



# ME311 Machine Design

Excel Tutorial (2010 Version)

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# 1. Get Organized

Enter some descriptive info about the sheet.

Put your inputs up top with names that will become variable names.

Put your calculated results down here.

Include a graphic to clarify the variables.

The image shows a screenshot of an Excel spreadsheet with the following content:

	A	B	C	G	H
1	<b>Disk Properties</b>				
2	W. Dornfeld				
3	27-Sep-2012				
4					
5	OD				
6	ID				
7	Thickness				
8	Density				
9					
10	Volume				
11	Weight				
12	lxx				
13	lzz				
14					
15					
16					
17					
18					

A 3D green disk graphic is positioned to the right of the spreadsheet, with a dashed horizontal line passing through its center. A yellow callout bubble points to the disk with the text: "Include a graphic to clarify the variables."

## 2. Name Your Variables

A. Select the cells with your variable names in them, and the cells to their right.

B. Click the Formulas Tab, then Create from Selection

The screenshot shows the Microsoft Excel interface. The 'Formulas' tab is selected in the ribbon. The 'Create from Selection' button is highlighted in the 'Defined Names' group. A green arrow points from this button to the 'Create Names from Selection' dialog box. The dialog box has the following options:

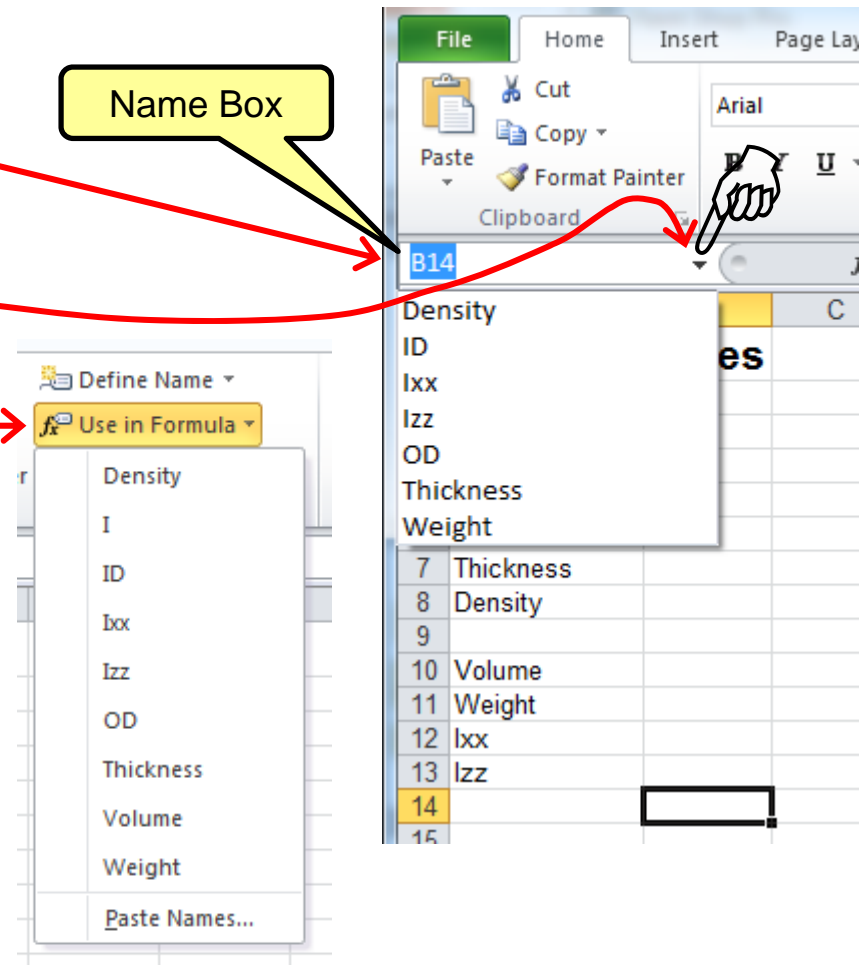
- Top row
- Left column
- Bottom row
- Right column

Buttons for 'OK' and 'Cancel' are at the bottom of the dialog. In the background, a spreadsheet is visible with a table titled 'Disk Properties' in columns A and B, rows 5 through 13. A green box highlights the cells A5:B13. A green cylinder is positioned between the spreadsheet and the dialog box, with a dashed line connecting them.

