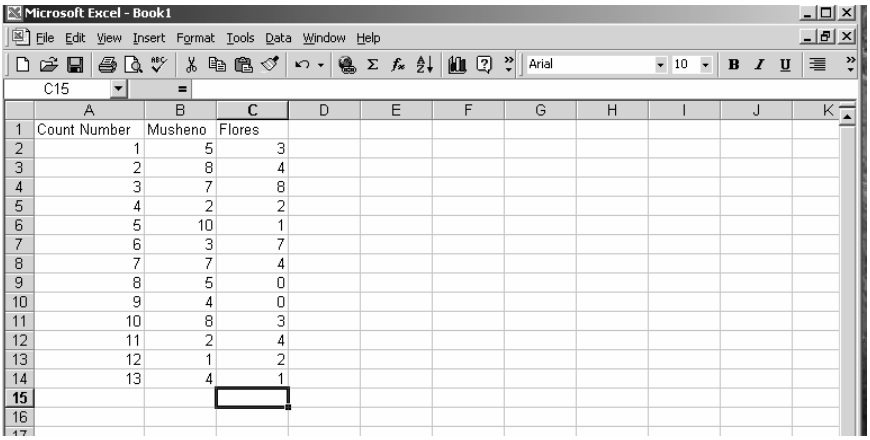
Central Arizona-Phoenix Long-Term Ecological Research Project

I have my data – what does it mean?

Scientists use statistics to help them decide whether the data they collect supports their hypothesis. For example, suppose you decide to compare the number of birds you counted during each observation with the number of birds your partner counted. (Alternatively, you could be comparing how many types of birds – the number of species observed.) Let's say you hypothesized that birds are attracted to vegetation, and because your yard has more vegetation than your partner's, you predicted your yard would have more birds than your partner's yard.

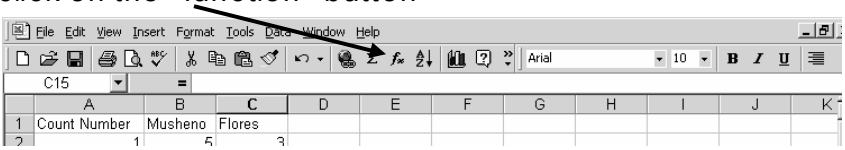
You've done the required number of bird counts, and you've organized the data. How can you decide whether your yard really had more birds? Statistics can help you…because math is your friend. What you need to do is compare your data to your partner's data using what's called a t-test…and Excel can do all the work for you. First, **open up an Excel file and enter the number of birds you observed** (or the number of different species) at each count, as shown in the example below.



	A	B	C
1	Count Number	Musheno	Flores
2	1	5	3
3	2	8	4
4	3	7	8
5	4	2	2
6	5	10	1
7	6	3	7
8	7	7	4
9	8	5	0
10	9	4	0
11	10	8	3
12	11	2	4
13	12	1	2
14	13	4	1
15			
16			

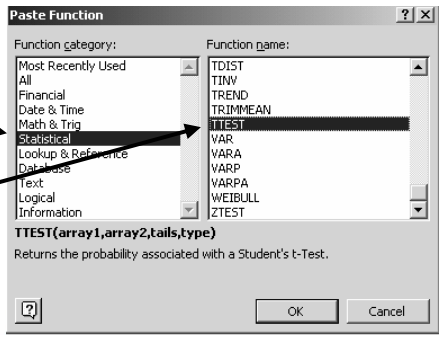
1. Then, click on an empty cell where you want your t-test result to appear.

