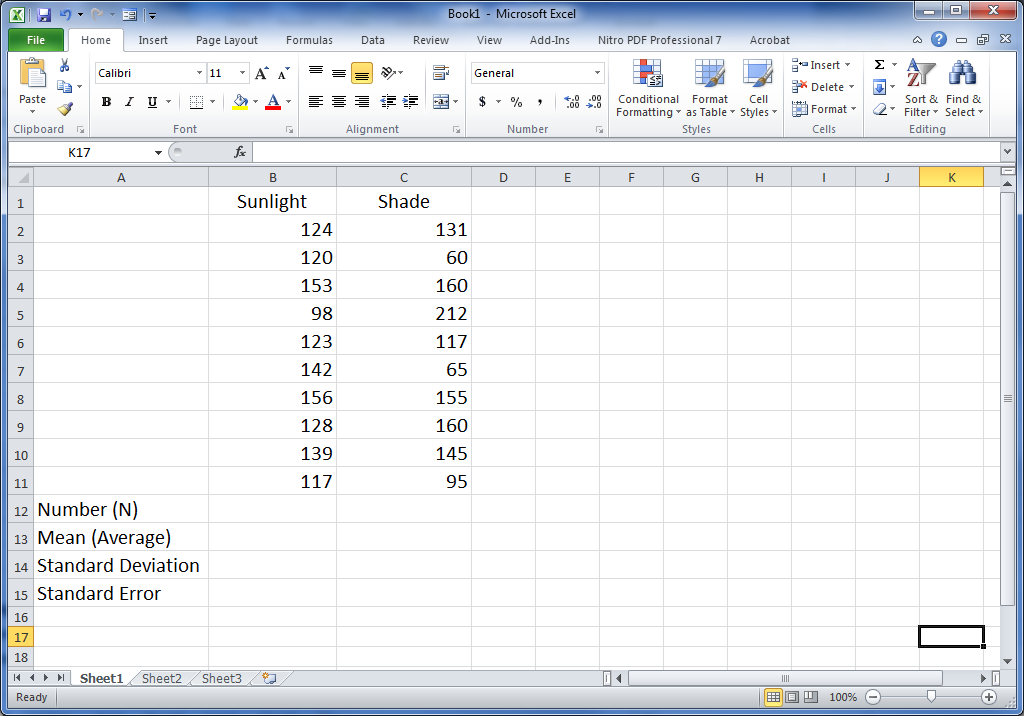
In this example you will learn how to calculate the mean, standard deviation, t-test and add error bars on graphs using Excel 2010.



1. **Enter the data to the right on your spreadsheet**

*NOTE: Make sure you enter the data in the same cells shown.*

1. **Calculate the *number of quantities* in each data range using the *count* function.**

* Select Cell B12
* Enter =count(
* Select the data range for Sunlight. Select cell B2 and drag to cell B11.
* Close parenthesis )
* Then Enter

*Your formula should look like this: =count(B2:B11)  
This tells you that the number of data points is equal to 10 (you have 10 values)*

**Follow the above steps to calculate the count for Shade.**

1. **Calculate the *mean* in each data range using the *average* function.**

* Select Cell B13
* Enter =average(
* Select the data range for Sunlight. Select cell B2 and drag to cell B11.
* Close parenthesis )
* Then Enter

*Your formula should look like this =average(B2:B11)*

**Follow the above steps to calculate the average for Shade.**

1. **Calculate the standard deviation in each data range using the stdev function.**

* Select Cell B14
* Enter =stdev(
* Select the data range for Sunlight. Select cell B2 and drag to cell B11
* Close parenthesis )
* Then Enter

