

# IPS Physical Science 9

## Making a Histogram with Excel

1. Open Microsoft Excel and type the title of the experiment into cell "A1".
2. Type the column headings "Mass before (g)" and "Mass after (g)" into the cells "A3" and "B3" as shown at the right.
3. You may need to adjust the width of the cells. This is done by clicking on the border line between the labels "A" and "B" at the top of the columns and dragging to the right until the desired width is obtained.
4. Type the values of the measurements into the two columns.
5. Label a third column "Change in mass (g)" by typing this into cell "C3".
6. After the data has been completely typed into the first two columns, the "Change" column can be calculated. Into cell "C4", type the formula "**=B4-A4**" do not put the " " marks into the formula. See the figure at the right. After you press "enter", the calculation will be carried out.
7. Next, click again on cell "C4". The cell will have a dark box around it when selected and the bottom right hand corner will have a small square dot. Move the cursor to the dot and click and drag the dot down the column until you reach the bottom of the data columns next to it. When you release the dot, the calculation formula will be copied into all of the highlighted cells in column "C" and the "Change in mass" will be shown.

	A	B	C
1	Mass of Ice & Water		
2			
3	Mass before (g)	Mass after (g)	Change in Mass (g)
4	10.01	10.01	
5	6.67	6.47	
6	4.82	4.84	
7			
8			
9			
10			
11			
12			
13			
14			
15			

	A	B	C
1	Mass of Ice & Water		
2			
3	Mass before (g)	Mass after (g)	Change in Mass (g)
4	10.01	10.01	=B4-A4
5	6.67	6.47	
6	4.82	4.84	
7			
8			
9			
10			
11			
12			
13			
14			
15			

	A	B	C
1	Mass of Ice & Water		
2			
3	Mass before (g)	Mass after (g)	Change in Mass (g)
4	10.01	10.01	0
5	6.67	6.47	
6	4.82	4.84	
7			
8			
9			
10			
11			
12			
13			
14			
15			

- Next, the “Bin Range” will be created. Click in cell “E3” and type “Bin Range”. Then click in cell “F3” and type the value representing the size of each bin. For this exercise we will use the value of 0.02 since our balances have an uncertainty of +/- 0.01 g.

	A	B	C	D	E	F
1	Mass of Ice & Water					
2						
3	Mass before (g)	Mass after (g)	Change in Mass (g)		Bin Range	0.02
4	10.01	10.01	0		0.03	
5	6.67	6.47	-0.2		=E4-\$F\$3	
6	4.82	4.84	0.02			
7						
8						
9						
10						
11						
12						
13						

- Click in cell “E4” and enter the largest positive value that you will need in order to include all of the “Change in mass” values that you have in column “C”.

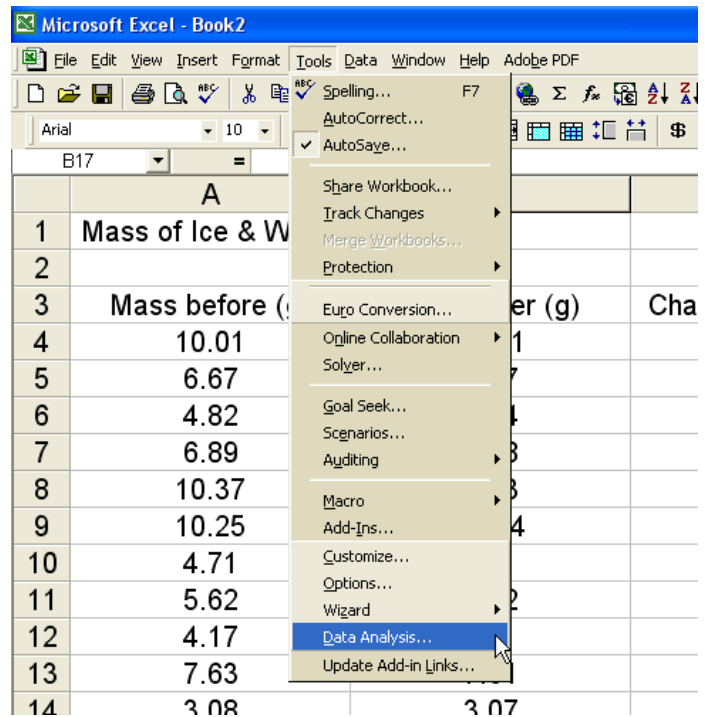
- Click in cell “E5” and enter the math formula **=E4-\$F\$3**. The \$ sign is necessary in order to “lock” the reference to cell “F3” when the formula is copied into other cells. Click “enter” to see the calculation of the formula.

