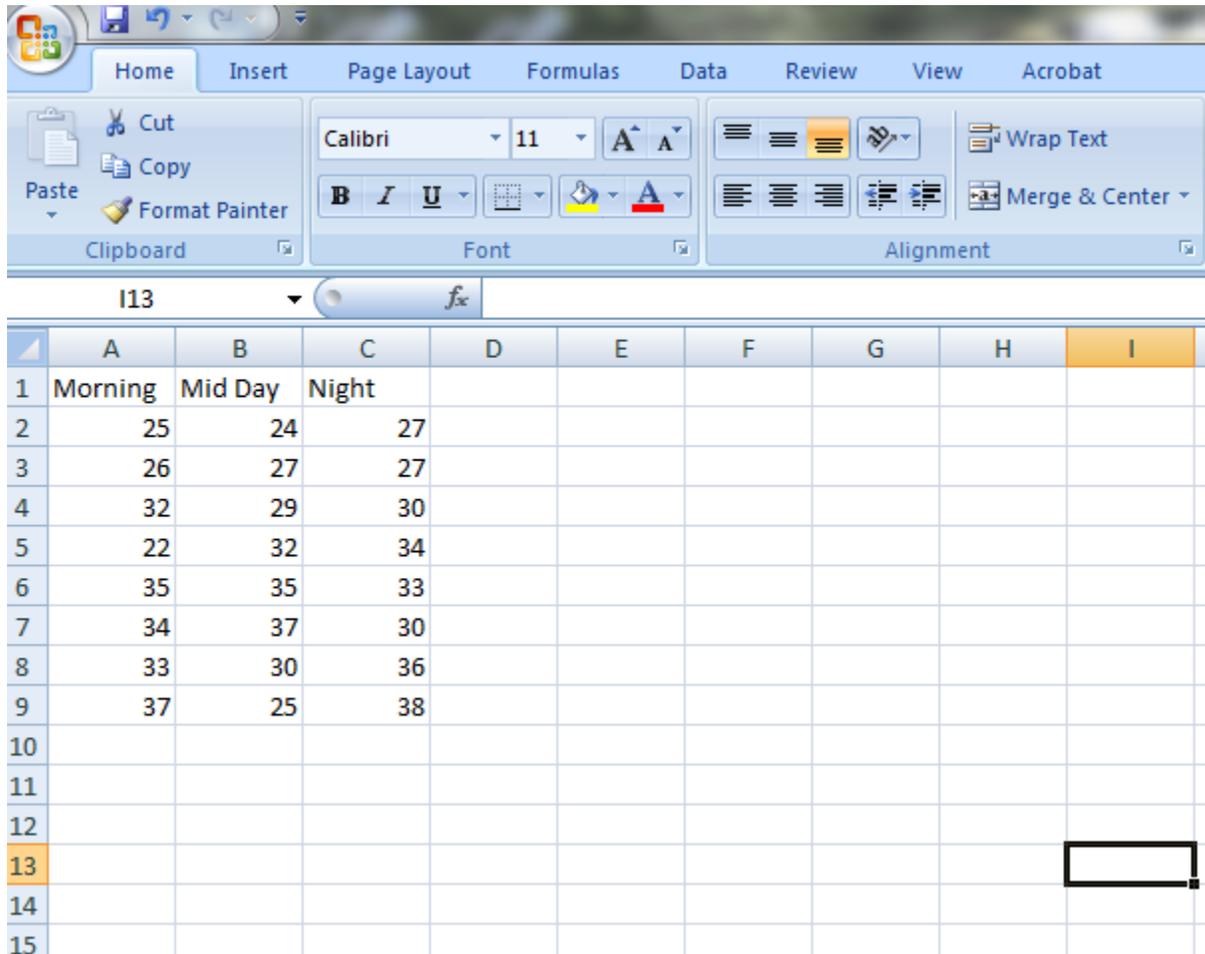


## One Way ANOVA

- Comparing three or more groups.
- One Factor.