*Your formula should look like this =stdev(B2:B11)*

**Follow the above steps to calculate the standard deviation for Shade.**

1. **Calculate the standard error in each data range using the sqrt function.**

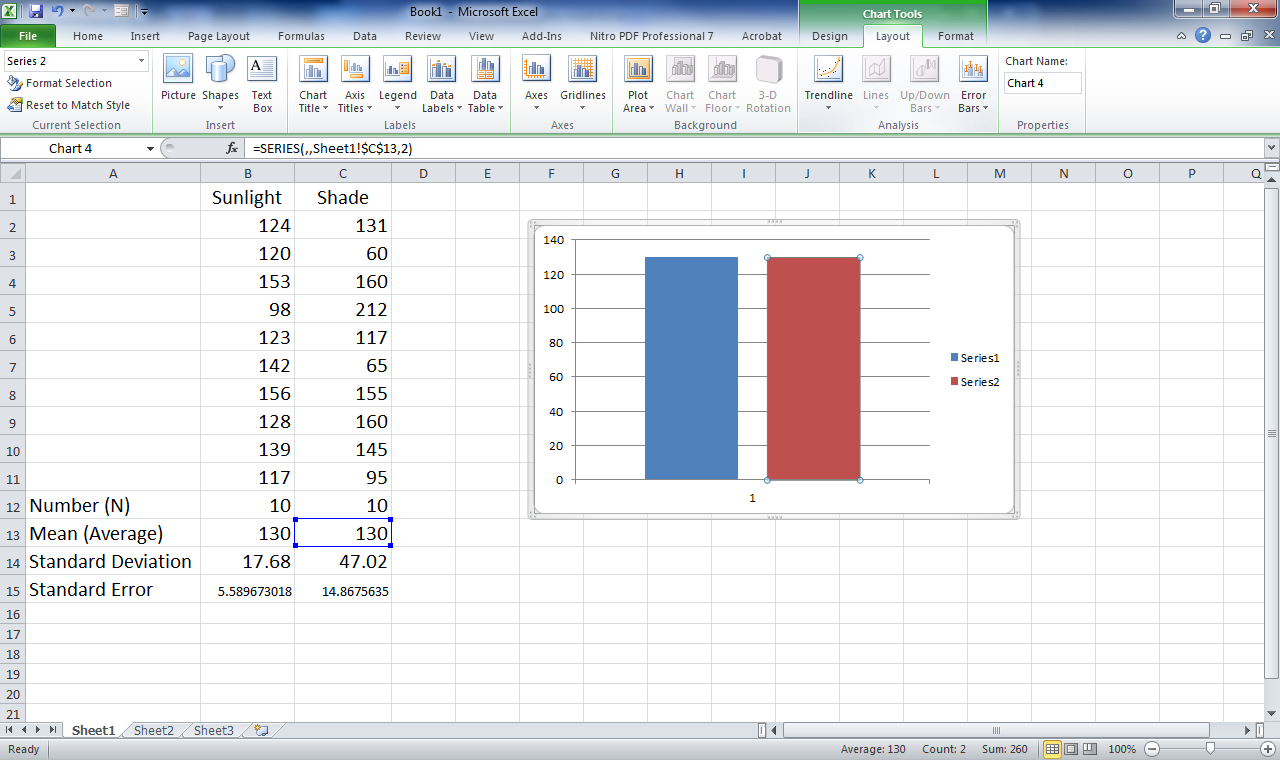
* Select Cell B15
* Enter =(
* Select cell B14
* Enter /(
* Enter sqrt(
* Select cell B12
* You must close all parenthesis for the formula to work. Enter )))

*Your formula should look like this =(B14/(sqrt(B12)))*

**Follow the above steps to calculate the standard error for Shade.**

1. **Adding standard error bars to a column graph**

* Select the Mean/Average for Sunlight and Shade (cells B13 and C13 should be selected)
* Select the “Insert” tab from the menu
* Go to the “Charts” tab and select “Column” dropdown and produce a COLUMN graph of your averages (clustered/not stacked)
* Right click on graph, Select data, Switch rows/columns
* Right click on one of the columns on the graph
  + Select “format data series”
  + Change series overlap in order to separate your columns. (negative to separate)
* Click on the column for *Sunlight* to add an error bar and choose “chart layout” from the menu



* Click on the “Error Bars” dropdown
* Select “More Error Bars Options”
* Select “Custom”
* Select “Specify Value”
* Enter the standard error data by choosing the cell containing the value.

