How can I perform Scheffe’s test in Excel?

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Scheffe's test is a statistical method used to compare multiple groups or treatments while controlling for Type I error rates. To perform Scheffe's test in Excel, one must first input the data for each group or treatment into separate columns. Then, the user must calculate the mean and standard deviation for each group. Next, the user can use the "Data Analysis" tool in Excel to generate the ANOVA table. From this table, the user can obtain the F-statistic and the critical value for Scheffe's test. Finally, using the formula "=SCH(x,y,z)" in a cell, where x is the F-statistic, y is the degrees of freedom for the numerator, and z is the degrees of freedom for the denominator, the user can obtain the p-value for Scheffe's test. If the p-value is less than the chosen significance level, the user can reject the null hypothesis and conclude that there is a significant difference between the groups.

Perform Scheffe's Test in Excel

A one-way ANOVA is used to determine whether or not there is a statistically significant difference between the means of three or more independent groups.

If the overall p-value from the ANOVA table is less than some significance level, then we have sufficient evidence to say that at least one of the means of the groups is different from the others.

However, this doesn't tell us *which* groups are different from each other. It simply tells us that not all of the group means are equal.

In order to find out exactly which groups are different from each other, we must conduct a post-hoc test that is capable of controlling the family-wise error rate.

One of the most commonly used post hoc tests is Scheffe's test.

The following step-by-step example shows how to perform Scheffe's test in Excel.

Step 1: Enter the Data

Suppose a teacher wants to know whether or not three different studying techniques lead to different exam scores among students. To test this, she randomly assigns 10 students to use each studying technique and records their exam scores.

First, we'll enter the grades for each student based on their studying technique used:

	A	B	C	D	E	F
1	**Technique 1**	**Technique 2**	**Technique 3**			
2	76	81	77			
3	77	82	78			
4	77	83	86			
5	81	83	88			
6	82	83	89			
7	82	84	90			
8	83	87	94			
9	84	90	95			
10	85	92	95			
11	89	93	98			
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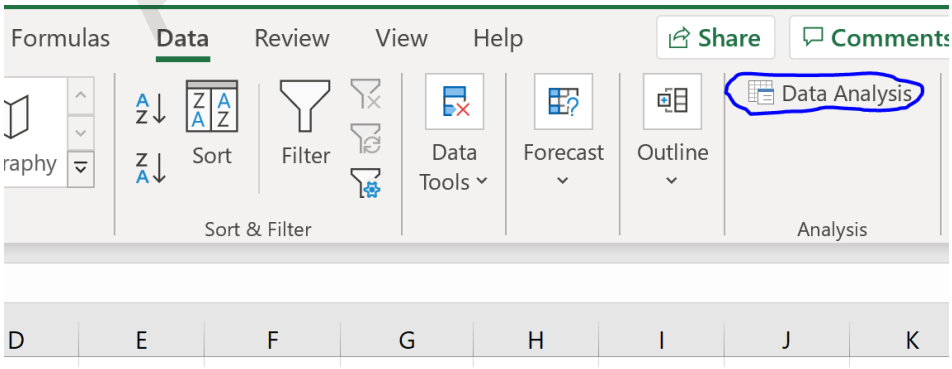
Step 2: Perform a One-Way ANOVA

