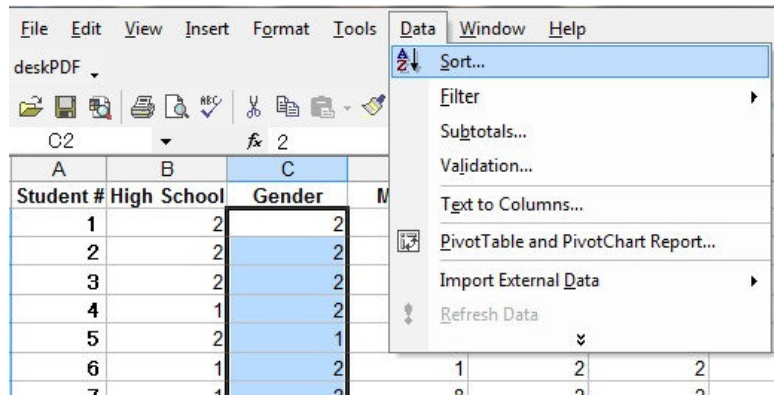


Step by step instruction how to make t test and interpret the P value

Several data sets are typed as follows:

| | A | B | C | D | E | F |
|----|-----------|-------------|--------|--------|------|------------|
| 1 | Student # | High School | Gender | Majors | Race | Motivation |
| 2 | 1 | 2 | 2 | 1 | 2 | 2 |
| 3 | 2 | 2 | 2 | 2 | 5 | 3 |
| 4 | 3 | 2 | 2 | 2 | 2 | 2 |
| 5 | 4 | 1 | 2 | 4 | 2 | 4 |
| 6 | 5 | 2 | 1 | 1 | 1 | 3 |
| 7 | 6 | 1 | 2 | 1 | 2 | 2 |
| 8 | 7 | 1 | 2 | 8 | 2 | 2 |
| 9 | 8 | 2 | 1 | 6 | 1 | 3 |
| 10 | 9 | 1 | 2 | 1 | 2 | 2 |
| 11 | 10 | 2 | 2 | 3 | 2 | 4 |
| 12 | 11 | 1 | 2 | 1 | 1 | 3 |
| 13 | 12 | 1 | 2 | 8 | 2 | 3 |
| 14 | 13 | 2 | 1 | 2 | 2 | 1 |
| 15 | 14 | 1 | 2 | 7 | 2 | 3 |
| 16 | 15 | 2 | 1 | 1 | 1 | 3 |
| 17 | 16 | 2 | 2 | 2 | 2 | 2 |

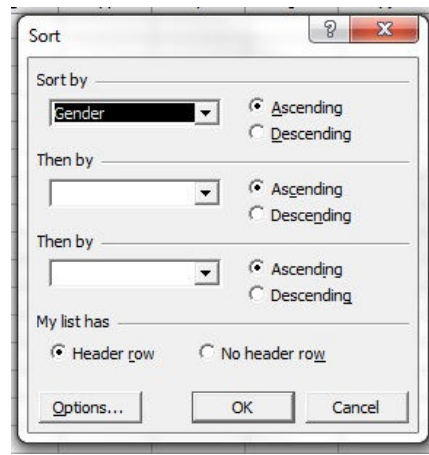
Suppose you compare the statistical significance of motivation levels between female and male. Sort the Gender column above. Select only the data part and go to Data tab to select Sort as shown below:



Sort warning will be popped up. Select "Expand the selection" so other parameters can be sorted in the same way.

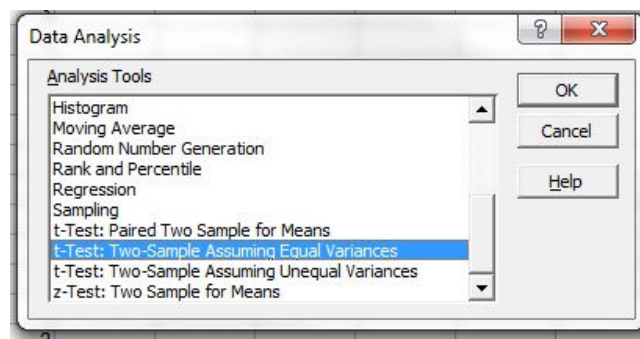


Then, Sort window comes up. Make sure if it sorts by “Gender.” If not, select the correct one. Then, click OK.

