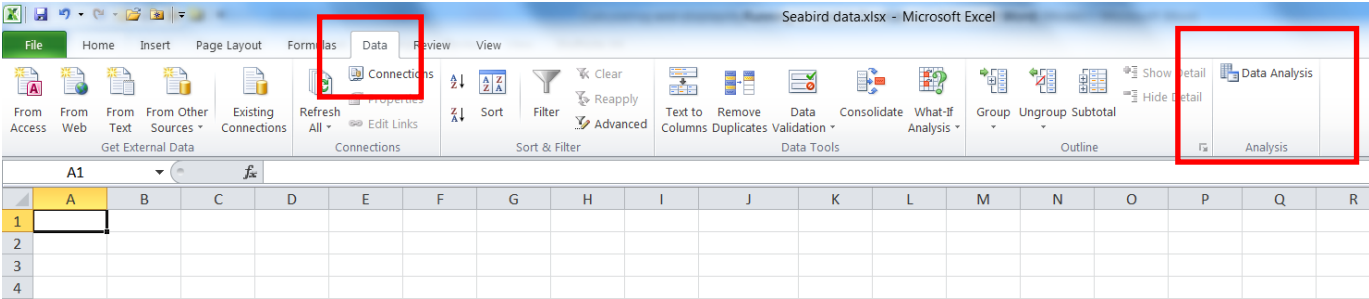


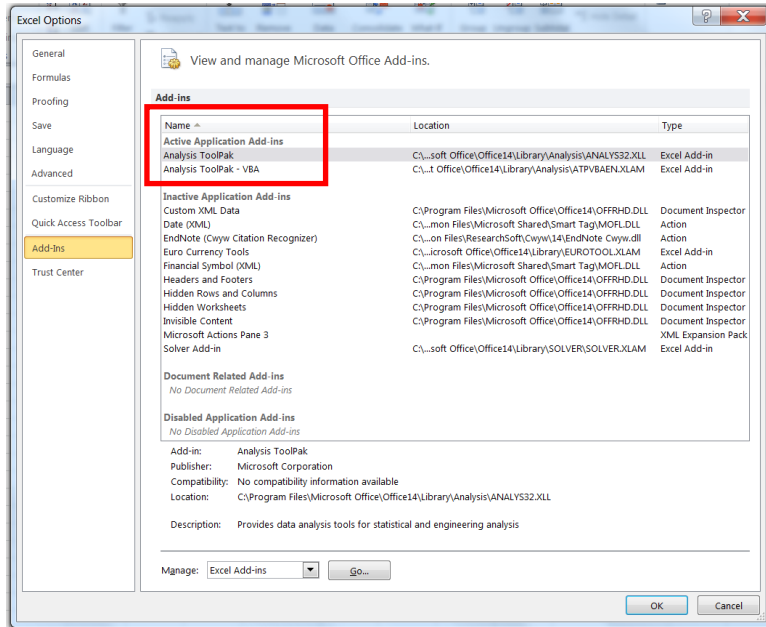
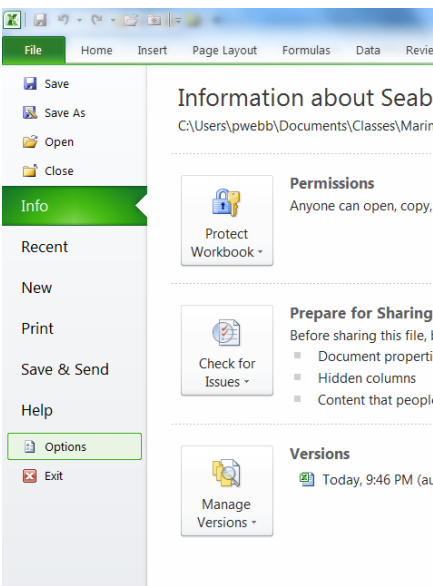
Running a t-test in Excel

Note: the Analysis ToolPak is no longer included in Excel for the Mac. You need to download a third party analysis program to perform some statistical tests. However, the shortcut described at the end of this document will work on both a PC and Mac.

