

# Running a Friedman's test with XLSTAT

[demoFriedman.xls](#)

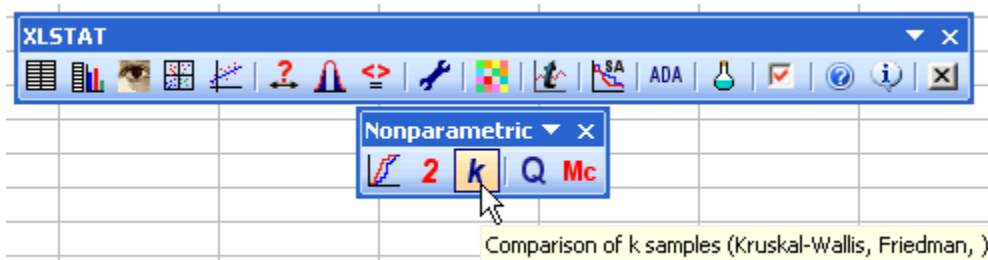
## Dataset for a Friedman's test

An Excel sheet with both the data and the results can be downloaded by clicking [here](#).

The data correspond to a sensory analysis where 10 experts have been asked to rate during two separate blind sessions the hardness of four different cheeses, on a [0->5] scale. Our goal is to determine if the difference in hardness between the cheeses is significant or not.

## Setting up a Friedman's test

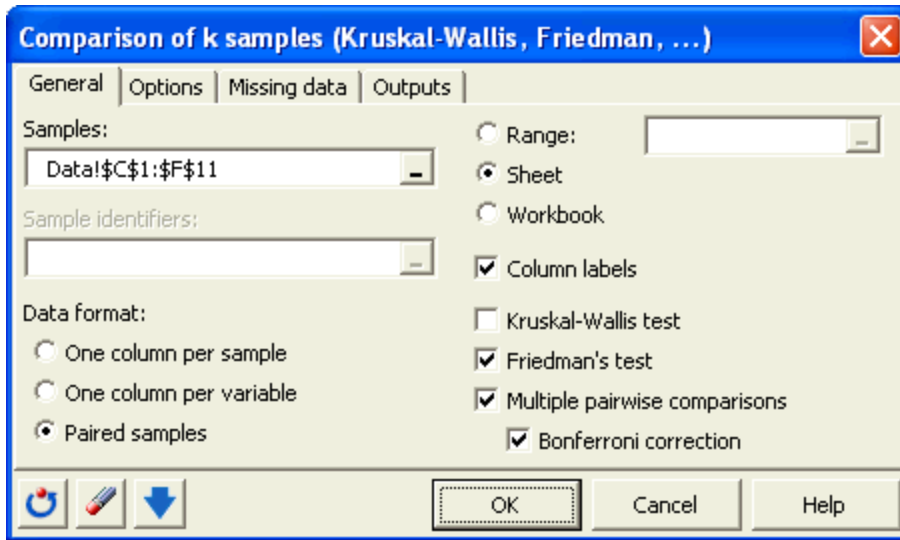
Once XLSTAT-Pro is activated, select the **XLSTAT / Nonparametric tests / Comparison of k samples** command, or click on the corresponding button of the **Nonparametric test** toolbar (see below).



Once you have clicked on the button, the dialog box appears.

Activate the **Paired samples** option first, then click in the **Samples** field, and select the data on the Excel sheet: select with the mouse the 4 columns of data corresponding to the 4 cheeses (or samples, or treatments).

As the cheeses names are included in the first row of the selection, leave the **Column labels** option checked. Then activate the **Multiple comparisons** option and the **Bonferroni** option so that if the hypothesis that the cheeses are the same is rejected, we may identify which cheeses are different.



After you have clicked on the **OK** button, the results are displayed on a new Excel sheet (because the Sheet option has been selected for outputs).

## Interpreting the results of a Friedman's test

The first table displays the Friedman's Q statistic and the corresponding p-value. The p-value tells us that the probability of rejecting the null hypothesis although it is correct is lower than 0.0001. In that case we can conclude that we can securely reject the null hypothesis that there is no difference between the cheeses.

Friedman's test:	
Q (Observed)	22,500
Q (Critical)	7,815
DF	3
p-value (Two-tailed)	< 0,0001
alpha	0,05
Test interpretation:	
H0: The samples are not significantly different.	
Ha: The samples do not come from the same population.	
As the computed p-value is lower than the significance level alpha=0,05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.	
The risk to reject the null hypothesis H0 while it is true is lower than 0,01%.	

The next results allow you to identify which cheeses are different from the others, as one would do with multiple comparisons tests in ANOVA. To take into account the fact that there are multiple comparisons on k groups, the Bonferroni correction is used. From the summary table below we see that the cheeses 2 and 3, and 1 and 3 are identified as different. Looking back at the data, the 3rd cheese is clearly the hardest cheese.

Multiple pairwise comparisons using the Nemenyi's procedure / Two-tailed test:

Sample	Frequency	Sum of rank	Mean of rank	Groups	
Cheese2	10	13,500	1,350	A	
Cheese1	10	20,500	2,050	A	
Cheese4	10	27,000	2,700	A	B
Cheese3	10	39,000	3,900		B