1. Open Excel.

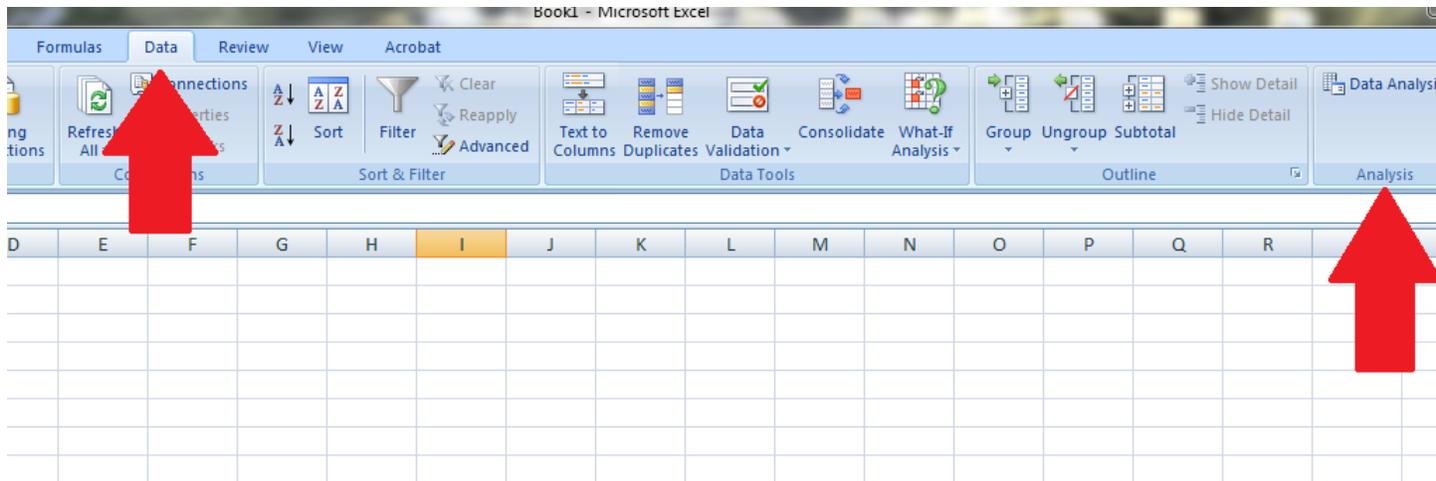
2. Enter Data.



