

Mathcad Webinar Overview:

- (1) Why import Excel data into Mathcad?
- (2) Overview of "Input file" and "Excel component"
- (3) Example cases
- (4) Introduction to the "READFILE" function
- (5) Summary and Question time

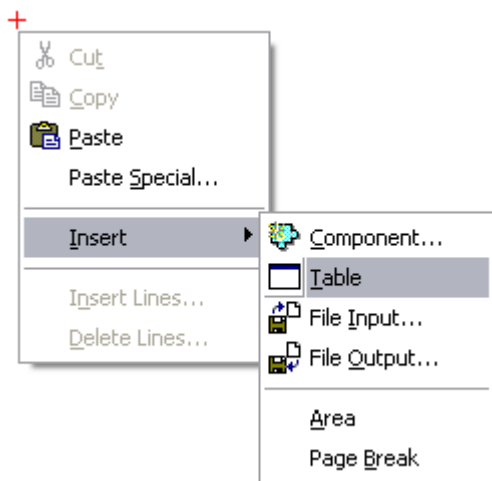
Data Exchange

Data Exchange: Import

There are a variety of methods of importing data into Mathcad:

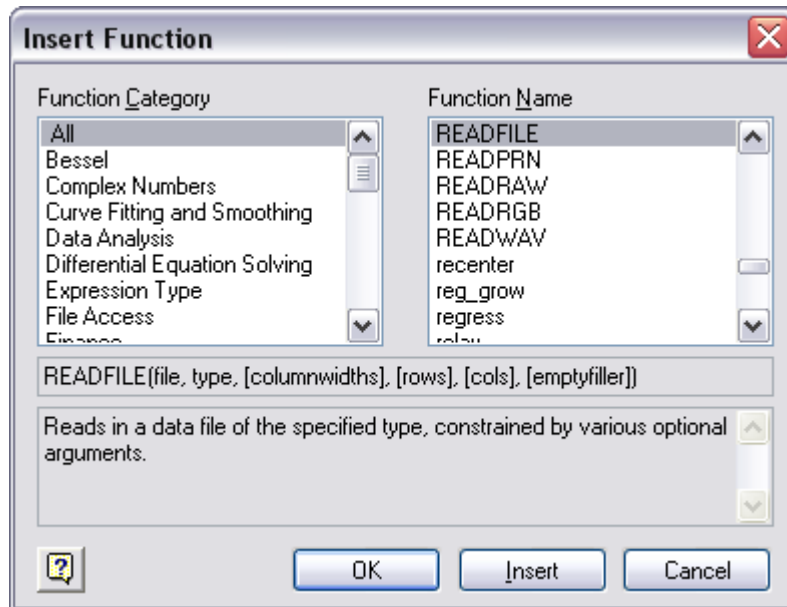
- An input file **component** (via data wizard)
- The Excel **component**
- The *READFILE* **function**

Each of these methods, with the exception of *READFILE*, are accessed by right-clicking in a blank space of the worksheet and choosing Insert / Component from the popup menu.



<<< Components are methods of exchanging data and functionality with other applications or sources. They are very useful methods of data exchange.

READFILE can be found under the Insert / Function menu.



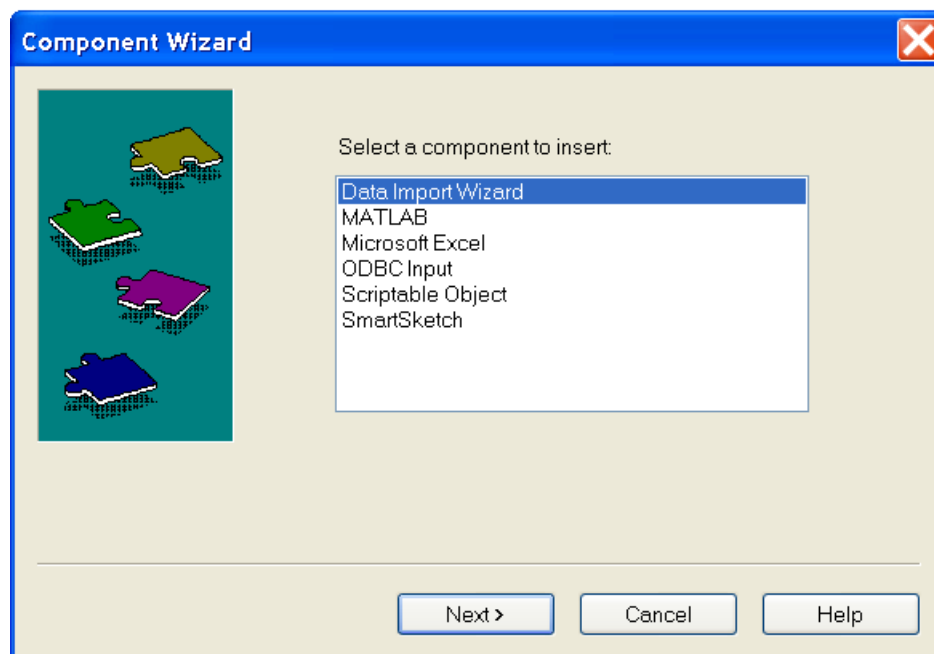
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Data Exchange

