Running a t-test or a z-test to compare the mean of a sample to a value in XLSTAT

demo_t_test.xls

Dataset to perform a mean comparison test - either a Student's t-test or a z-test

An Excel sheet containing both the data and the results for use in this tutorial can be downloaded by clicking here. The data correspond to the mathematic grade average for the first semester of a class of 33 students.

Goal 1 of this tutorial

We want to compare the results of those students with the county average which is 11.5. We don't have the information about the variance of this statistic so we cannot run a z-test. We will then run a t-test.

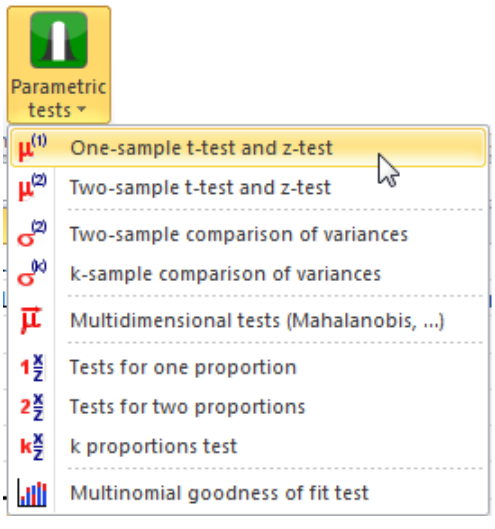
Some descriptive statistics on the class performance have been computed and can be found on the sheet **Desc**.

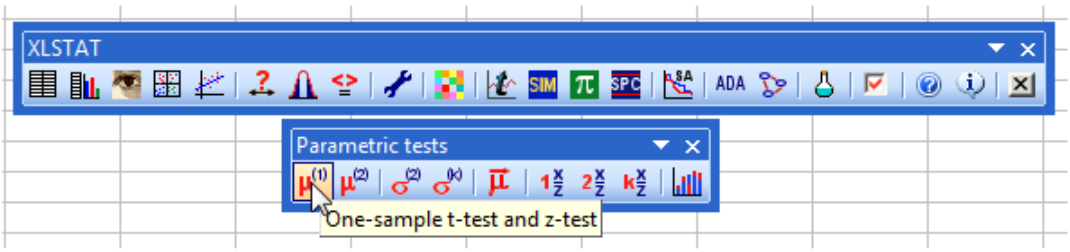
As you can see the average is 11.121.

We can use a t-test to determine if the difference between the average of the class and the average of all students in the county are similar or different with a risk of 5%.

Setting up a Student's t-test for comparing the mean of a sample to a value

Go over to the menu **Parametric tests** and select the option **One-sample t-test and z-test**.



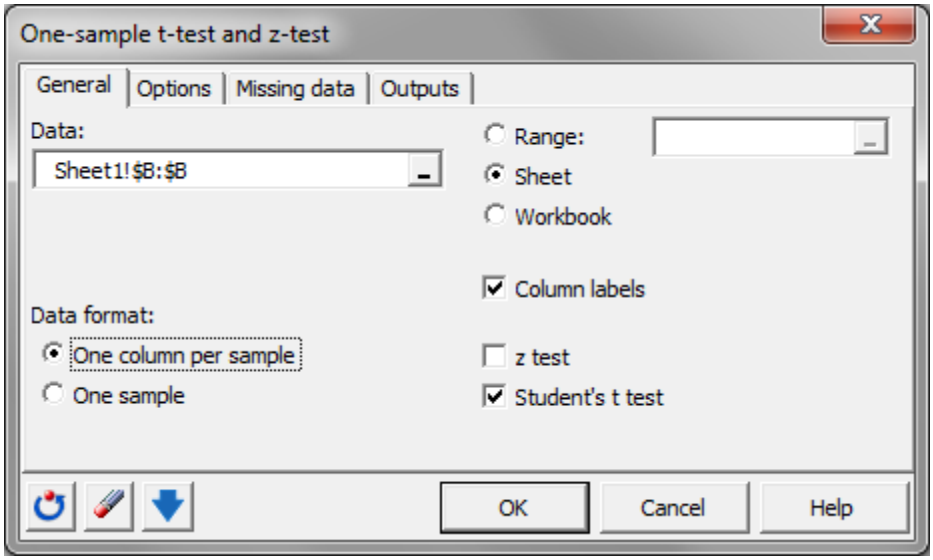


In the dialog box, select the data. Press the **Range selector** and select the column B that contains the "Math average".
The data format is **One sample per column**. Here we have only one column corresponding to one sample to test. If the data were spanned on several columns for the same sample we could use the other option.

The results will be displayed in a new sheet as we keep the default option **Sheet**.