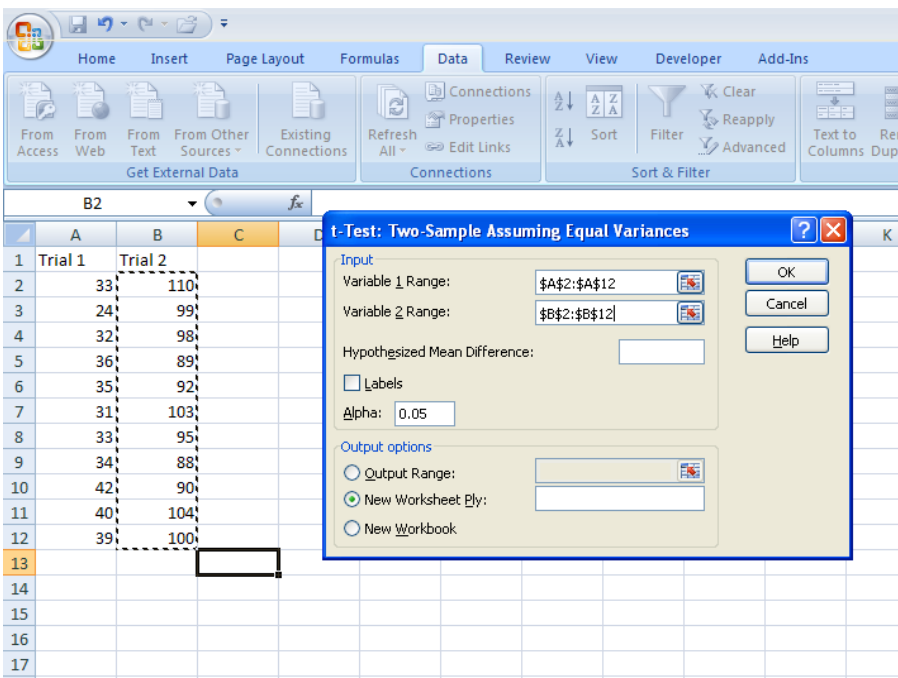
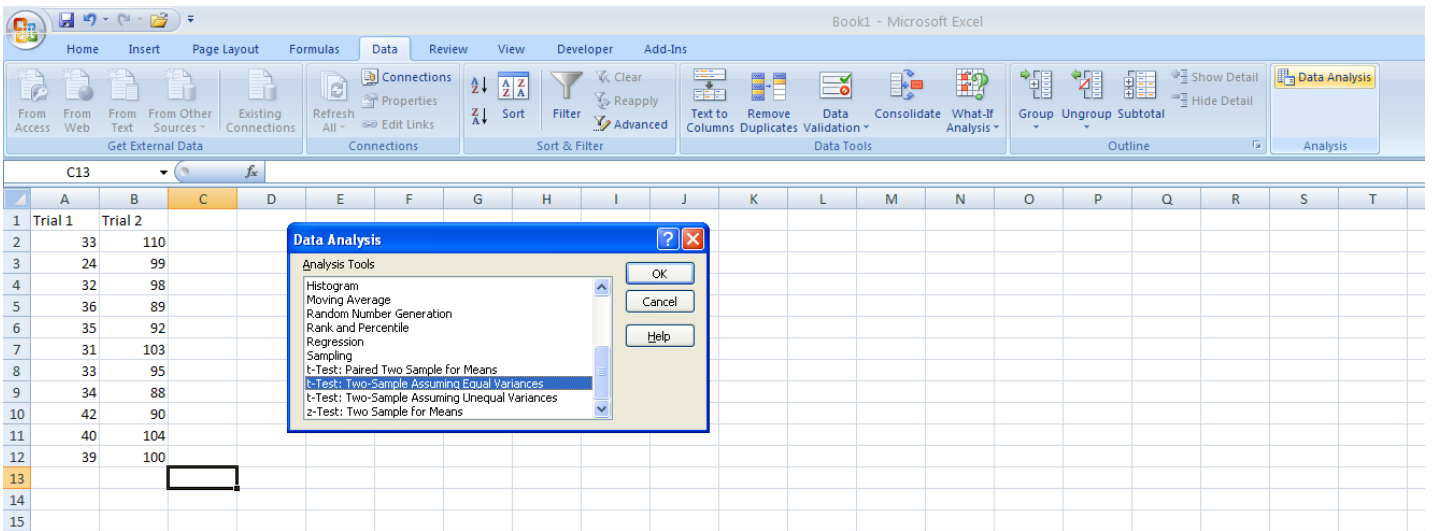
You will need to have the Data Analysis add-in installed to your version of Excel to run statistical tests. If you click on the “Data” menu tab and see the “Data Analysis” option as below, then the add-in is already installed.



