Creo – Mathcad Prime Integration Introduction
Level 7 only

Overall concept:
Creo and Mathcad Prime have the ability to have two way communications with each other. The following will show you how to set up this functionality.

We want to enter a scaling factor in Creo that will modify a rectangular block. While this could easily be accomplished with relations in Creo, the goal of Level 7 is to understand how Creo and Mathcad Prime communicate.

The overall process will be as follows:
The block dimensions and a scaling factor (a Creo parameter) will be modified in Creo. Mathcad Prime will take these values and calculate the dimensions of the revised block. These values are then passed back to Creo where upon a (double) regeneration; the model will update with the Mathcad calculated values.

Process Steps:

1) Create a simple feature that is defined by height, width and depth dimensions.

2) Create a new parameters called SCALING_VALUE and assign it a value (.5), H and assign it a value of 100, W and assign it a value of 200 and D and assign it a value of 300. These are the values that will be passing to Mathcad.

See Page 6 for information related to the "mapping" of variables between Creo and Mathcad.
3) Build a Mathcad worksheet similar to the one shown below. Note that the input variable names exactly match those created as parameter names in Creo.

<table>
<thead>
<tr>
<th>TITLE:</th>
<th>Mathcad Prime - Creo test</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION:</td>
<td>Resize a block as a function of a Creo Scaling Factor</td>
</tr>
<tr>
<td>INPUT:</td>
<td></td>
</tr>
<tr>
<td>scaling_value := .2</td>
<td></td>
</tr>
<tr>
<td>h := 20</td>
<td></td>
</tr>
<tr>
<td>w := 10</td>
<td></td>
</tr>
<tr>
<td>d := 5</td>
<td></td>
</tr>
<tr>
<td>CALCULATIONS:</td>
<td></td>
</tr>
<tr>
<td>height := h * scaling_value</td>
<td></td>
</tr>
<tr>
<td>width := w * scaling_value</td>
<td></td>
</tr>
<tr>
<td>depth := d * scaling_value</td>
<td></td>
</tr>
</tbody>
</table>

In Mathcad Prime, select the four input values and on the Input/Output tab, select the Assign Input option. This will place a small “in” designation in the upper left corner of the variable.

Select the three output values (height, width and depth) and tag these to Assign Output.

Note that it doesn’t really matter what the input values are at this time as values coming from Creo will replace these during regeneration. Only the logic of the program is important.

Save your file and exit Mathcad at this point.

4) In Creo, on the Analysis tab, select Prime Analysis. Select Load File and pick on your Mathcad file. Select Auto-Map.

For Auto-Mapping to work:

If a parameter/dimension in Creo finds an "eligible" variable in Mathcad with the same name and same units, then it is auto-mapped. Eligible variables are those regions with the Assign Input tag.
5) In the Prime to Creo Parametric region, select Prime Variable and the green + button that is to the left of the option. The outputs selection dialog box will fill with any variables tagged Assign Output in Mathcad.

Select all the values in this box and then select on the OK.

Select Compute, you should see “Prime Analysis was successfully performed” on the prompt line at the bottom of the screen.

We now need to associate the parameter names in Creo with the output from Mathcad Prime. Key in your new names. Select the Compute button or the new names are lost.

Add Feature is now available for your use. Select this. Give it a name.

Close the Dialog box. Note that the Analysis feature is in the model tree.

On my office machine, I had a difficult time trying to define the Creo Parameter Names. I ended up editing the definition of the Analysis feature and defining the Parameter Names under the Result params.

6) We now need to define some relations that will take the mapped values and apply them to the model dimensions.

The format for the dimensional definition is:

\[ dx = y:FID_z \]

where
- \( x \) is the numeric value Pro/E assigned to the dimensional value
- \( y \) is the variable name used in the Mathcad worksheet
- \( z \) is the CREO Analysis feature name

7) Execute and Verify your relations (Relations icon with the green check mark).
10) Testing your model.
Regenerate. Since all variables have been mapped, a regenerate will produce the following model. Be patient as Mathcad needs to load and execute. The Mathcad operation happens in the background so you will not see the worksheet.