*Note: select the same cell for positive and negative*

**Follow the above steps for the *Shade* column and use the standard error that applies to the shade.**

1. **Adding a Legend to indicate what the columns represent**

* Right Click on the chart
* Select “Select Data”
* Highlight “Series 1”
* Select “Edit”
* Add Series name: You can type in the name or select the cell the name appears

*Collapse button, select the cell, un-collapse and OK*

*Do the same for Series 2*

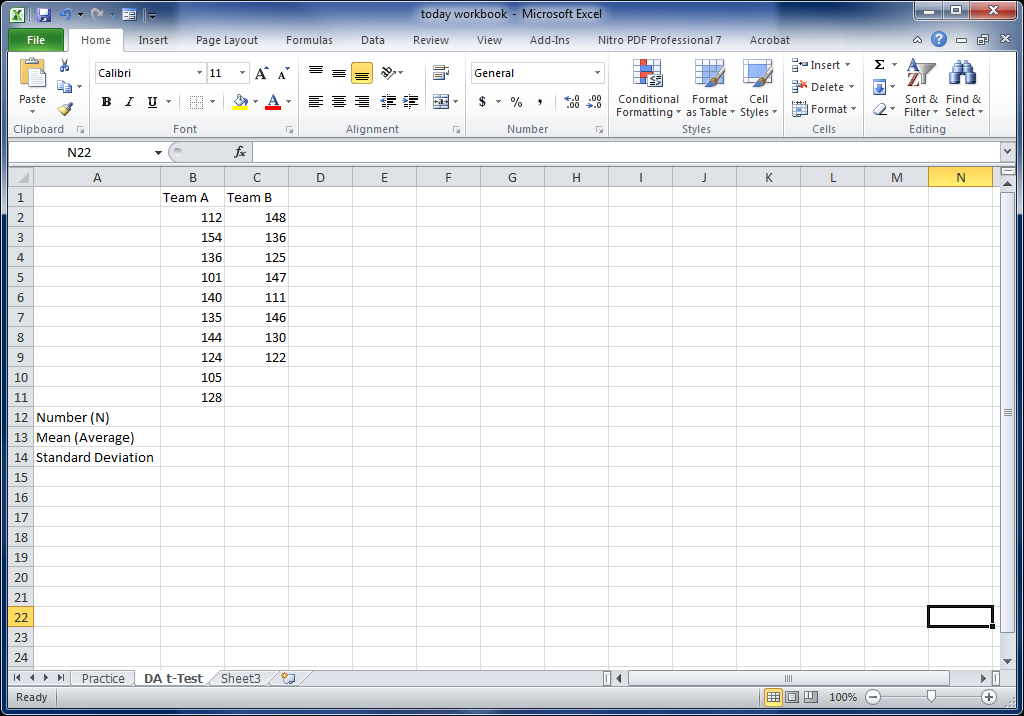
1. **How to do a Data Analysis add-in to do a t-test**