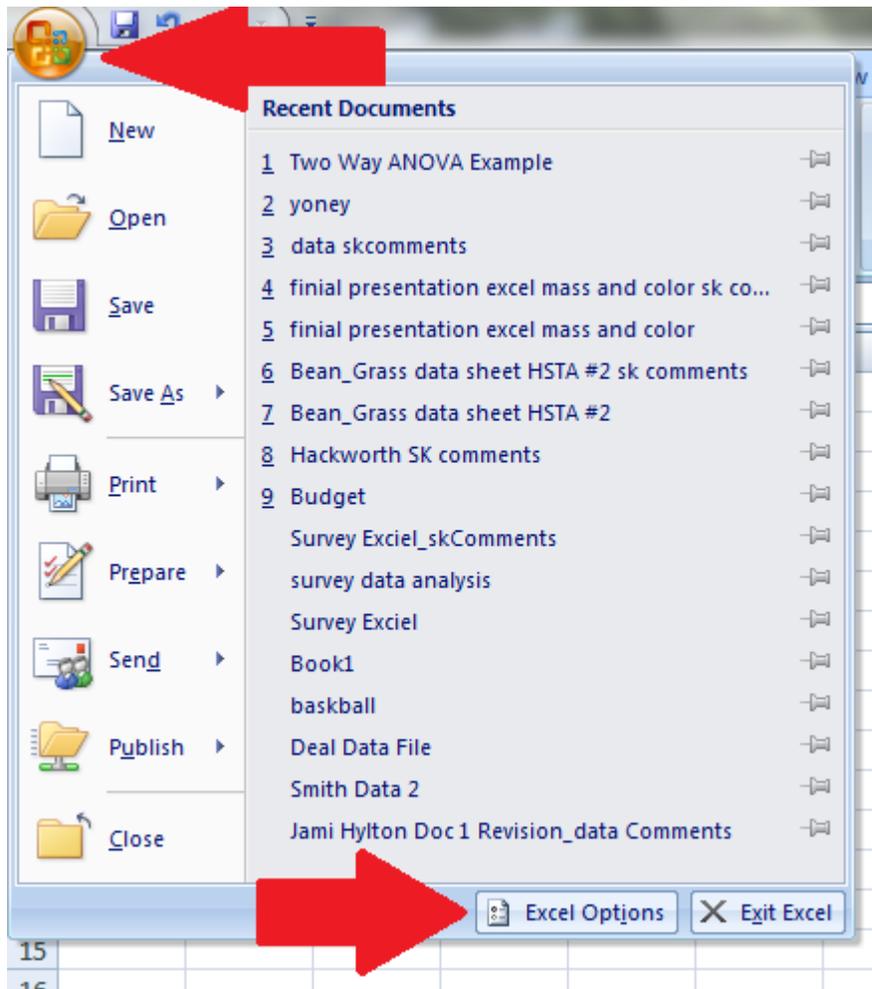
The screenshot shows the Microsoft Excel interface. The ribbon is set to the 'Home' tab, with the 'Font' and 'Alignment' groups visible. The data table is as follows:

	A	B	C	D	E	F	G	H	I
1	Morning	Mid Day	Night						
2	25	24	27						
3	26	27	27						
4	32	29	30						
5	22	32	34						
