



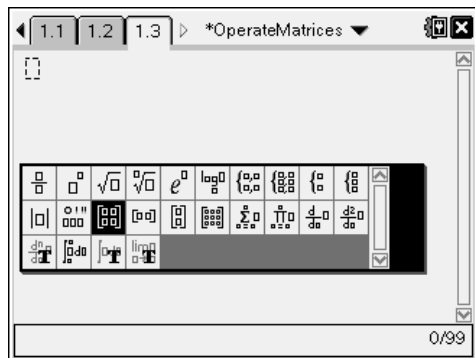
Open up a new TI-Nspire document. Insert a new *Calculator* page or open the *Scratchpad* (≡) or press (ctrl) (0) to start this activity.

Part 1 – Adding and Subtracting Matrices

Matrices are located in the Math Template, which can be accessed through the catalog (≡) or by pressing (ctrl) (0). The template is pictured at the right.

The highlighted template is for a 2×2 matrix. Select this template by pressing (enter).

Fill in the values by typing the number and using either (tab) or the NavPad to move between the entries in each row or column.



1. Enter the following examples. Record the results for each exercise.

a. $\begin{bmatrix} 2 & 5 \\ 8 & -11 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ -3 & 7 \end{bmatrix}$

b. $\begin{bmatrix} 2 & 3 \\ 10 & -1 \end{bmatrix} - \begin{bmatrix} 4 & 9 \\ -5 & 2 \end{bmatrix}$

c. $\begin{bmatrix} 4 \\ 9 \end{bmatrix} + \begin{bmatrix} 1 & -6 \\ -2 & 8 \end{bmatrix}$

d. $\begin{bmatrix} 7 & -9 \\ -3 & 4 \end{bmatrix} - \begin{bmatrix} 6 & -5 & 0 \\ -1 & 0 & 3 \end{bmatrix}$

2. When can matrices be added or subtracted?

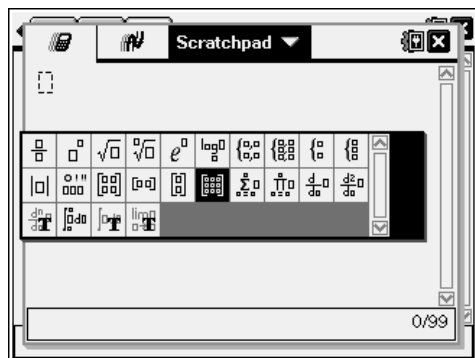
3. How does the error message help figure out the rule to add and subtract matrices?

4. What is the rule to add and subtract matrices?

Part 2 – Multiplying Matrices

Insert a new *Calculator* page by pressing $\text{ctrl} + \text{I}$ and selecting **Calculator** or press $\text{ctrl} + \text{I}$ to open the *Scratchpad*.

In this problem, you will use the 3×3 matrix template (shown at the right). When you select this template, a dialogue box will appear and ask you to enter the number of rows and columns of the matrix you want to create.



Multiply two matrices in the same manner as adding or subtracting. As you complete the examples, you should think about the dimensions of the two matrices multiplied together and the answer.

5. Calculate the following examples. Record the results for each exercise.

a. $\begin{bmatrix} 4 & -3 \\ -1 & 7 \end{bmatrix} \cdot \begin{bmatrix} 1 & 3 \\ 8 & 5 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 9 \end{bmatrix} \cdot \begin{bmatrix} -1 \\ -4 \end{bmatrix}$

c. $\begin{bmatrix} 2 \\ 7 \end{bmatrix} \cdot \begin{bmatrix} -3 & 5 \end{bmatrix}$

d. $\begin{bmatrix} 2 & 5 & 7 \\ -4 & 11 & -8 \\ -6 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 6 & 10 \\ 0 & -1 & 1 \\ 7 & 1 & 5 \end{bmatrix}$

e. $\begin{bmatrix} -2 & 0 \\ 8 & 4 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ 5 \\ 9 \end{bmatrix}$

6. What dimension matrices could be multiplied?

7. If the matrices could be multiplied, what is the dimension of the result?

8. If an $a \times b$ matrix is multiplied by a $c \times d$ matrix, what must be true in order to get an answer?

Part 3 – Inverses and Determinants of Matrices

Insert a new *Calculator* page or open the *Scratchpad*.

Finding the Inverse of a Matrix

In order to find the inverse of a matrix, enter negative one as the exponent. Try the following example:

$$\begin{bmatrix} 2 & -1 \\ 7 & 11 \end{bmatrix}^{-1}$$

Finding the Determinant of a Matrix

To find the determinant of a matrix, select **MENU > Matrix & Vector > Determinant** and enter the matrix. Try the following example:

$$\det\left(\begin{bmatrix} 2 & -1 \\ 7 & 11 \end{bmatrix}\right)$$

9. Find the inverse and determinant of each matrix.

Inverse

Determinant

a. $\begin{bmatrix} 4 & 2 \\ 6 & 3 \end{bmatrix}$

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

c. $\begin{bmatrix} 1 & 2 \\ -3 & 3 \end{bmatrix}$

d. $\begin{bmatrix} 2 \\ 8 \end{bmatrix}$

e. $[2 \ -1 \ 7]$

10. What dimension matrices have a determinant? An inverse?

11. What is the relationship between the determinant and the inverse matrix?

12. Does the determinant affect whether a matrix has an inverse? If so, how?

Practice Problems

Insert a new *Calculator* page or open the *Scratchpad* to solve the following problems.

1. $\begin{bmatrix} 10 & 19 \\ -8 & 22 \end{bmatrix} + \begin{bmatrix} 17 & 5 \\ -3 & -9 \end{bmatrix}$

2. $\begin{bmatrix} 0 & 1 \\ 3.5 & 2.4 \end{bmatrix} - \begin{bmatrix} -1.7 & 1.3 \\ 1.1 & -0.2 \end{bmatrix}$

3. $\begin{bmatrix} \frac{1}{4} & 6 \\ -2 & -\frac{2}{5} \end{bmatrix} + \begin{bmatrix} -1 & \frac{9}{4} \\ 0 & \frac{1}{7} \end{bmatrix}$

4. $\begin{bmatrix} 4.6 & 5 \\ 2 & 8 \end{bmatrix} - \begin{bmatrix} -4 & -13 \\ -3 & -23 \end{bmatrix}$

5. $\begin{bmatrix} 0 & -2 \\ -1 & 10 \end{bmatrix} \cdot \begin{bmatrix} -3 & 2 \\ 7 & -1 \end{bmatrix}$

6. $\begin{bmatrix} 1 & 2 \\ -1 & -2 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ -2 \end{bmatrix}$

7. $\begin{bmatrix} 1 \\ 3 \\ 7 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 & 1 \\ 4 & 4 & 4 \\ 2 & 9 & 7 \end{bmatrix}$

8. $\begin{bmatrix} 2 \\ 1 \\ -\frac{1}{8} \end{bmatrix} \cdot [9 \quad -7 \quad 3]$

9. $\begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix} \cdot \begin{bmatrix} \frac{2}{3} & -\frac{1}{3} \\ \frac{1}{3} & -\frac{2}{3} \end{bmatrix}$

10. Find the inverse of: $\begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix}$

11. Find the inverse of: $[5 \quad 2 \quad 1 \quad 8]$

12. Find the determinant of: $\begin{bmatrix} 1 & 2 & 4 \\ 2 & -3 & 5 \\ 0 & -1 & 0 \end{bmatrix}$