Data Exchange: The Data Import Wizard

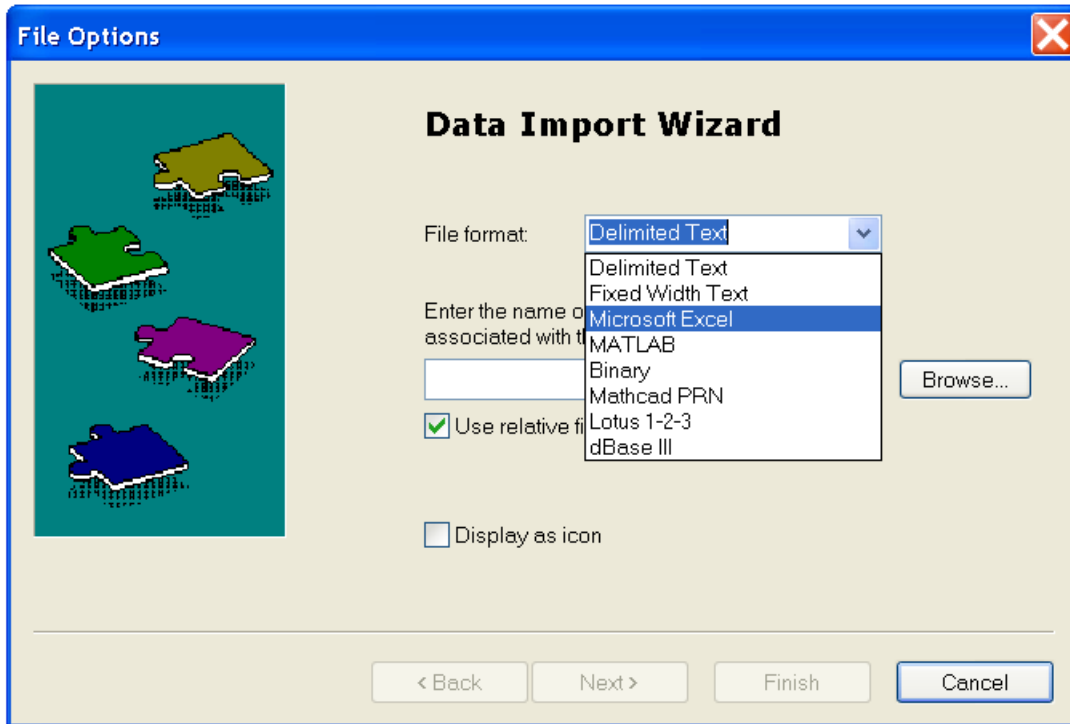
The Data Import Wizard is available under the **Insert / Component** menu.

The wizard, similar to that found in Microsoft Excel, will allow you to read a large variety of file formats — including binary, fixed-width, and database formats — preview the data, select delimiters, visually or numerically select rows and columns to import, and control other preferences, such as how to deal with missing values.



Data Exchange

There are a variety of formats which can be imported. Choose your file type from the drop-down menu, browse to the file and click Next.



Follow the wizard prompts, which differ depending on the type of data you are importing. Click Finish when completed. Mathcad inserts your data.

Enter variable name >>> :=

	0	1
0	-10	7.04
1	-9	19.78
2	-8	43.39
3	-7	...

Enter the name of the variable. The row and column indices update to reflect the origin value in the worksheet.