6	35	35	33						
7	34	37	30						
8	33	30	36						
9	37	25	38						
10									
11									
12									
13									
14									
15									

3. Click on Data. Look at the right side of the screen - Is there a Data Analysis icon?



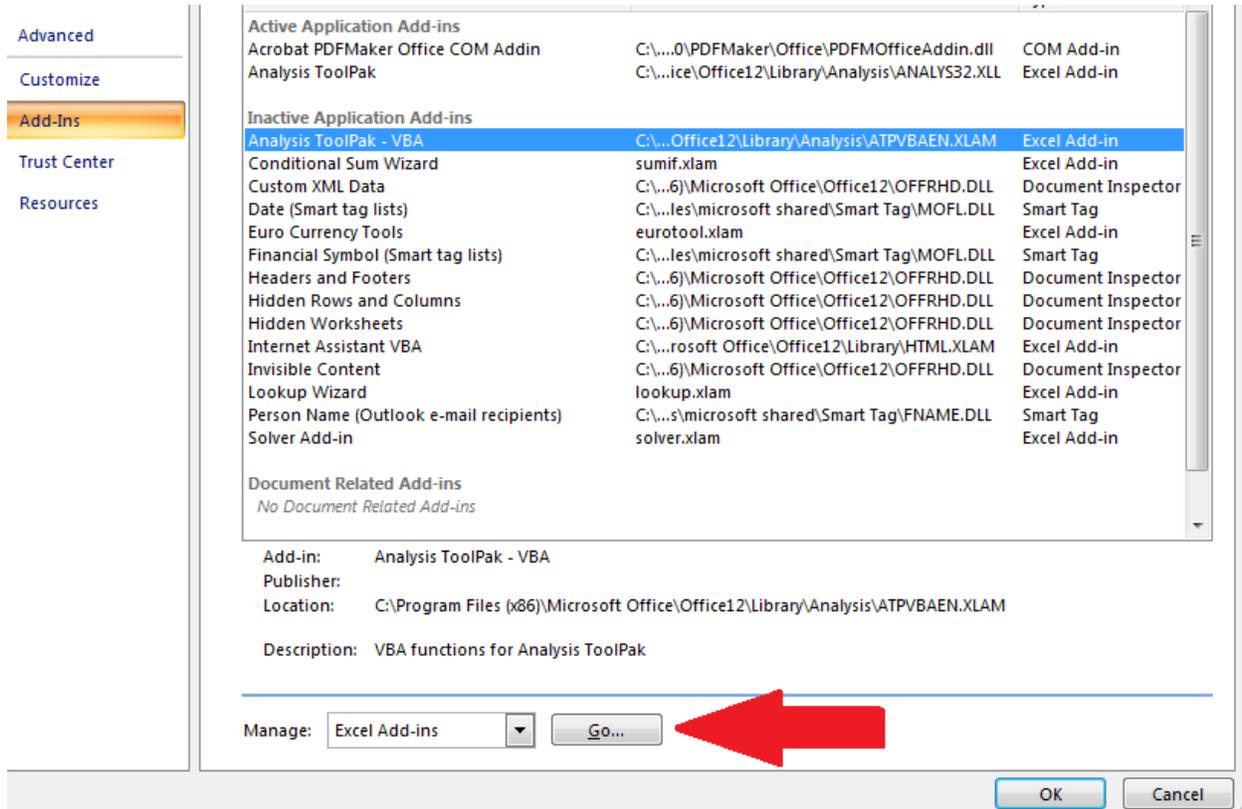
4. If not, Click on the Start Button and then Excel Options