Note: Two regenerates are probably required as the 1st regenerate updates the values and parameters (the Stop light goes to yellow), the 2nd regenerate updates the geometry (the Stop light goes to green).

Edit your Extrude and you should see the values at 50% of the original.

11) Edit your parameters and set the Scaling_Value to 2. Regenerate 2 times. This should be the result:
Documenting your work:

Set:
Scaling_Value to 3
H to 3
W to 4
D to 5

Capture an image similar to the ones on the previous page showing the dimensions and model tree.

On the Tools tab, select the down arrow in the Model Intent region. Select Relations and Parameters. Select the Print icon at the top of the dialog box. Discard page 2 as it does not contain any useful information for us. The instructor is looking for correct Relations and Local Parameters.

Set:
Scaling_Value to 1
H to 10
W to 20
D to 30

Capture an image similar to the ones on the previous page showing the dimensions and model tree.

Both of these captures can go on a singular sheet. Print the sheet.

Print your Mathcad worksheet. Make sure your name and course number is in the Header. This will follow the screen captures.

Sheet order:
Cover page
Screen Captures
Relations and Parameter information
Mathcad Prime worksheet.

Other Notes (valid for WF5 & Mathcad 15, but who knows relative to Creo 2 & Mathcad Prime)

If you modify the Mathcad worksheet with Creo still in session, you MUST delete and re-create the Analysis feature, otherwise the system seems to keep using the un-revised Mathcad version. It should be possible to redefine the analysis feature and then modify the Mathcad worksheet during the redefinition process.

Important: Do not manually close (exit) Mathcad while working within the Mathcad Analysis feature. Doing so has caused Creo to lock up and you will probably need to use Task Manager to kill the Pro/E process.

There may still to be an issue in the labs such that if you have the Relations dialog box displayed and you select Show – Info to display current values; then you move the Relations dialog box – the left and right mouse buttons become un-usable requiring you to use the Task Manager to kill the Pro/E (xtop) process.

End Level 7
Notes (From Creo Online Help)

About Mapping names of Variables or Parameters

Mapping of names of Mathcad variables or Creo Parametric parameters requires special care. Follow these guidelines when you use Mathcad worksheets with Creo Parametric.

- Creo Parametric disregards case-sensitivity in names of Mathcad variables. The names are always represented in uppercase in Creo Parametric.
- Creo Parametric does not distinguish between Mathcad variables having the same name but with different display attributes such as bold, italics, or bold italics. In Creo Parametric, the name is always represented in plain text.
- Do not tag a Mathcad variable that contains Greek and other non-Latin characters such as pi, sigma, and so on.
- When you map a Mathcad variable name containing a literal subscript character, the name changes such that the subscript character is preceded by an underscore in Creo Parametric. The converse is also true. For example, a_x changes to a_x.
- Creo Parametric does not support the mapping of Mathcad variables names with superscripts, special characters, spaces, and vector or matrix elements.
- Creo Parametric supports Mathcad variables names that are alphanumeric, in uppercase or lowercase, and with literal subscript and underscore characters.
- Creo Parametric supports Mathcad units that have superscript characters. For example, in^2.
- Creo Parametric does not support the mapping of Mathcad variables names that are longer than 32 characters.
- You can map Creo Parametric parameters or dimensions and Mathcad variables only if they have the same unit type. If you want to map a Mathcad unit that does not exist in Creo Parametric, create a custom unit in Creo Parametric to match the unit of the Mathcad variable.
- Use only lowercase characters when tagging a Math region using the value proe2mc or mc2proe.
- Apply the proe2mc tag only to those Math regions with the definition symbol :, for example, x:=45.78 in, where x is a Mathcad assignment variable and in is the units.
- Do not apply the proe2mc tag to a Math region such as y:=x+25.14,x+y:=45.7 newton,F(a,b):=123.45 cm, or y=result.
- Apply the mc2proe tag only to those Math regions with the evaluation symbol =, for example, y=70.92 in, where y is a Mathcad results variable and in is the units.