C. In the popup select "Left column" and "OK"

### 3. Some Notes on Names

- A. You can add a new name by selecting a cell and typing the name in the Name Box.
- B. You can see or edit a list of cell names by clicking on the Name Box drop-down or clicking Formulas>Use In Formula.
- C. Some names will get redefined, such as “D1”, because it is already a cell name. Spaces become underscores.
- D. The names “c” and “r” become c\_ and r\_.
- E. Capitalization is preserved, but ignored! (d is same as D)



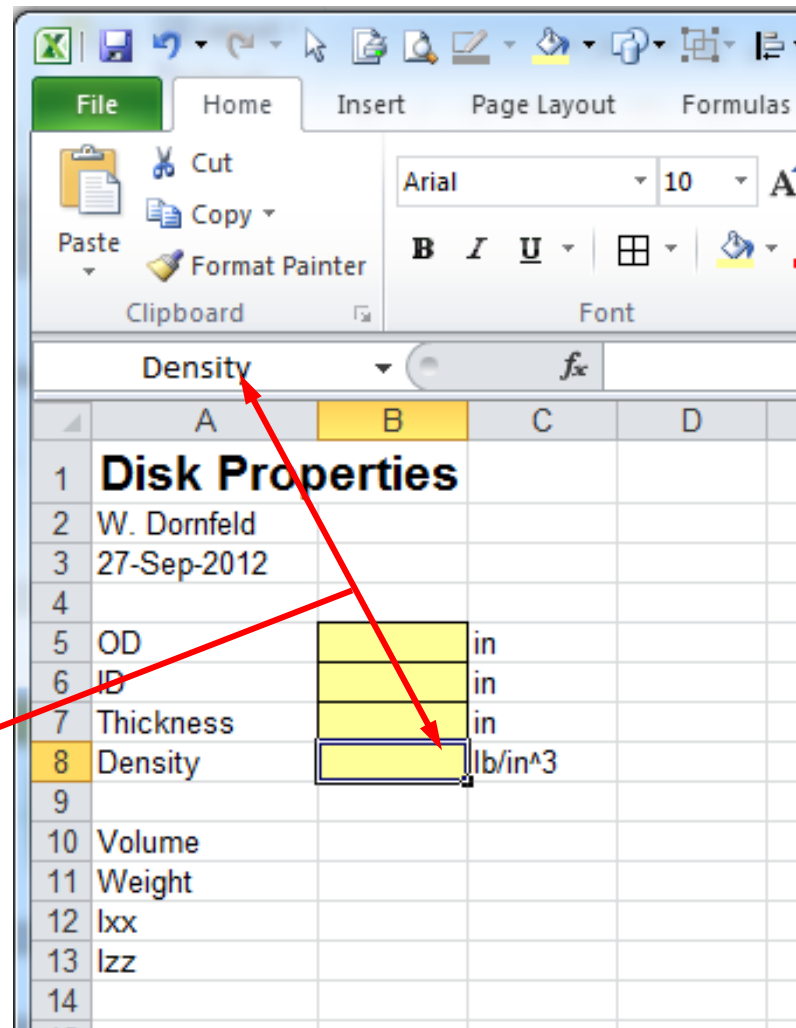
## 4. Highlight the Inputs

- A. Select the cells where input values will go. Using these tool buttons



highlight the cells.

- B. Notice that the variable names now display in the “name box”. Cell B8 is selected, and “Density” is its name.
- C. Add units to the right of each input cell.