MyData4 :=

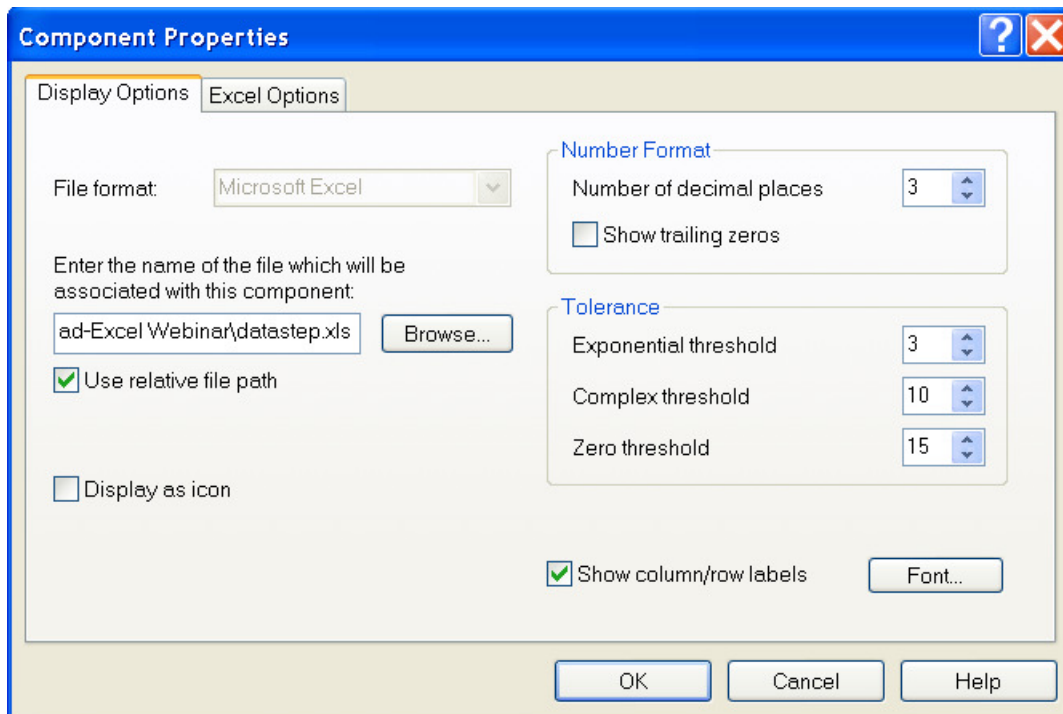
	1	2
1	-10	7.04
2	-9	19.78
3	-8	43.39
4	-7	...

ORIGIN = 1



Data Exchange

To edit the properties of the component, right-click and choose Properties from the popup menu. You may edit everything except the file format.



Data Exchange

Data Exchange: The Excel Component

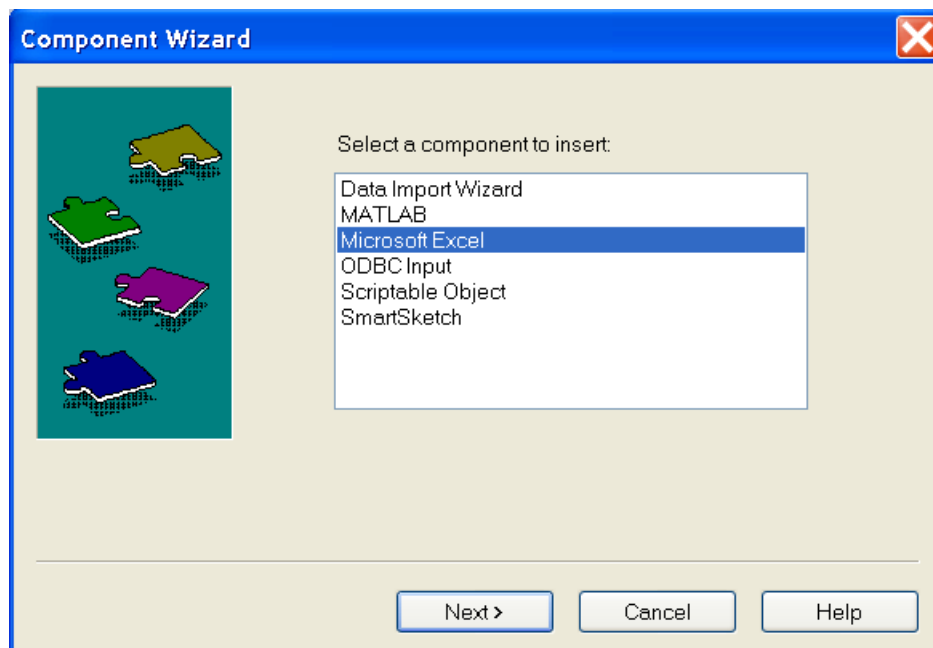
The Excel component allows you to exchange data with an Excel worksheet embedded as an object in your Mathcad worksheet. For example suppose we wish to input a matrix M into the Excel worksheet and take the sum of each row using Excel.

$$M := \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

To edit the file format, you must start over. Right-click on the component and choose Import from the popup menu.

