A - 2B = \begin{bmatrix} 4 & 9 & -6 \\ -1 & 16 & 4 \end{bmatrix}$$

How to multiply two matrices using the TI-83/84

If $C = \begin{bmatrix} 11 & 5 \\ 10 & 9 \end{bmatrix}$ and $D = \begin{bmatrix} 6 \\ 1 \end{bmatrix}$, find the matrix product CD .

Steps

- 1 Enter the matrices C and D into your calculator.
- 2 All matrix calculations are done on the home screen.
If necessary, press $\boxed{2\text{nd}} \boxed{[\text{QUIT}]}$ to take you to the **Home** screen and press $\boxed{[\text{CLEAR}]}$.
To calculate CD :
 - i Press $\boxed{2\text{nd}} \boxed{[\text{MATRIX}]} \boxed{3}$ to paste matrix $[C]$ onto the **Home** screen.
 - ii Press $\boxed{\times} \boxed{2\text{nd}} \boxed{[\text{MATRIX}]} \boxed{4}$ to multiply by matrix $[D]$.
Note: You can omit the multiplication key if you wish, as the calculator interprets $[C] [D]$ as $[C] \times [D]$.
 - iii Press $\boxed{[\text{ENTER}]}$ to evaluate.
- 3 Write down your answer.



$$\therefore CD = \begin{bmatrix} 71 \\ 69 \end{bmatrix}$$

Questions on multiplying matrices using the TI-83/84

- 1 The questions below relate to the following six matrices.

$$A = \begin{bmatrix} 1 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 3 \\ 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 0 & -1 \end{bmatrix} \quad D = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} \quad E = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix} \quad F = \begin{bmatrix} 0 & 1 & 4 \\ 3 & 2 & 1 \end{bmatrix}$$

- a Which of the following matrix products are defined?
 - i AB ii BA iii AC iv CE v EC vi EF vii FE viii FA
- b Compute the following products by hand.
 - i AB ii CE iii DB iv FE
- c Enter the six matrices into your calculator and compute the following matrix expressions.
 - i AB ii FE iii $AB - 3CE$ iv $2FE + 3B$

Original location: Chapter 26 (p.654), Exercise 26D Q1 (p.656)

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Answers

Entering matrices questions

2 No answers required

Matrix multiplication questions

1 a i, ii, iv, v, vii

b i [6] ii [2] iii $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ iv $\begin{bmatrix} 1 \\ 8 \end{bmatrix}$
 c i [6] ii $\begin{bmatrix} 1 \\ 8 \end{bmatrix}$ iii [0] iv $\begin{bmatrix} 11 \\ 19 \end{bmatrix}$

Original location: Answers (p.796-797)

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