## 5. Enter Your Equations

- A. Lead with the “equals” sign. You can either type in the variable name, or click in the Data cell to add the variable to the equation. Don't click on the Name cell.
- B. You can enter equations in the cells, or in the Formula box up above.

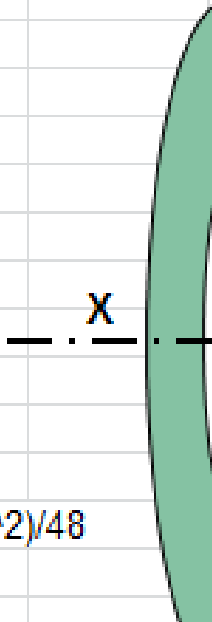
The screenshot shows the Microsoft Excel interface with the following data:

	A	B	C	D	E	F
1	<b>Disk Properties</b>					
2	W. Dornfeld					
3	27-Sep-2012					
4						
5	OD					
6	ID					
7	Thickness					
8	Density					
9						
10	Volume	=PI()*(OD^2-ID^2)/4*Thickness				
11	Weight					
12	lxx					
13	lzz					
14						
15						

The formula bar at the top displays:  $=PI()*(OD^2-ID^2)/4*Thickness$

## 6. Enter The Rest of Your Equations

	A	B	C	D	E	F	G
1	<b>Disk Properties</b>						
2	W. Dornfeld						
3	27-Sep-2012						
4							
5	OD	2	in				
6	ID	1	in				
7	Thickness	0.5	in				
8	Density	0.285	lb/in <sup>3</sup>				
9							
10	Volume	1.178	=PI()*(OD^2-ID^2)/4*Thickness				
11	Weight	0.336	=Density*Volume				
12	Ixx	0.000326	=Weight/386*(OD^2-ID^2)/8				
13	Izz	0.000290	=Weight/386*(3*OD^2+3*ID^2+4*Thickness^2)/48				
14							
15							



Notice how readable the formulas are.

You can display the formulas by copying your equation cells one column to the right, and adding an apostrophe ahead of the equals sign – to turn it into text.

## 7. Try The Goal Seeker

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F
1	<b>Disk Properties</b>					
2	W. Dornfeld					
3	27-Sep-2012					
4						
5	OD	2 in				
6	ID	1 in				
7	Thickness	0.5 in				
8	Density	0.285 lb/in <sup>3</sup>				
9						
10	Volume	1.178 in <sup>3</sup>				
11	Weight	0.336 lb				
12	lxx	0.000326 lb.in.sec <sup>2</sup>				
13	lzz	0.000290 lb.in.sec <sup>2</sup>				
14						
15						
16						
17						

The formula bar shows: Thickness     $f_x$  =Density\*Volume

The Goal Seek dialog box is open, showing:

- Set cell: B11
- To value: 1.0
- By changing cell: \$B\$7

Buttons: OK, Cancel

What if you wanted to know how thick the disk needed to be for it to weigh one pound?

Click the Data Tab>WhatIfAnalysis>Goal Seek, and tell it you want to set B11 (the weight) to be 1.0 lb by changing B7 (the thickness). Then click OK.



## 8. The Goal Seeker, continued

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G
1	<b>Disk Properties</b>						
2	W. Dornfeld						
3	27-Sep-2012						
4							
5	OD	2	in				
6	ID	1	in				
7	Thickness	1.48916906	in				
8	Density	0.285	lb/in <sup>3</sup>				
9							
10	Volume	3.509	in <sup>3</sup>				
11	Weight	1.000	lb				
12	lxx	0.000972	lb.in.se				
13	lzz	0.001288	lb.in.se				
14							
15							
16							
17							

The formula bar shows the formula for cell B11:  $\text{=Density*Volume}$ .