Remember that the external file is *linked* to Mathcad and must be moved with the Mathcad file for dependent calculations to function.

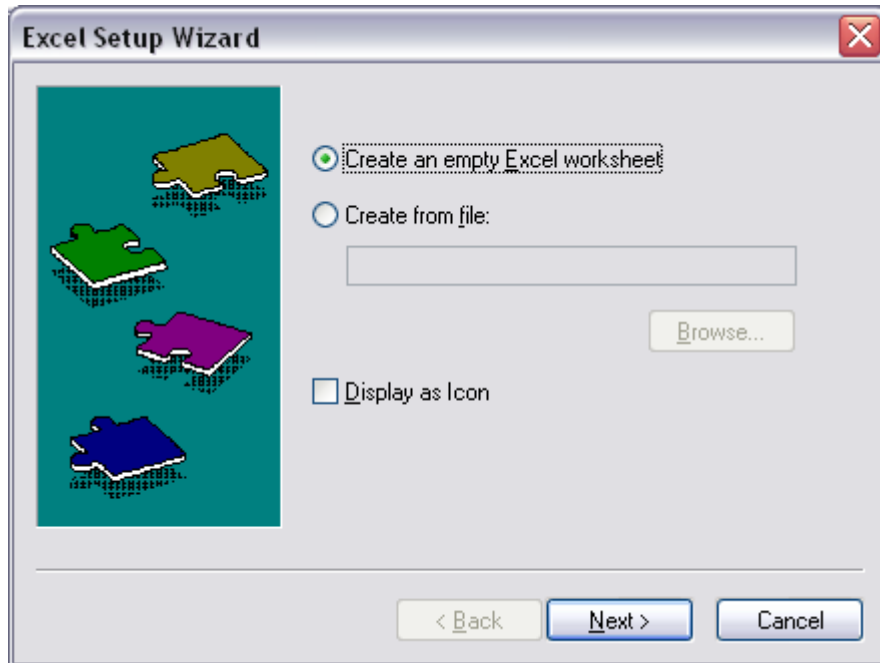
Right-click in an unoccupied area of your worksheet and choose Insert / Component from the popup menu. Choose Microsoft Excel from the list of available components.



Data Exchange

You have two options:

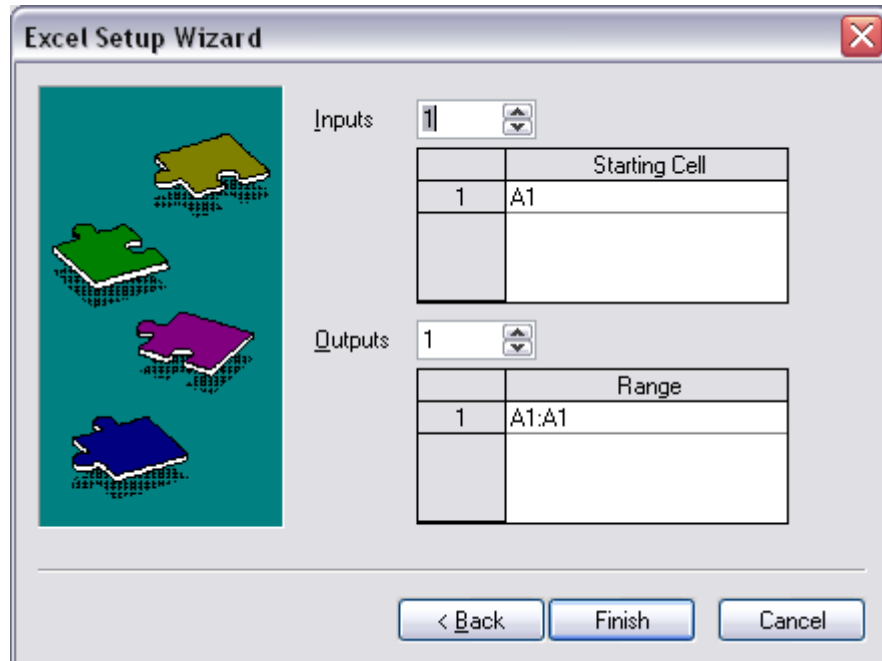
- Link to an existing Excel worksheet.
- Create a new Excel object.