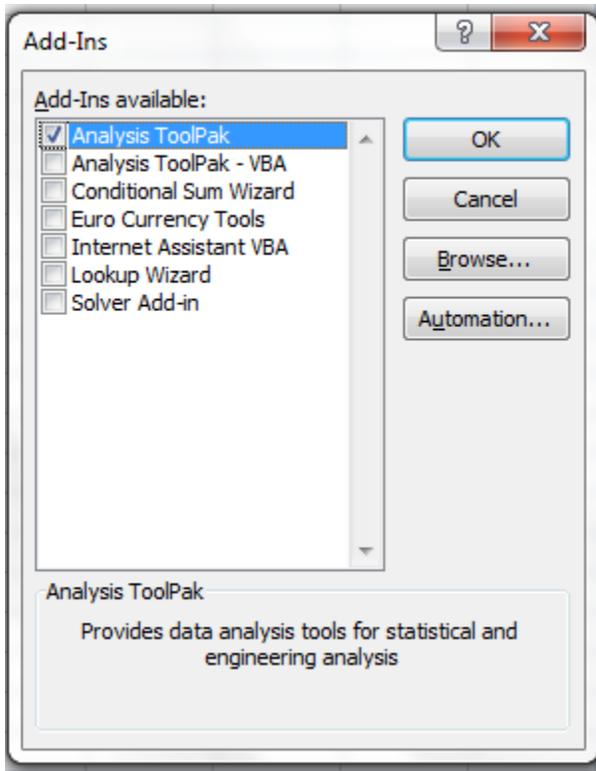
5. Click Add Ons

6. Click on Analysis ToolPak

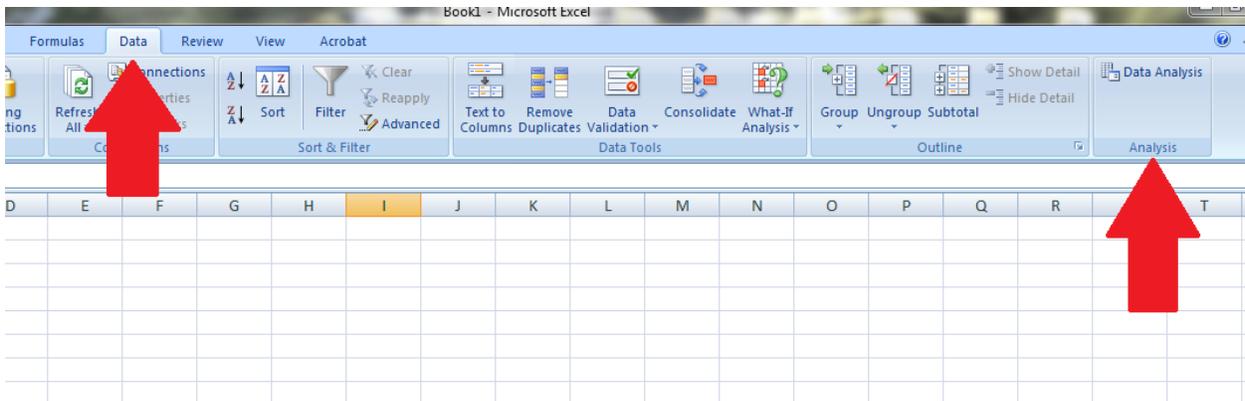
7. Click on Go



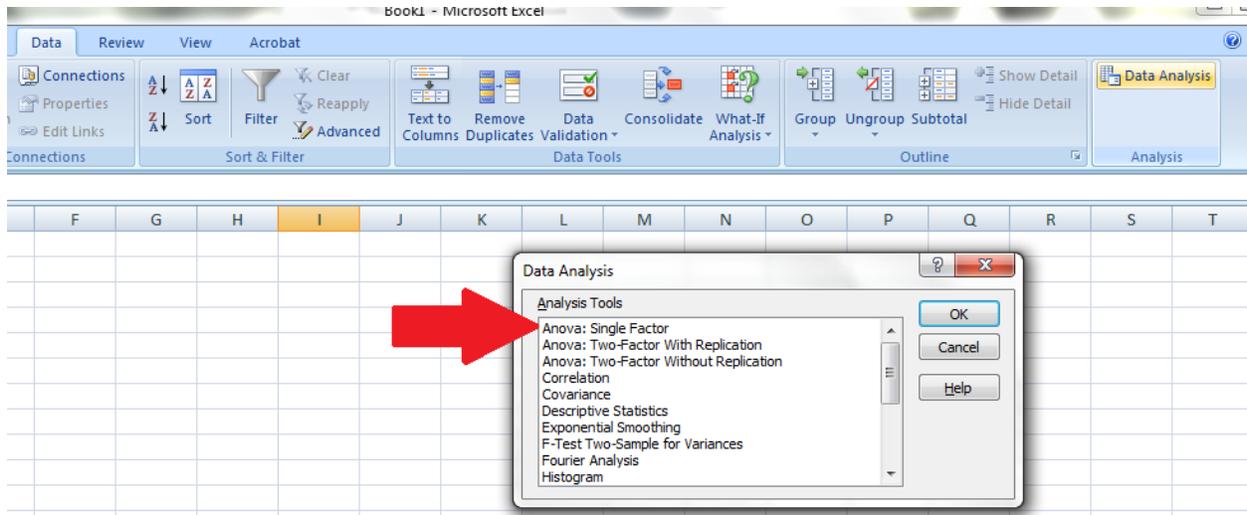
8. Make sure the Analysis ToolPak is selected and click ok.