The 'Goal Seek Status' dialog box displays the following information:

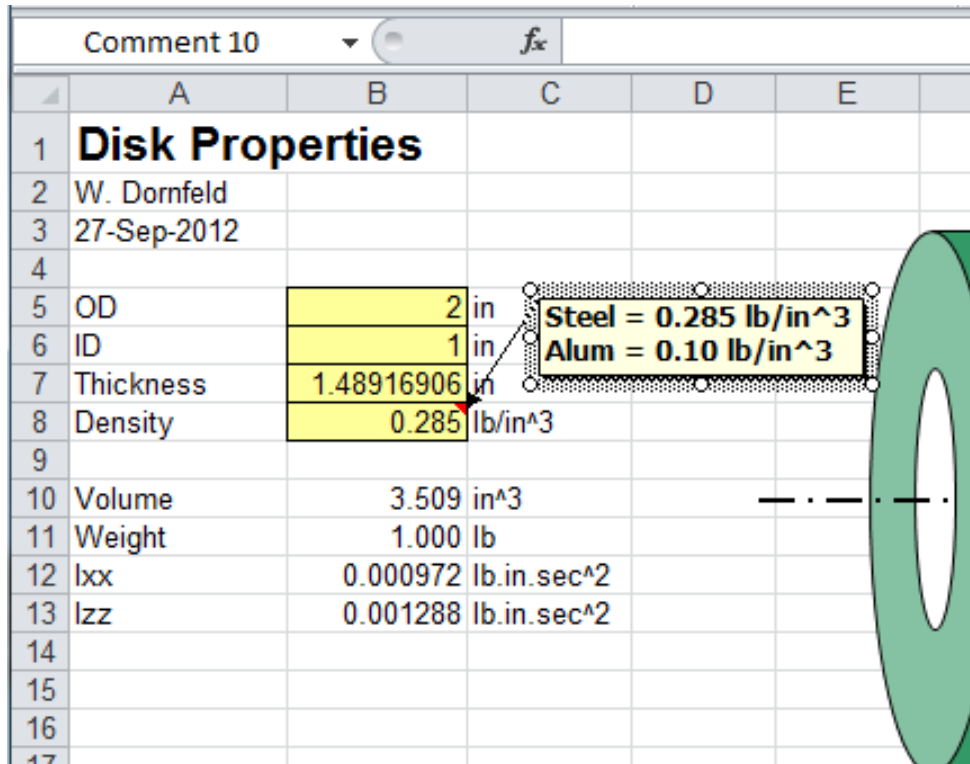
- Goal Seeking with Cell B11 found a solution.
- Target value: 1
- Current value: 1.000

The dialog box includes buttons for Step, Pause, OK, and Cancel.

You can accept what Goal Seeker found, or cancel.

Try doing this manually by tweaking guesses to thickness and see how long it takes!

## 9. Add a Comment



The screenshot shows an Excel spreadsheet with a table of disk properties. The table has columns A through E and rows 1 through 17. The table is titled "Disk Properties" in row 1. The data is as follows:

	A	B	C	D	E
1	<b>Disk Properties</b>				
2	W. Dornfeld				
3	27-Sep-2012				
4					
5	OD	2 in			
6	ID	1 in			
7	Thickness	1.48916906 in			
8	Density	0.285 lb/in <sup>3</sup>			
9					
10	Volume	3.509 in <sup>3</sup>			
11	Weight	1.000 lb			
12	Ixx	0.000972 lb.in.sec <sup>2</sup>			
13	Izz	0.001288 lb.in.sec <sup>2</sup>			
14					
15					
16					
17					

A comment box is visible over the cell containing "0.285 lb/in<sup>3</sup>". The comment text is:

Steel = 0.285 lb/in<sup>3</sup>  
Alum = 0.10 lb/in<sup>3</sup>

To the right of the spreadsheet is a 3D rendering of a green disk with a white center hole. A dashed line connects the center of the disk to the center of the comment box.

You can add comments to cells by selecting the cell and then right clicking  Insert Comment from the drop-down list.

Once entered, the comment will appear when your cursor dwells over the cell. Or, you can right click the cell and pick “Show Comment” to have it always visible.