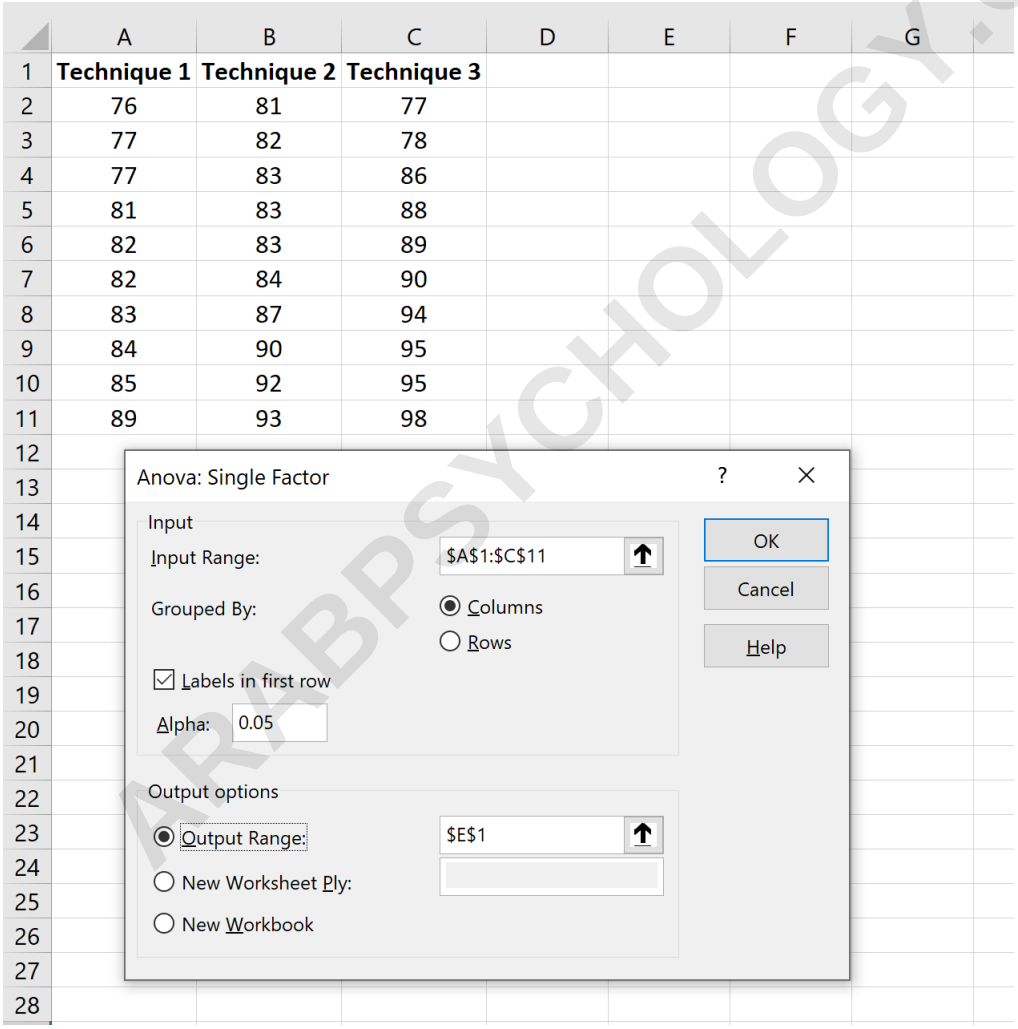
To perform a one-way ANOVA, click the Data tab along the top ribbon, then click on the Data Analysis option within the Analysis group.



If you don't see this option, you need to first .

In the new window that appears, click Anova: Single Factor and then click OK.

In the new window that appears, fill in the following information:



E	F	G	H	I	J	K
Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Technique 1	10	816	81.6	16.48889		
Technique 2	10	858	85.8	19.28889		
Technique 3	10	890	89	50.44444		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	275.4667	2	137.7333	4.792268	0.016554	3.354131
Within Groups	776	27	28.74074			
Total	1051.467	29				

Since the overall p-value (0.016554) in the ANOVA table is less than .05, this means that each group does not have the same average exam score.

Next, we will perform Scheffe's test to determine which groups are different.

Step 3: Perform Scheffe's Test

First, we need to calculate Scheffe's critical value. This is calculated as:

Scheffe's Critical Value = F Critical Value * 2

In our example, Scheffe's critical value is 3.354131 * 2 = 6.708.

Next, we can calculate the F-statistic for each pairwise comparison, which is calculated as:

F-statistic: (x1-x2)2 / (MSwithin(1/n1 + 1/n2))

For example, we can use the following formulas to calculate the F-statistic for the pairwise difference between each technique:

E	F	G	H	I	J	K
Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Technique 1	10	816	81.6	16.48889		
Technique 2	10	858	85.8	19.28889		
Technique 3	10	890	89	50.44444		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	275.4666667	2	137.7333	4.792268	0.016554	3.354131
Within Groups	776	27	28.74074			
Total	1051.466667	29				
	Critical Values	Formulas				
Scheffe's Critical Value	6.708	=K12*2				
Technique 1 vs. Technique 2	3.069	=(H5-H6)^2/(H13*(1/F5+1/F6))				
Technique 1 vs. Technique 3	9.527	=(H5-H7)^2/(H13*(1/F5+1/F7))				
Technique 2 vs. Technique 3	1.781	=(H6-H7)^2/(H13*(1/F6+1/F7))				

The only F-statistic that exceeds Scheffe's Critical Value is the one for the comparison between technique 1 and technique 3.

Thus, the only two groups that are statistically significantly different are technique 1 and technique 3.