For our example select Create an empty Excel worksheet.

Data Exchange

Regardless of the choice, Mathcad will present you with the following screen asking for the **Inputs** TO the component from Mathcad (and respective cell destinations) as well as **Outputs** FROM the component to Mathcad (and respective cell sources).



You can make modifications here, or wait until after you have inserted the component into your worksheet. For our example in the Outputs Range table type D1:D3. Click Finish to insert the component into your sheet.

A new Excel component embedded in Mathcad with 1 input placeholder and 1 output placeholder will now appear.

OUTPUT(S) go here
>>>

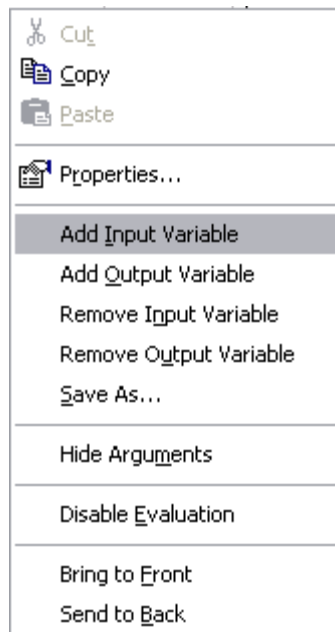
■ :=

■
<<< INPUT(S) go here

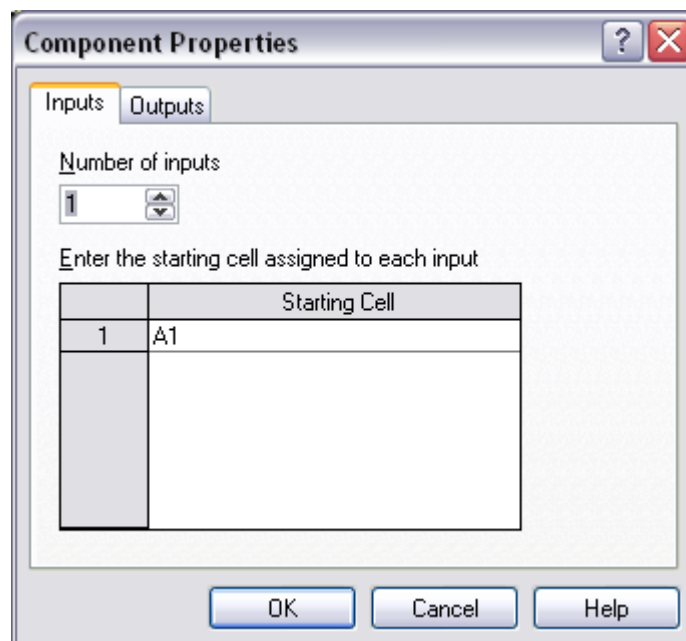
Type M, the name of the input matrix, in the lower left placeholder and assign the name RowSum as the output in the upper left placeholder.

Data Exchange

While in Mathcad, you may add additional inputs or outputs by right-clicking on the component.



To modify the destination and source cells for inputs and outputs respectively, right-click on the component and choose Properties from the popup menu.



To access the full functionality of Excel, double-click on the component to

invoke in-place activation of the object. The toolbars and menus at the top of the screen will update to Excel's toolbars and menus. For our example in the D1 column type =sum(A1:A3)

Data Exchange

The result of the calculation using Excel is then

The sum of the rows, calculated using Excel's SUM function, is output to the variable *RowSum*.

RowSum :=

1	2	3	6
4	5	6	15
7	8	9	24

M <<< M is passed to the Excel component

To return to the Mathcad sheet, click anywhere outside the component. The toolbars and menus will update accordingly from those of Excel to Mathcad. Then type RowSum and the D1 column appears as the answer.

$$\text{RowSum} = \begin{pmatrix} 6 \\ 15 \\ 24 \end{pmatrix}$$

Important: Regardless of whether you read in an existing Excel sheet or create a new Excel object, the Excel component is a local copy of the spreadsheet. Changes made within the object will not be reflected in the original sheet.