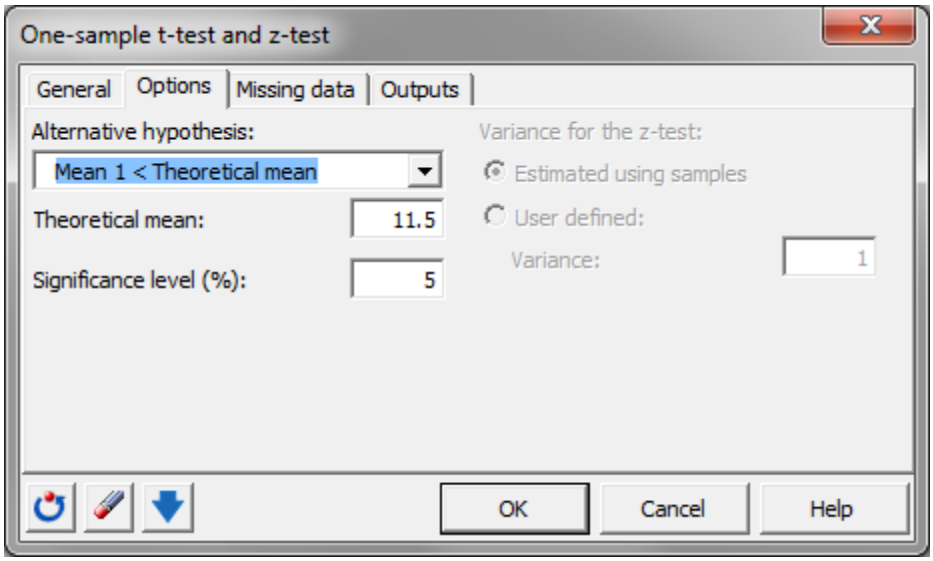
The name of the column was included in our data selection so we tick the option **Column labels**.

Finally you have to decide if you want to run a t-test or a z-test. As explained above we don't have the information about the standard deviation of the population so we have to run a **Student's t test**.

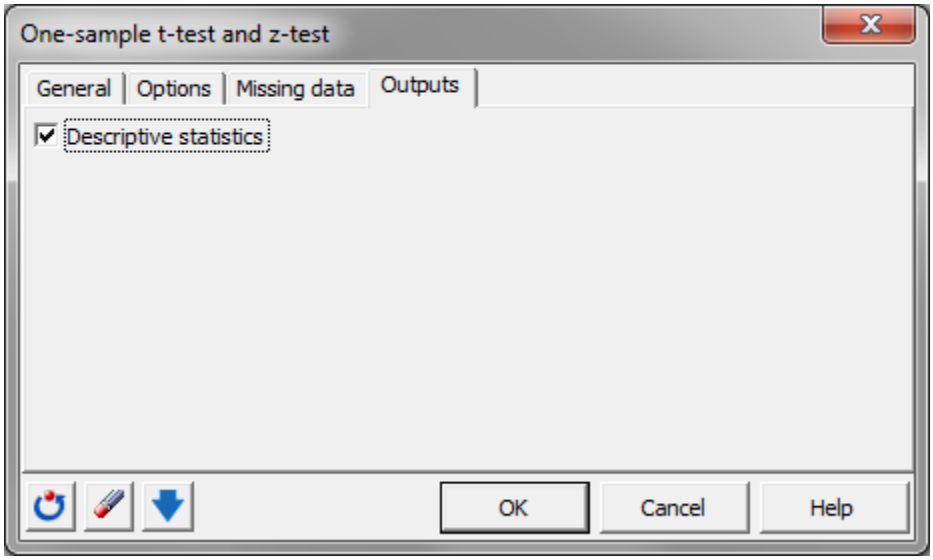


We can move on to the tab **Options** to specify our analysis.
The first thing to select is the alternative hypothesis. We know that the average of the class is inferior to the general average so we can select the option **Mean 1 < Theoretical mean** to run a one-sided test which is more accurate than a two-sided test.

Then we enter 11.5 in the **Theoretical mean** field.
The default significance level is 5%. We will use this value.



In the **Missing data** tab we can choose any option as we do not have missing data in this dataset.
For the last section **Outputs** we select the only available option **Descriptive statistics**.



When everything is set, press **OK**.

Results of the Student's t-test to compare the mean of a sample to a value

The results of the t-test appear in a new sheet.
The following table shows that the class of student is performing significantly less good than the average of the county.

One-sample t-test / Lower-tailed test:

95% confidence interval on the mean:

] -Inf ; 12,170 [

Difference	-0,379
t (Observed value)	-0,612
t (Critical value)	-1,694
DF	32
p-value (one-tailed)	0,272
alpha	0,05

Test interpretation:

H0: The difference between the means is equal to 0.

Ha: The difference between the means is lower than 0.

As the computed p-value is greater than the significance level alpha=0,05, one cannot reject the null hypothesis H0.

