DATA Analysis Help

I strongly suggest you use two-way ANOVAs in your project analyses

You can use the Excel Data analysis Add-In OR SPSS to perform these tests

I offer help and expect you to figure out how to run the statistics:

- These slides will show you how to set things up for the Excel software

- If you use SPSS, go to the Biometry web-site for help: http://www.pelagicos.net/classes_biometry_fa15.htm

- There are lots of additional help available – through Excel Help and Google

DATA Analysis Example

Three groups of students measured the width / height of 30 snail shells at two sites (Philippines and Mexico).

These are the summary statistics for these observations:

One-Way (single factor) ANOVAs

Three groups of students measured the width / height of 30 snail shells at two sites (Philippines and Mexico). Using the entire dataset (combining data from the three groups), you will use a one-way ANOVA to determine whether the shells from the Philippines and Mexico differ in their length and in their width. To do this, you will have to re-arrange (copy and paste) the data into two columns of 90 rows (do this for each test). Make sure you select the p value of 0.05 for the significance level (alpha = 0.05).

Ho = null hypothesis = " there is no pattern"
Ha = alternate hypothesis = " there is a pattern"

Ho = there is no difference between the (two) populations
Ha = there is a difference between the (two) populations

What IS the difference?
The estimated population means, given the estimated S.D.s

One-Way (Single factor) ANOVAs

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
MX_height	90	1609	17.8	14.9
PH_height	90	628	6.9	0.8

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	5346.45	1	5346.45	676.0874	1.62E-62	3.894232
Within Groups	1407.611	178	7.907928			
Total	6754.061	179				

F > F critical, p < 0.05

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
MX_width	90	643	7.1	1.4
PH_width	90	1092	12.1	1.6

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1120.006	1	1120.006	728.8658	7.75E-65	3.894232
Within Groups	273.5222	178	1.536642			
Total	1393.528	179				

F > F critical, p < 0.05

Two-Way (two factor) ANOVAs

To test two factors at one (the origin of the shells and whether the three samples taken by three groups of students vary), you can run a two-way ANOVA (with replication).

This test allows you to test three hypotheses at once:

Ho = there is no difference between the (two) populations
Ha = there is a difference between the (two) populations

Ho = there is no difference between the (three) groups
Ha = there is a difference between the (three) groups

Ho = there is no interaction between the populations and groups
Ha = there is an interaction between the populations and groups

Example: 2-way ANOVAs

Anova: Two-Factor with Replication

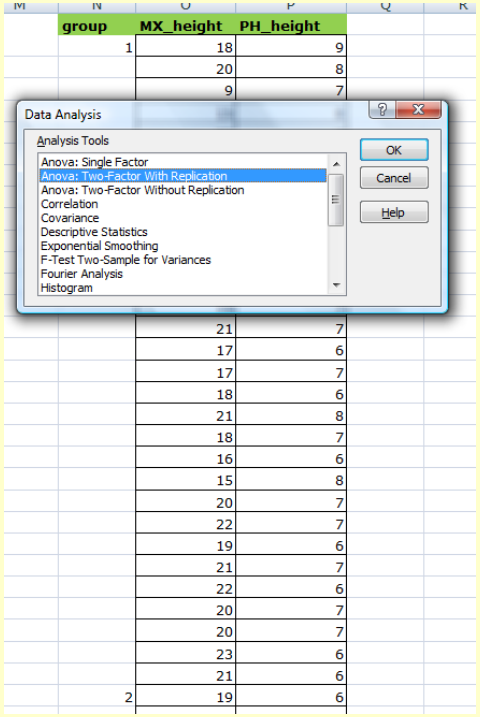
This analysis tool is useful when data can be classified along two different dimensions. For example, in an experiment to measure the height of plants, the plants may be given different brands of fertilizer (for example, A, B, C) and might also be kept at different temperatures (for example, low, high). For each of the six possible pairs of {fertilizer, temperature}, we have an equal number of observations of plant height. Using this Anova tool, we can test:

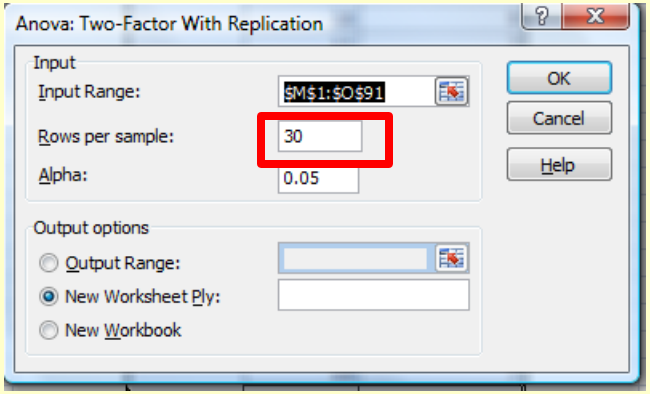
- Whether the heights of plants for the different fertilizer brands are drawn from the same underlying population. Temperatures are ignored for this analysis.
- Whether the heights of plants for the different temperature levels are drawn from the same underlying population. Fertilizer brands are ignored for this analysis.

From Excel Help:

Input range

	Group 1	Group 2
Trial 1	75	58
	68	56
	71	61
	75	60
Trial 2	66	62
	70	60
	68	59
	68	68





Enter number of rows in each sample (sample size)

Example: 2-way ANOVAs

Anova: Two-Factor With Replication

SUMMARY	MX_width	PH_width	Total
1			
Count	30	30	60
Sum	222	373	595
Average	7.4	12.4	9.9
Variance	1.6	2.0	8.2
2			
Count	30	30	60
Sum	221	367	588
Average	7.4	12.2	9.8
Variance	0.7	1.6	7.1
3			
Count	30	30	60
Sum	200	352	552
Average	6.7	11.7	9.2
Variance	1.8	1.1	8.0

- Calculate means / S.D.s for each group of 30 snail shells

By Group / Population (n = 30)

- How will the degrees of freedom look like?

By Groups / Populations

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	17.74	2	8.87	6.044	0.0029	3.048
Columns	1120.01	1	1120.01	762.943	1.64E-65	3.895
Interaction	0.34	2	0.17	0.117	0.889374	3.048
Within	255.43	174	1.47			
Total	1393.53	179				