- Now, just like you did in column 3, you will copy the formula from cell “E5” into those below it. Click on cell “E5” and then click on the small square dot in the lower right hand corner. Drag it down the column until you get to the largest negative value needed to include all of your “change” data in column “C”.

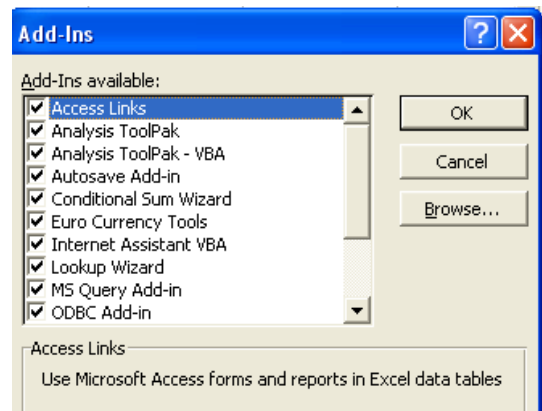
- Two important considerations: (1) if you want the histogram to show zero in the middle, you will need to end at a negative value equal in size to your positive value. (2) If you want the histogram to have a zero value, you must start with a positive value that is a multiple of your bin size.

	C	D	E	F	G
	Change in Mass (g)		Bin Range	0.02	
	0		0.03		
	-0.2		0.01		
	0.02		-0.01		
			-0.03		
			-0.05		
			-0.07		
			-0.09		
			-0.11		
			-0.13		
			-0.15		
			-0.17		
			-0.19		
			-0.21		
			-0.23		
			-0.25		
			-0.27		
			-0.29		
			-0.31		
			-0.33		
			-0.35		
			-0.37		
			-0.39		
			-0.41		
			-0.43		

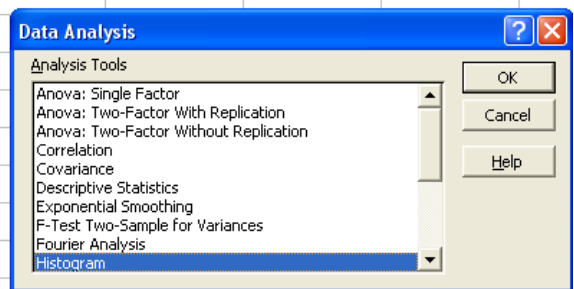
13. You are now ready to use the Histogram Tool. Click on the “Tools” menu at the top of the screen and look for “Data Analysis”.



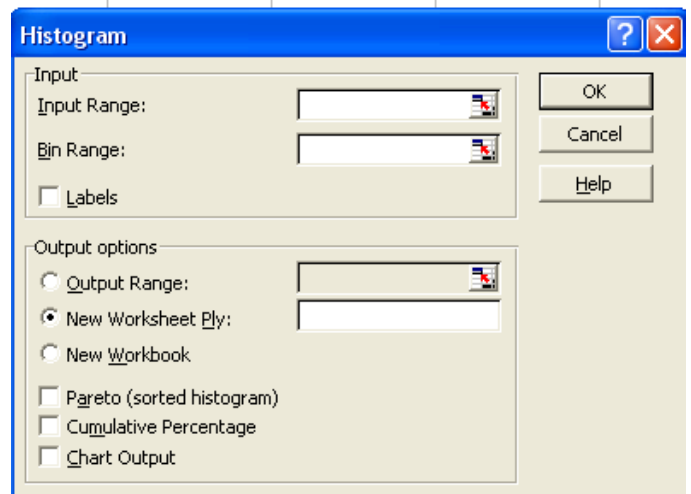
14. If you don't have “Data Analysis” in the list, you will need to run “Add-Ins”. The “Add-Ins” will be shown in the Tools list also. The “Add-Ins” dialogue box is shown at the right. Simply check all of the items and click “OK”. This operation usually takes a minute or so to be completed but after it is done, the “Data Analysis” tool will show up in the “Tools” menu.