2. Next, click on the "function" button

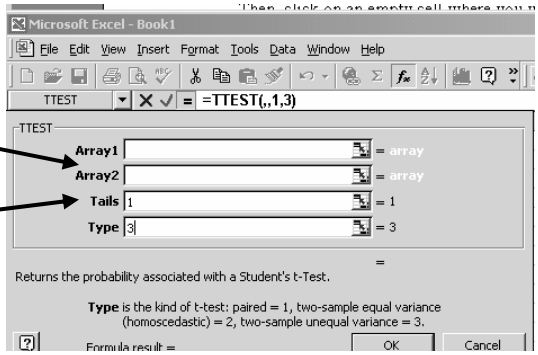


3. You will get the screen at right. Select "Statistical"

4. Select "TTEST" Then, click OK.



Next, you will see this dialogue box:



5. For **Array 1**, click and drag your first column of data

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6. For **Array 2**, click and drag the second column of data

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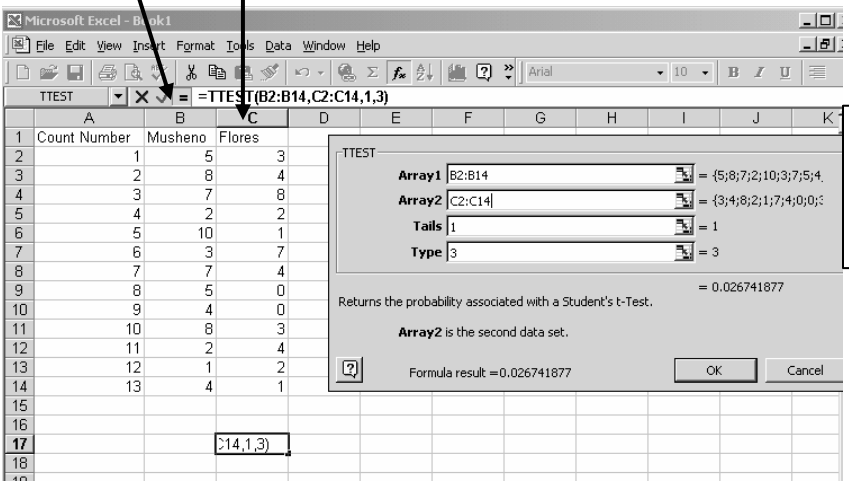


If the dialogue box is covering your data, you can drag it out of the way.

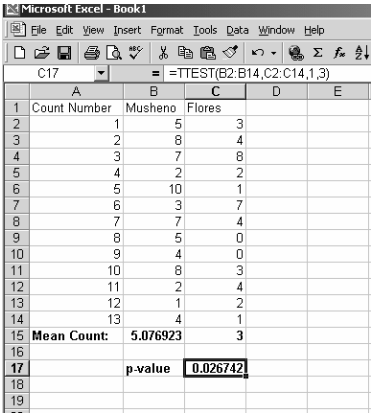
7. For **Tails**, choose "1" if your prediction is in a certain direction (my yard will have more birds). Choose "2" if you have no prediction of direction.

8. For **Type**, enter "3." Then, click OK.

9. The program will place a value in the box you selected in Step 1. This is called the "p value." It represents the probability that the difference between the two sets of numbers is due to random chance only. If your p value is greater than 0.05, there is a greater than 5% chance that the difference is random – and that's too much of a chance for most scientists. If your p value is less than 0.05, there is less than 5% chance that the difference is random – most scientists would conclude that this implies there is a *significant* difference between the two sets of data.

10. Compare the means of the two sets of data. Is one mean larger than the other? (To calculate the mean, you can use the same "function" button you used in Step 2, select "Statistical" and "Average") If so, is your p-value less than 0.05? If your answer to both questions is yes, then your data differs significantly from your partner's…and perhaps your hypothesis is supported!

For example, the example data we started with has means that look different: one is 5, and one is 3. The p-value is 0.027, which indicates that the difference is statistically significant. Therefore, this researcher would conclude that the hypothesis that Musheno's yard attracted more birds was supported.



	A	B	C	D	E
1	Count Number	Musheno	Flores		
2	1	5	3		
3	2	8	4		
4	3	7	8		
5	4	2	2		
6	5	10	1		
7	6	3	7		
8	7	7	4		
9	8	5	0		
10	9	4	0		
11	10	8	3		
12	11	2	4		
13	12	1	2		
14	13	4	1		
15	**Mean Count:**	**5.076923**	**3**		
16					
17		**p-value**	**0.026742**		
18					
19					