Matrices – Act 1

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Answers

7 8 9 10 **11** 12

TI-Nspire | Investigation | Student | 30 min

Addition & Subtraction

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.

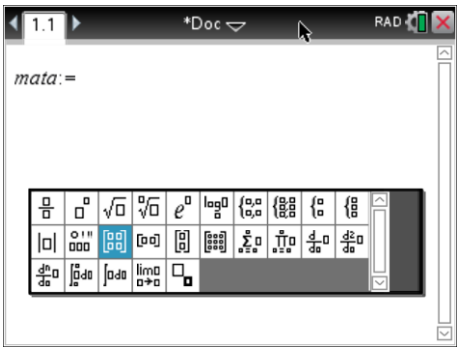
In this document a matrix is denoted as: [A].

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)

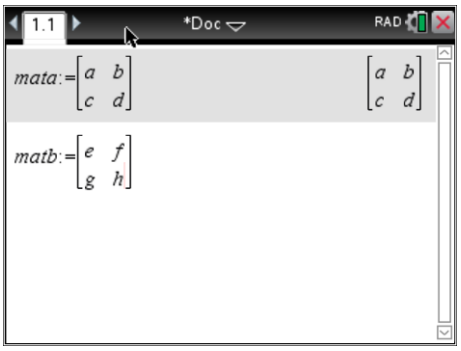
Define matrix A as: mata:= $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$



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

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

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

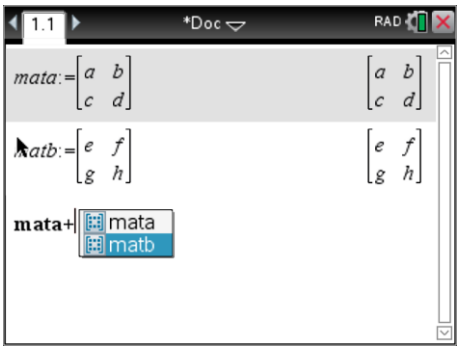


Add the two matrices together:

mata + matb

Note:

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

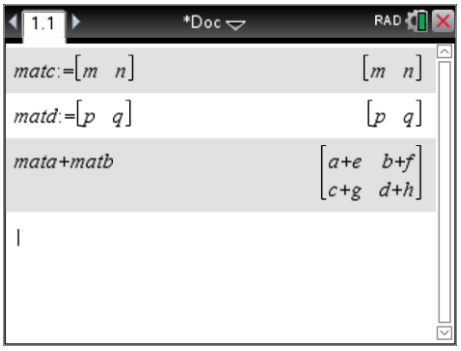


Author: P. Fox

Questions

1. Write down the rule for adding two: 2 x 2 matrices.

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} a+e & b+f \\ c+g & d+h \end{bmatrix}$$



2. Use your rule to answer the following:

a) $\begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} + \begin{bmatrix} 5 & 7 \\ 2 & 8 \end{bmatrix} = \begin{bmatrix} 7 & 10 \\ 6 & 9 \end{bmatrix}$

b) $\begin{bmatrix} 5 & 7 \\ 2 & 8 \end{bmatrix} + \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 10 \\ 6 & 9 \end{bmatrix}$

c) $\begin{bmatrix} 5 & -2 \\ 1 & -3 \end{bmatrix} + \begin{bmatrix} 6 & 8 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 11 & 6 \\ 2 & -1 \end{bmatrix}$

d) $\begin{bmatrix} 6 & 8 \\ 1 & 2 \end{bmatrix} + \begin{bmatrix} 5 & -2 \\ 1 & -3 \end{bmatrix} = \begin{bmatrix} 11 & 6 \\ 2 & -1 \end{bmatrix}$

3. Check your answers using the CAS calculator.

Commutative Law:

$$a+b=b+a$$

4. Determine if the commutative law (above) applies to matrices. Yes … it applies.

Associative Law:

$$a+(b+c)=(a+b)+c$$

5. Determine if the associative law (above) applies to matrices. Yes … it applies.

6. Add [A] to itself. ie: mata + mata. Check this answer against 2 × [A].

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 2a & 2b \\ 2c & 2d \end{bmatrix} = 2\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

7. Write down a general rule for n × [A]

$$n\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} na & nb \\ nc & nd \end{bmatrix}$$

8. Explore the subtraction of matrices.
Use the previous questions as a guide for your explorations.

Answers will vary, students should identify however that the commutative and associative laws do not apply for subtraction.

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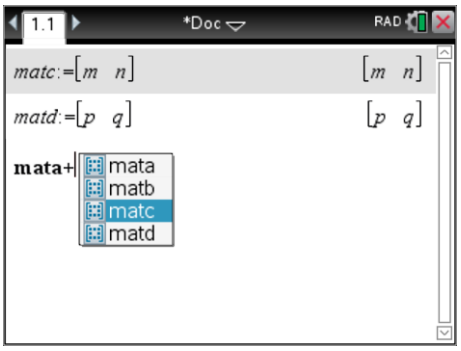
Dimensions

Two new matrices need to be defined: matc and matd

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

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



9. Explore the addition and subtraction of matrices with different dimensions. Record the results for each of the following:

   None of the results below can be computed. Each will return a result 'dimension error'. Students should identify that matrices must be the same dimension in order to add or subtract.

   a) [A] + [C] =

   b) [C] + [A] =

   c) [A] + [D] =

   d) [D] + [A] =

   e) Comment on your findings with regards to addition and subtraction of matrices with different dimensions.

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