15. In the “Data Analysis” dialogue box, the option “Histogram” will be shown with several other data analysis tools. Select “Histogram” and click “OK”



16. The Histogram dialogue box will look like the one shown at the right. You will need to provide THREE sets of information in order for it to work properly. It needs to know “Input Range”, “Bin Range”, and “Output Range”.



17. The locations of each range can be typed in, but there is a faster way to enter the value. At the right side of each entry window, there is a square button with a red arrow. Clicking on the red arrow reduces the size of the input box and allows you to click and drag over the cells in the open worksheet. In the "Input Range" window, click on the red arrow. Then click in cell "C4" and drag down until all of the values are highlighted. The location of these cells will appear in the white window. Now, click on the red arrow again to go back to the original dialogue box.

18. Next, you will enter the "Bin Range" using the same procedure as you used for the Input Range. Click on the red arrow next to the "Bin Range" input box. Then, click and drag over the values on the worksheet for the bin range. Go back to the original dialogue box by clicking on the red arrow again.

19. Now, an output location needs to be determined. For our exercise, we will place the histogram data on the same sheet as our lab data. Select the option of "Output Range" by clicking on the radio button next to it on the left. Then, click on the red arrow next to the input box. The output range will need to go where it won't over-write any of our other numbers, so we'll put it in column "H" by clicking on cell "H1". Then return to the original box by again clicking on the red arrow.

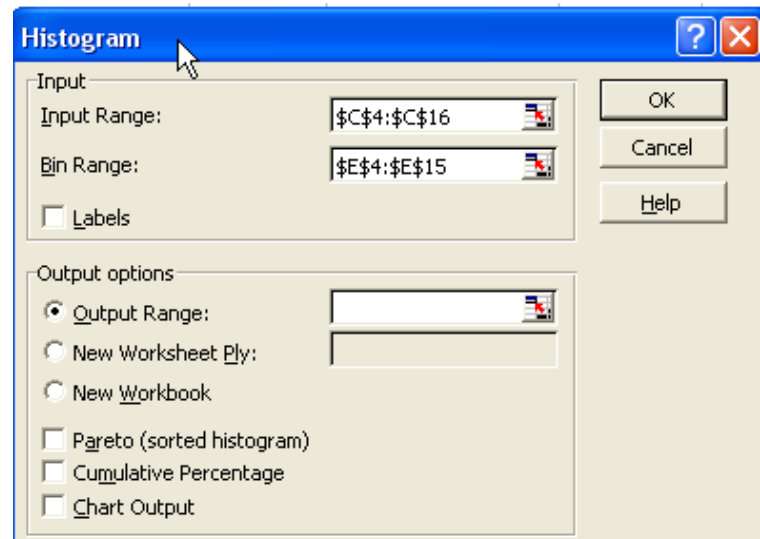
Mass after (g)	Change in Mass (g)		B
10.01	0		
6.47	-0.2		
4.84	0.02		
6.98	0.09		
10.3	-0.07		
10.24	-0.01		
4.6	-0.11		
5.62	0		
3.07	-0.01		
2.50	0.11		