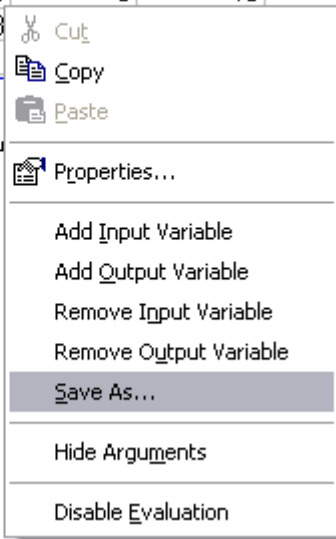
To alter the original sheet or to create an independent Excel sheet, right-click on the component and choose Save As from the popup menu.

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RowSum :=

1	2	3	6
4	5	6	15
7	8		

M



A context menu is displayed over the matrix M. The menu items are: Cut, Copy, Paste, Properties..., Add Input Variable, Add Output Variable, Remove Input Variable, Remove Output Variable, Save As... (highlighted), Hide Arguments, and Disable Evaluation.

Data Exchange

Data Exchange: The READFILE Function

The *READFILE* function is quite versatile and was designed to give you some of the same options as the Data Wizard. It also:

- **Can be called from a program to batch process files because it is a function and not a component**
- **Updates and rereads the file each time the Mathcad worksheet is recalculated**

The syntax to *READFILE* is:

```
READFILE(file, type, [columnwidths], [rows], [cols], [emptyfiller] )
```

The required arguments are:

- **file** - the filename plus extension with full path
- **type** - the type of file, allowed types are "delimited", "fixed" and "Excel"

The optional arguments are:

- **[columnwidths]** - if "fixed" is specified for type, insert a column vector containing the widths of each column in the file
- **[rows]** - can be a single integer specifying the starting row or a two-element vector specifying the starting and ending rows
- **[cols]** - can be a single integer specifying the starting column or a two-element vector specifying the starting and ending columns
- **[emptyfiller]** - allows you to specify what value Mathcad should use
- to fill any missing entries (NaN is the default)

```
Enter variable name >>> MyData5 := READFILE("datastep.xls" , "Excel" )
```

```
MyData5 := READFILE("datastep.xls" , "Excel" )
```

	1	2
1	-10	7.04
2	-9	19.78

Note: The full path is not required as long as the data file resides in the same directory as the Mathcad file.

MyData5 =

3	-8	43.39
4	-7	45.55
5	-6	61.42
6	-5	65.7
7	-4	81.96
8	-3	...

To check the current working directory, evaluate the built-in CWD variable directly in your sheet.

CWD = "C:\TEMP\"

Data Exchange

Data Exchange: A Note About NaNs

NaN stands for "Not a Number" and can be used to represent missing data values from a data file or Excel sheet. These missing points may have never been recorded due to operator or instrumentation errors or were recorded with unphysical values.

1	2	3
4	5	6
7	8	9
10		12
	14	15
16	17	

<<< This is an Excel object. Note the empty cells.

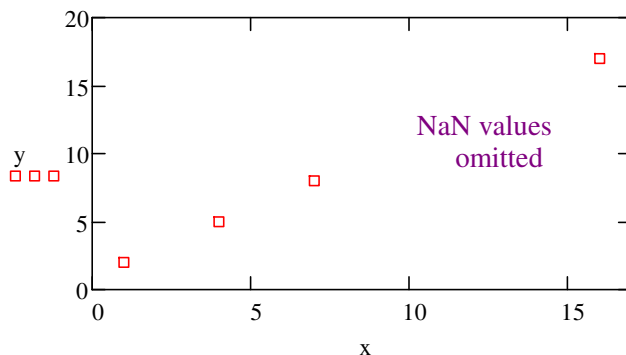
MyData6 := READFILE("NaNTest.xls", "Excel") <<< Read in data with *READFILE*.

$$\text{MyData6} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ 10 & \text{NaN} & 12 \\ \text{NaN} & 14 & 15 \\ 16 & 17 & \text{NaN} \end{pmatrix}$$

<<< Mathcad treats the empty values as NaNs.

NaN values are not included in plots.

$$x := \text{MyData6}^{\langle 1 \rangle} \quad y := \text{MyData6}^{\langle 2 \rangle}$$



$$x = \begin{pmatrix} 1 \\ 4 \\ 7 \\ 10 \\ \text{NaN} \\ 16 \end{pmatrix} \quad y = \begin{pmatrix} 2 \\ 5 \\ 8 \\ \text{NaN} \\ 14 \\ 17 \end{pmatrix}$$

Note: Only the Data Import Wizard supports NaNs.

Summary

Three methods of importing Excel data

- (1) Data Import Wizard
- (2) Excel Component
- (3) READFILE Function

Thank you everyone for your time and patience!!!