*You will need to add the add-ins first.*

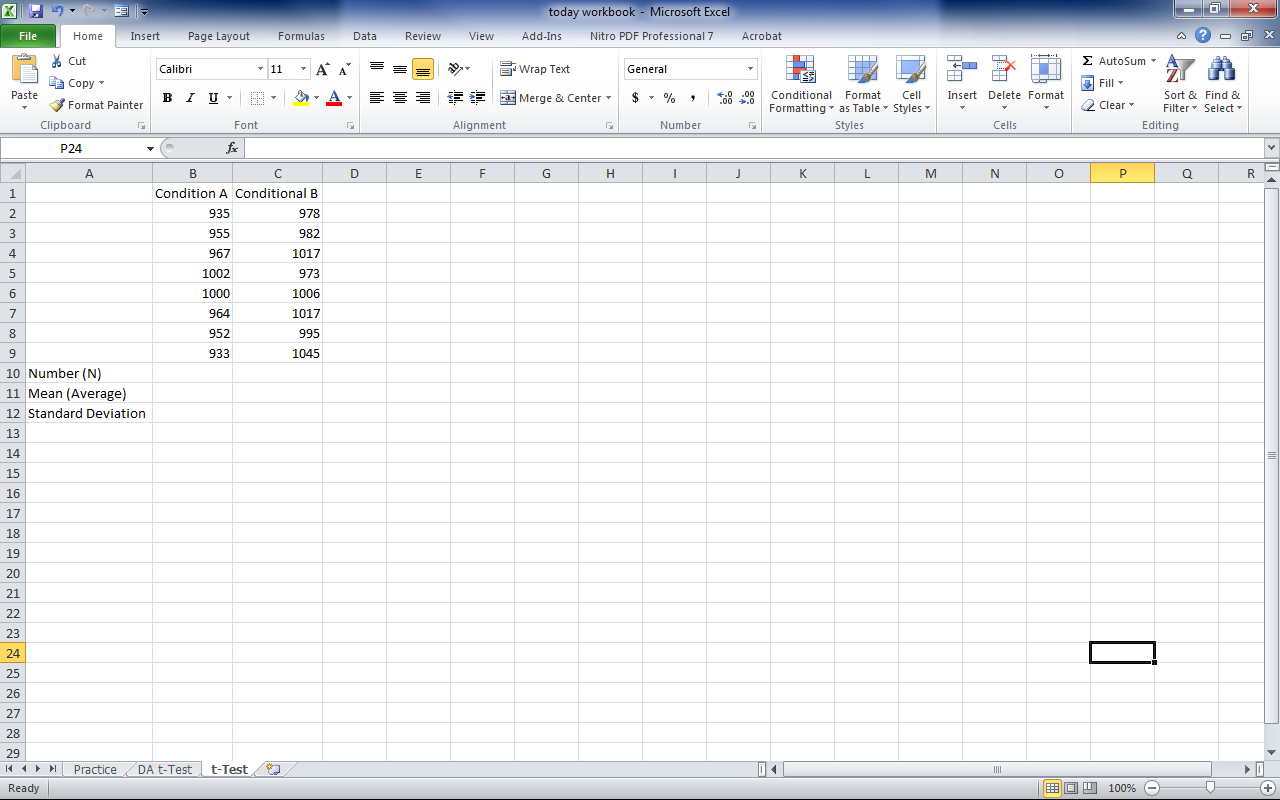
* Click “File” from the menu
* Click “Options”
* Click “Add-ins” on the left side
* Find the “analysis ToolPak” and “Analysis ToolPak – VBA”
* Make sure the dropdown by “Manage:” says “Excel Add-ins” and Click “Go”
* Check the two Add-ins “Analysis ToolPak and Analysis ToolPak-VBA” and click “OK”

*You will find the “Data Analysis” under “Data” on the menu*

1. **How to Do a Two Sample T-Test assuming equal variances**

* Enter two different sets of data into Excel
* Click “Data” on the menu
* Click the “Data Analysis” on the toolbar
* From the Box Select: t-Test: Two Sample assuming equal variances
* Click “OK”
* Select Variable 1 Range (Team A)
* Select Variable 2 Range (Team B)
* Hypothesis Mean Difference: 0
* Check “Labels” (*only if you selected the column labels with your data range for each team*)
* Alpha: 0.05
* Select “Output Range”, click the collapse button and select a cell on the spreadsheet
* Click “OK” and it will give you the results of your analysis

1. **Calculating a t-Test not using the Data Analysis**



* Enter your data into Excel

Participants are the same for each group. We will measure the reaction.

Do a paired t-test

* Select a Cell on your spreadsheet
* Enter =ttest(

Excel will prompt you to enter “array 1”

* Select the data range for Condition A
* Enter a comma
* Select the data range for Condition B
* Enter a comma

Tails: Now you need to determine how many tails the test has ---

*If you predict that there will be a difference between these two groups and you have a directional hypothesis, Condition A will be different than Condition B than this will be a one-tail test because you predict the difference.*

*If you are unclear you should do a two-tail test, this is when you predict that there may be a difference but you are not sure which group will be faster or slower.*

We are doing a one-tail test

* Enter a 1 and then a comma

Type: *is your data from the same participants or different participants. You will enter a number here 1, 2, or 3 depending on what your design is.*

*For this design it is a repeat design – each participant took part in both conditions.*

* Enter a 1 and close parenthesis

P value = 0.016

*Type 2 is when the data is from different groups and the variance is statistically the same, the variance is equal among the two groups.*

*Type 3 is also when the data is from different groups but the variance is unequal.*

*If you are unsure if the variance is equal then choose type 3 because it makes the test stricter.*