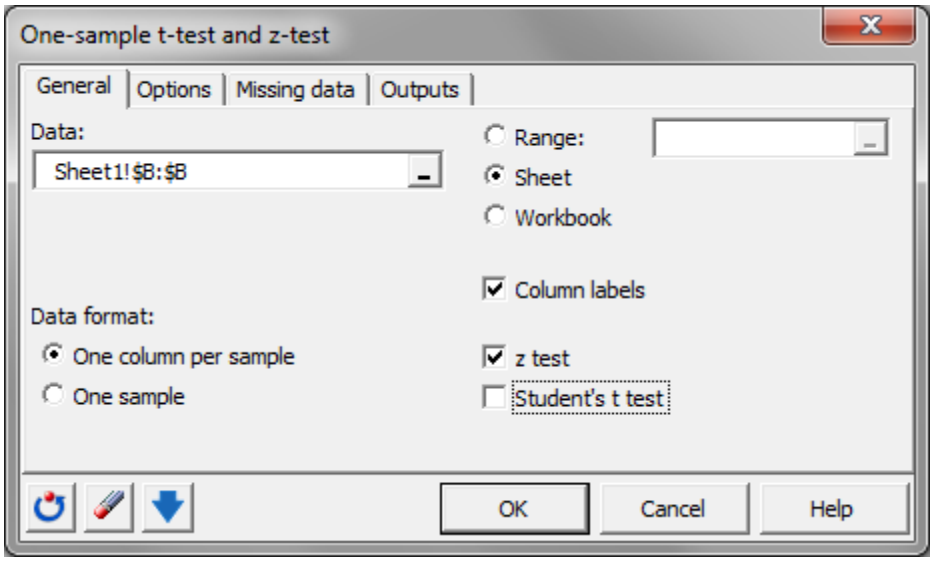
The risk to reject the null hypothesis H0 while it is true is 27,25%.

Goal 2 of this tutorial

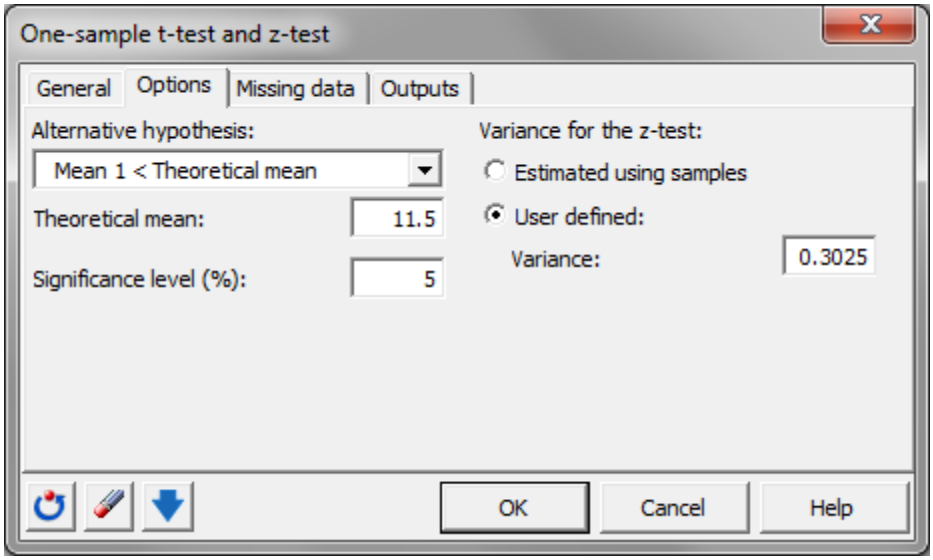
To go further we can now use the standard deviation for the math grades for the county. Let's use 0.55. So the variance is 0.3025.

Setting up a z-test for the comparison of the mean of a sample to a value

In the first tab **General**, this time instead of the **Student's t-test** option choose the option **z-test**.



In the **Options** tab, you need to set the variance for the z-test. Opt for the option **User defined** and set the value to 0.3025.



Click **OK**.

Results and interpretation of a z-test for the comparison of the mean of a sample to a value

In the results page you now have that the hypothesis H0 should be rejected and that the students performed significantly worse than the students of the county.

One-sample z-test / Lower-tailed test:

95% confidence interval on the mean:

] -Inf ; 11,279 [

Difference	-0,379
z (Observed value)	-3,956
z (Critical value)	-1,645
p-value (one-tailed)	< 0,0001
alpha	0,05

Test interpretation:

H0: The difference between the means is equal to 0.

Ha: The difference between the means is lower than 0.

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 following video shows how to run a Student's t-test and a z-test in XLSTAT.

http://www.youtube.com/watch?feature=player_embedded&v=wzILOF0KiIU