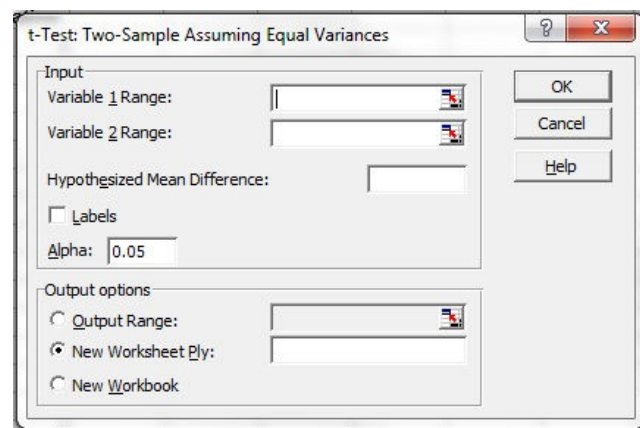


Make sure the numbers in column are sorted and other columns are changed along with this.

Now, you compare the “Motivation levels” between two genders. Go to Tools tab and select Data Analysis. You will find three different cases of t-test as shown:



For Paired Two Sample, this is for the same group with different outcomes, such as before and after. The others are for two different groups with similar or different standard deviations. You may check the distribution by making the histogram. Click one of them, then you have:



“Variable 1 Range” is, in this case, female’s motivation levels; thus you will select only the part corresponding to female (=1) as shown below:

| Gender | Majors | Race | Motivation |
|--------|--------|------|------------|
| 1 | 1 | 1 | 3 |
| 1 | 6 | 1 | 3 |
| 1 | 2 | 2 | 1 |
| 1 | 1 | 1 | 3 |
| 1 | 1 | 1 | 3 |
| 1 | 6 | 2 | 5 |
| 1 | 2 | 2 | 3 |
| 1 | 2 | 2 | 3 |
| 1 | 1 | 2 | 3 |
| 1 | 1 | 1 | 3 |
| 1 | 1 | 2 | 4 |
| 1 | 6 | 1 | 1 |
| 1 | 2 | 2 | 2 |
| 1 | 8 | 1 | 2 |
| 1 | 1 | 1 | 5 |
| 1 | 6 | 2 | 5 |
| 1 | 1 | 2 | 3 |
| 1 | 1 | 2 | 5 |
| 1 | 1 | 2 | 5 |
| 1 | 4 | 2 | 4 |
| 1 | 1 | 7 | 5 |
| 1 | 1 | 2 | 5 |
| 1 | 2 | 2 | 3 |
| 1 | 8 | 1 | 2 |
| 1 | 2 | 2 | 3 |
| 1 | 1 | 2 | 4 |
| 1 | 2 | 2 | 3 |
| 1 | 5 | 2 | 4 |
| 1 | 5 | 1 | 5 |
| 1 | 1 | 1 | 1 |
| 1 | 6 | 2 | 4 |
| 1 | 2 | 2 | 2 |
| 1 | 4 | 1 | 2 |
| 1 | 6 | 2 | 3 |
| 1 | 1 | 2 | 4 |
| 1 | 6 | 2 | 5 |
| 1 | 6 | 2 | 3 |
| 1 | 6 | 2 | 3 |
| 1 | 1 | 2 | 3 |
| 1 | 4 | 2 | 4 |
| 2 | 1 | 2 | 2 |

For Variable 2 Range, do the same thing as above with male (=2). Choose where to output in “Output options.” Then, click OK.

The result will be shown as follows:

| t-Test: Two-Sample Assuming Equal Variances | | |
|---|-------------|-------------|
| | Variable 1 | Variable 2 |
| Mean | 3.307692308 | 2.722222222 |
| Variance | 1.376518219 | 0.834920635 |
| Observations | 39 | 36 |
| Pooled Variance | 1.116848144 | |
| Hypothesized Mean | 0 | |
| df | 73 | |
| t Stat | 2.396958796 | |
| P(T<=t) one-tail | 0.009546317 | |
| t Critical one-tail | 1.665996479 | |
| P(T<=t) two-tail | 0.019092635 | |
| t Critical two-tail | 1.992998477 | |

The P-value that is less than 0.05 or the t Critical that is less than the absolute value of t Stat would conclude that the two data are significantly different. (This particular result indicates statistical significance.)