# Problems for Statist ical tests

1.  It is claimed that the median weight m of a bag of rice in a load is 40 Kg.
In order to test this, 13 bags were randomly chosen from the load and their measured weights are given below:

 { 41.2, 39.5, 41.3, 36.8, 38.8, 40.9, 38.9, 34.9,  39.2,  31.7,  40.8, 38.0,  30.9 }

Using  one sample t test, to an significance level of 0.05, test the null hypothesis
H0:  mu=40  against an alternate hypothesis H_A :  mu < 40.

Also, Using the Wilcoxon statistics to test, to an significance level of 0.05, the null hypothesis
H0:  m=40 against an alternate hypothesis HA: m < 40.


2.  A botanist measured the growths of pea stem segments for two groups under different conditions.
He made 11 observations of group X and 13 observations of group Y to record the following data:

 X : 0.8, 1.8, 1.0, 0.1, 0.9, 1.7, 1.0, 1.4, 0.9, 1.2, 0.5   (in mm)

 Y : 1.0, 0.8, 1.6, 2.6, 1.3 ,1.1 ,2.4 ,1.8, 2.5, 1.4, 1.9, 2.0, 1.2  (in mm)


Check if the two groups have significant difference in their growth of stem segments using an appropriate statistical test. Use alpha = 0.05 as a significance level. State the null hypothesis and alternate hypothesis clearly.

    (Perform  Welsch t-test and Wilcoxon rank sum test)


3.  Let X and Y be a student's GPA score in the first and second semester respectively. The two semester scores for 15 students in a degree program are listed in the paired data below:

X :   {2.88, 3.67, 2.76, 2.34, 2.46, 3.20, 3.17, 2.90, 3.98, 4.00, 3.39, 2.59, 2.78, 2.85, 3.25  }
Y :   {3.22, 3.49, 2.54, 2.17, 2.53, 2.98, 2.98, 2.84, 3.76, 3.96, 3.52, 2.36, 2.62, 3.06, 3.16   }

Perform t test  and Wilcoxon's signed rank test to see whether these two sets of scores are significantly different to a significance level of 0.05.  State your hypothesis clearly.

4. The cholesterol level of four groups of adults with distinct food habits among the groups were compared in an experiment. The results are present below:

*Group*–1 :  220, 214,  203,  184,  186,  200,  165
*Group*–2 :  262, 193,  225,  200,  164,  266,  179
*Group*–3 :  272,  192, 190,  208,  231,  235,  141
*Group*–4 :  190,  255,  247,  278, 230,  269,  289

Assuming that these four data sets follow Normal distributions, test the null hypothesis that their population measn are equal to a significance level of 0.05.

5.  Chemists use Ion Sensitive Electrodes to measure ionic concentrations of acquous solutions. In order to calibrate this equipment, the output signal in millivolt was measured for known ion concentrations in units of ppm. The data is reproduced here:

concentration (in ppm) :   0.0,  50.0,  75.0,  100.0,  150.0,   200.0

signal (in mV)             :       1.72,  2.11,  2.36,  2.56,  3.05,  3.42

Calculate a least square regression line between concentration and signal data.