Matrices – Act 2

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Student Activity

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TI-Nspire | Investigation | Student | 30 min

Multiplication

Start a new document and insert a calculator application.

The first matrix will be defined as: *mata*

It is not necessary to have 'mat' at the start of the variable name, however it will help immediately identify which of your defined variables is a matrix.

In this document a matrix is denoted as: [A].

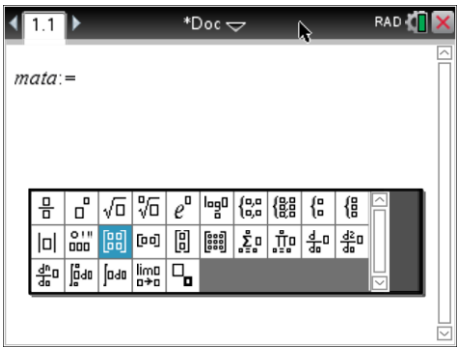
One way to define a variable is to use ":="

Type: mata:=

Use the maths template and select the 2 x 2 matrix template (shown opposite)

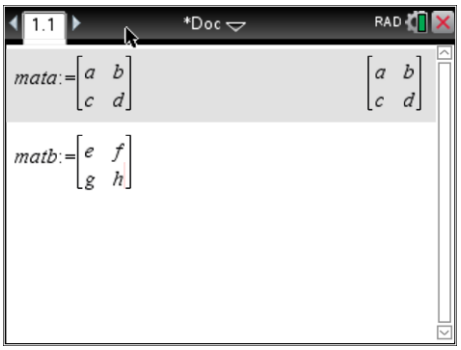
Define matrix A as: mata:= $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$

Use the [**TAB**] key to navigate around the matrix.



Repeat the above process to create a second matrix called Matrix B

matb := $\begin{bmatrix} e & f \\ g & h \end{bmatrix}$

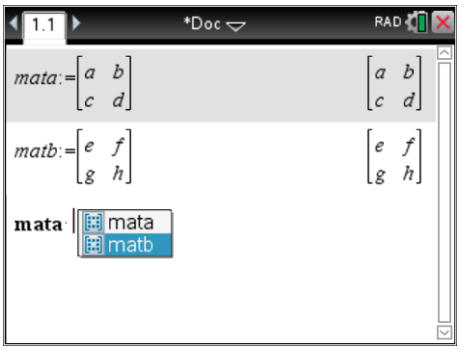


Multiply the two matrices together:

mata × matb

Note:

To avoid typing the variable name again, press the variable button and select the variable name from the list.



Author: P. Fox

Questions

1. Write down the rule for multiplying two: 2 x 2 matrices and include a diagram showing how each component is determined.

2. Use your rule to answer the following: (ie: Do these questions by hand)

a) $\begin{bmatrix}1 & 2\\4 & 1\end{bmatrix}\times\begin{bmatrix}2 & 3\\1 & 5\end{bmatrix}=$ b) $\begin{bmatrix}2 & 3\\1 & 5\end{bmatrix}\times\begin{bmatrix}1 & 2\\4 & 1\end{bmatrix}=$

c) $\begin{bmatrix}1 & 1\\1 & 1\end{bmatrix}\times\begin{bmatrix}6 & 8\\1 & 2\end{bmatrix}=$ d) $\begin{bmatrix}6 & 8\\1 & 2\end{bmatrix}\times\begin{bmatrix}1 & 1\\1 & 1\end{bmatrix}=$

e) $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}\times\begin{bmatrix}2 & 3\\1 & 5\end{bmatrix}=$ f) $\begin{bmatrix}2 & 3\\1 & 5\end{bmatrix}\times\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}=$

g) $\begin{bmatrix}7 & 3\\5 & 2\end{bmatrix}\times\begin{bmatrix}-2 & 3\\5 & -7\end{bmatrix}=$ h) $\begin{bmatrix}2 & 3\\1 & 5\end{bmatrix}\times\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}=$

3. Check your answers to the above questions using the CAS calculator.

Commutative Law:

$$a\times b=b\times a$$

4. Use the algebraic representation of matrix multiplication from Question1 combined with selected answers from Question 2 to determine if the commutative law (above) applies to the multiplication of matrices.

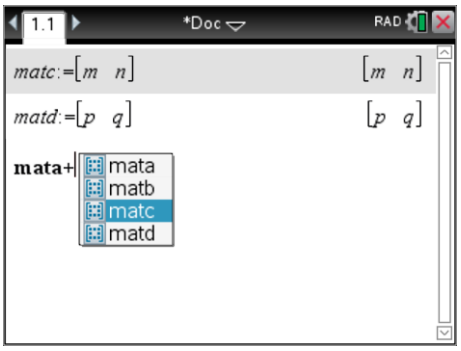
5. Multiply matrix A by itself; mata × mata, check this answer against mata^2.

Dimensions

Two new matrices need to be defined: matc and matd

matc : = $\begin{bmatrix}m & n\end{bmatrix}$

matd := $\begin{bmatrix}p\\q\end{bmatrix}$



6. Explore the multiplication of matrices with different dimensions. Record the results for each of the following:

a) [A] × [D] = b) [C] × [A] =

c) [A] × [C] = d) [D] × [A] =

e) [C] × [D] = f) [D] × [C] =

g) Comment on your findings with regards to the multiplication of matrices with different dimensions. **Hint**: Write down the dimensions of each matrix "Rows x Columns" next to each multiplication problem above noting which multiplication problems produce a result and the corresponding dimensions of the result.

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