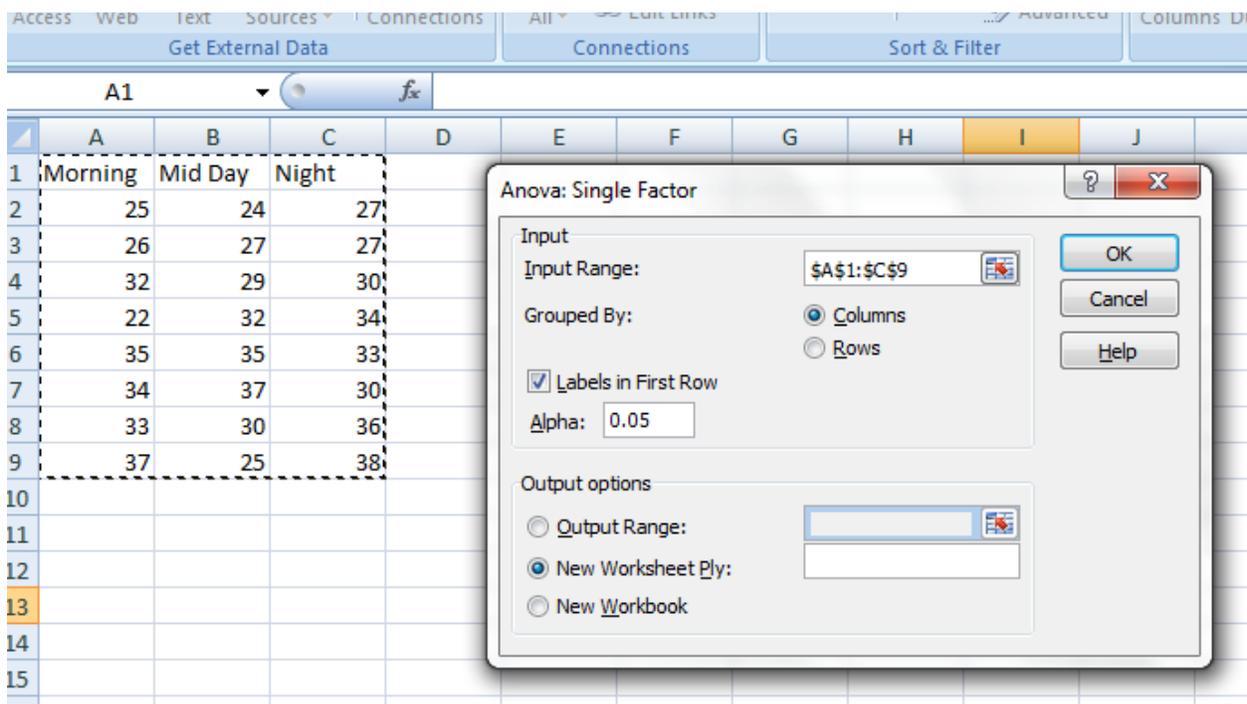
9. Now click on Data and on the right side of the screen the Data Analysis icon will be there.



10. Click Data Analysis and then select ANOVA: single factor and click OK. **If you have two factors you will need to complete a ANOVA: Two-Factor with Replication.**



11. Now highlight all columns including the labels. Click Labels in First Row and then Ok.



12. An ANOVA chart will appear.

	A	B	C	D	E	F	G	H
1	Anova: Single Factor							
2								
3	<b>SUMMARY</b>							
4	<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>			
5	Morning	8	244	30.5	29.42857			
6	Mid Day	8	239	29.875	21.26786			
7	Night	8	255	31.875	16.41071			
8								
9								
10	<b>ANOVA</b>							
11	<i>Source of Variance</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>	
12	Between Groups	16.75	2	8.375	0.374401	0.6922	3.4668	
13	Within Groups	469.75	21	22.36905				
14								
15	Total	486.5	23					
16								
17								
18								

13. Now look at the p-value

If you get a  $p$  value of **less than .05% or 5%**, then **there is significant difference**. This means that you can safely say at least 95% of the time you see a difference.

If you get a  $p$  value of **more than .05% or 5%**, then **there is no significant difference**. This means the data is similar more than 5% of the time.

14. Now look at F and compare it to F Crit. If F is larger than F Crit you have a significant difference.

15. Remember this test just tells you there is a difference, not where the difference is.

16. You can also add standard deviation. This is a great way to measure how spread out your numbers are. To find standard deviation take the square root of the variance.

17. Graph the average value for each group and add standard deviation bars.

18. To graph

19. If you have any questions please ask.