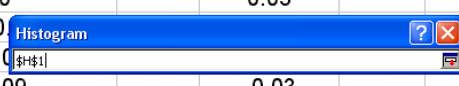
Change in Mass (g)	Bin Range	0.02
0	0.03	
-0.2	0.01	
0.02	-0.01	
0.09	-0.03	
-0.07	-0.05	



0	-0.11
0.03	-0.13
-0.02	-0.15



	C	D	E	F	G	H
Change in Mass (g)			Bin Range	0.02		
	0		0.03			
	-0.2					
	0.02					
	0.09		-0.03			



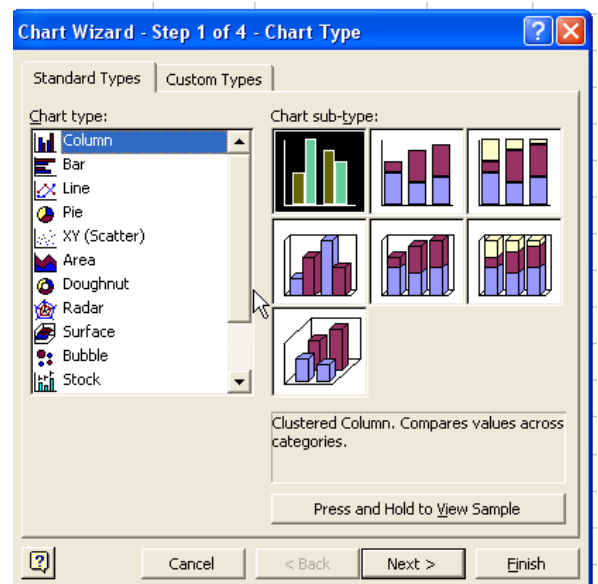
20. Finally, you can now click on the “OK” button and let the computer create the histogram values. Two new columns will appear in sheet 1 like those shown at the right. They are called “Bin” and “Frequency”. Leave them selected (highlighted) for the next step.

			Bin	Frequency
			-0.19	1
Bin Range	0.02		-0.17	0
			-0.15	0
			-0.13	0
			-0.11	1
			-0.09	0
			-0.07	0
			-0.05	1
			-0.03	0
			-0.01	2
			0.01	4
			0.03	1

21. With the two columns “Bin” and “Frequency” still selected (highlighted), click on the “Chart Wizard” button as shown at the right.



22. Chart Wizard has four steps. Step 1 is Chart Type selection. The default is “Column” type and this is what we want. Click on “Next” at the bottom of the window.

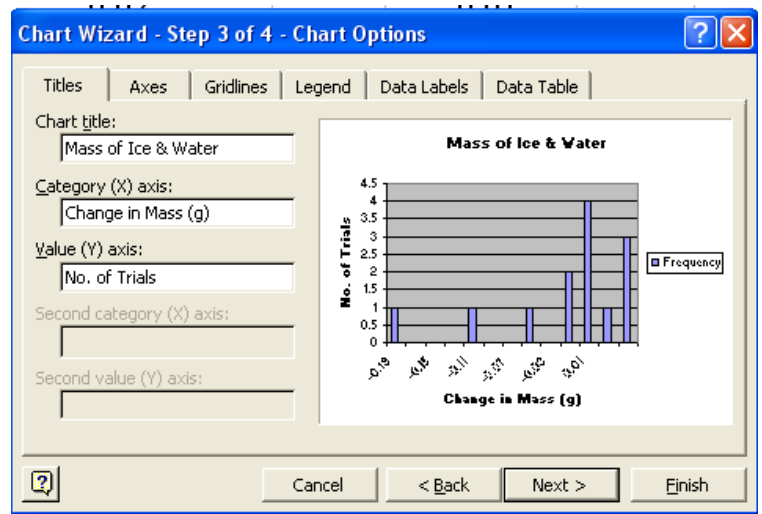


23. In step 2 of chart wizard, click on the “Series” tab. In the “Name: “ window, click on the red arrow and then select cell “A1”. This is where we typed the title of the experiment. Then, click on the red arrow again and the experiment title should appear above the graph. The “Values: “ window should be showing the location of the “Frequency” column and the “Category (X) axis labels: “ should show the location of the “Bin” column. If they do not, you will need to make it so.