If you do not see the “Data Analysis” option, you will need to install the add-in. Do this by clicking on “File” in the top left corner, and selecting the “Options” button (below left). You will then see the Excel Options menu (below right): click on the “Add-Ins” button and select the “Analysis ToolPak” and click the “Go” button to install. The “Data Analysis” tab should then appear in the “Data” menu as shown above.



To run the t-test, arrange your data in columns as seen below. Click on the “Data” menu, and then choose the “Data Analysis” tab. You will now see a window listing the various statistical tests that Excel can perform. Scroll down to find the t-test option and click “OK”.



Now input the cells containing your data. In the menu box, click in the “Variable 1 Range” box and then use the cursor to select the column containing the data for trial 1. As you select the cells in your spreadsheet, the range should also appear in the menu box window. Repeat the process for “Variable 2 Range” and your other column of data. You can change the output options and value for alpha if appropriate, but the default alpha of 0.05 is usually fine for your purposes. When everything looks good, click “OK”. You will now see the results of your statistical test (unless you selected otherwise, by default the results will open in a new worksheet).

	Variable 1	Variable 2
Mean	34.45454545	97.0909
Variance	24.27272727	49.0909
Observations	11	11
Pooled Variance	36.68181818	
Hypothesized Mean Difference	0	
df	20	
t Stat	-24.25394869	
P(T<=t) one-tail	1.32133E-16	
t Critical one-tail	1.724718218	
P(T<=t) two-tail	2.64265E-16	
t Critical two-tail	2.085963441	

Among the variables that appear in the results sheet (left), depending on your experiment the most important result is the p-value, highlighted at left in the pink cell. Since you set your alpha value at 0.05, if the p-value is less than 0.05, you can say that there is a statistically significant difference between the means of your two trials. Note that in this example, $p = 2.6 \times 10^{-16}$, which is < 0.05 , so the difference is significant.

Shortcut:

If all you are interested in is the p-value, a quick way to calculate this is by entering the following syntax directly into a cell: =T.TEST(array1, array2,tails,type)

	A	B	C	D	E	F	G
1	33	110					
2	24	99					
3	32	98					
4	36	89					
5	35	92					
6	31	103					
7	33	95					
8	34	88					
9	42	90					
10	40	104					
11	39	100					
12		2.64E-16					
13							
14							
15							

Here, *array1* refers to the first set of data (A1:A11 in the example at left), *array2* is the second set of data (B1:B11), *tails* refers to whether you want to run a one- or two-tailed test (in the example at left the number 2 is entered, indicating a two-tailed test; it would be 1 for a one-tailed test), and the *type* refers to:

- 1 = paired test
- 2 = two sample equal variance test
- 3 = two sample unequal variance test

The value returned from this formula is your p-value (2.64E-16 in the example at left, the same as was calculated above).