			Bin	Frequency
			-0.19	1
			-0.17	0
			-0.15	0
			-0.13	0
			-0.11	1
			-0.09	0
			-0.07	0
			-0.05	1
			-0.03	0
			-0.01	2
			0.01	4
			0.03	1
			More	3

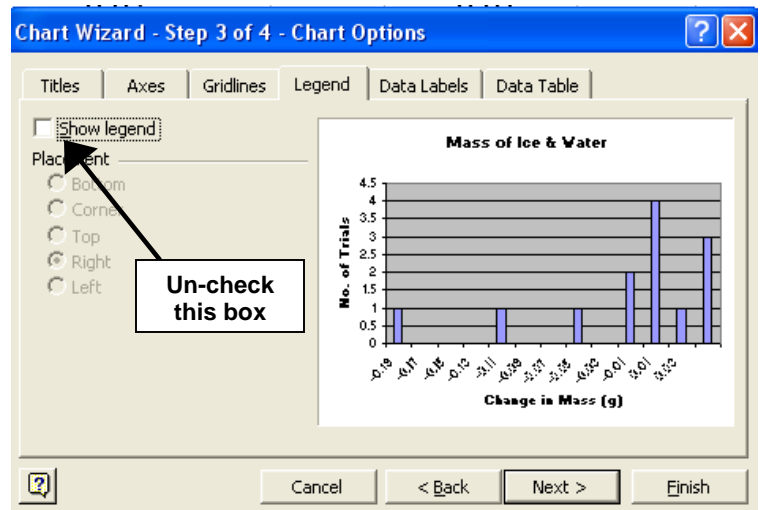
24. Click on “Next” and go to Step 3 of 4 in chart wizard.

25. Step 3 of 4 has two main things for you to do. First, in the title window, type in the “Category (X) axis:” and “Value (Y) axis:” labels. For this histogram, those labels shown at the right will be appropriate.

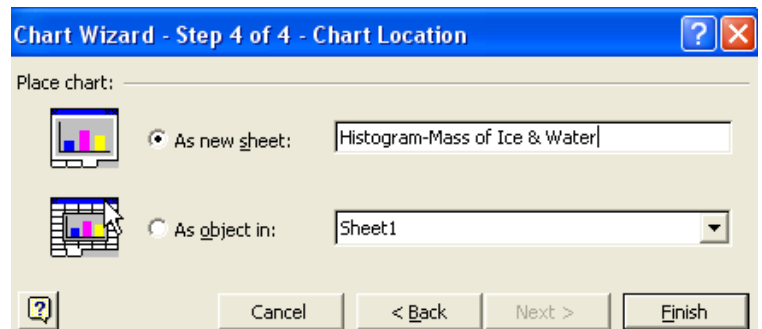


26. The next thing to do is to remove the legend from the graph. Click on the “Legend” tab and then de-select or un-check the “Show Legend” option. If the graph included two or more sets of “Change” data, we would leave this option checked so that the different columns would have a key or label to tell them apart.

27. Now, go on to step 4 of 4 by clicking on “Next”. The fourth step involves deciding where you want the chart to be located. You can either put it onto a sheet as an object (show it along side the data in sheet 1) or make it appear as an entire sheet. For our purposes, we need it to appear “As New Sheet:”. Select the button next to this option, and then type “Histogram” into the label box as shown at the right.



28. When you click “Finish” the histogram chart will appear as a new sheet with a tab at the bottom labeled “Histogram”. You can return to your data by clicking on the tab labeled “Sheet 1” and then return to the histogram by clicking on the tab “Histogram”.



29. The histogram can now be printed by making it visible on the screen by clicking on the “Histogram” tab, and choosing the print command from either the print button or the print option in the “File” menu.