STAT 40001/MA 59800 Statistical Computing/ Computational Statistics Fall 2013
Homework 5

Name:

Due : October 24, 2013 PUID:

Instruction: Please submit your R code along with a brief write-up of the solutions (do not submit raw output). Some of the questions below can be answered with very little or no programming. However, write code that outputs the final answer and does not require any additional paper calculations.

Q.N. 1) A college bookstore claims that, on average, a college student will pay **$100** per class for textbooks. A student group investigates this claim by randomly selecting ten courses from the course catalog and finding the textbook cost for each course. The data collected is

$$\mathbf{140, 125, 150, 102, 143, 170, 120, 94, 53, 115}$$

a) At **0.05** level of significance is there an enough evidence to prove that the test book cost is greater than **$100** per class.
b) Construct a **95%** confidence interval for the average test book cost per course.
c) Construct a **90%** confidence interval for the average test book cost per course.

Q.N. 2) If $\boldsymbol{X_1, X_2, \cdots, X_n}$ are independent random variables following a $\boldsymbol{N(0,1)}$ distribution, then $\boldsymbol{Y = \sum_{i=1}^{n} X_i^2 \sim \chi_n^2}$. Given 10 independent and identically distributed (i.i.d.) random variables $\boldsymbol{X_i}$, where $\boldsymbol{X_i \sim N(0, \sigma = 5)}$ for $\boldsymbol{i = 1, 2, \cdots, 10}$, compute

a) $\boldsymbol{P\left(\sum_{i=1}^{10} X_i^2 \leq 600\right)}$

b) $\boldsymbol{P\left(\frac{1}{10}\sum_{i=1}^{10} X_i^2 \geq 12.175\right)}$

c) $\boldsymbol{P\left(\frac{1}{10}\sum_{i=1}^{10} X_i^2 = 5\right)}$

Q.N. 3) The `babies` data frame in the `UsingR` packages has a collection of variables taken for each new mother in a Child and Health Development Study. The variable `age` contains the mom's age and the variable `dage` contains the dad's age for several babies. Do a significance y=test of the null hypothesis of equal ages against a one-sided alternative that dads are older.

Q.N. 4) Water -quality researchers wish to measure biomass/chlorophyll ratio for phytoplankton(in milligrams per liter of water). There are two possible test, one less expensive then the other. To see whether the two tests give the same results, ten water sample were taken and each was measured both ways. Table below provide the measurements. Perform a test to see if there is a difference in the means of the measured amounts. Please list all the assumptions you made to perform the test.

Method 1	45.9	47.6	54.9	38.7	35.7	39.2	45.9	43.2	45.4	54.8
Method 2	48.2	64.2	56.8	47.2	43.7	45.7	53.0	52.0	45.1	57.5

Q.N.5) The Hubble Space Telescope was put into orbit on April 25, 1990. Unfortunately, on June 25, 1990, a spherical aberration was discovered in Hubble's primary mirror. To correct this, astronauts had to work in space. To prepare for the mission, two teams of astronauts practiced making repairs under simulated space conditions. Each team of astronauts went through 15 identical scenarios. The times to complete each scenario were recorded in days.

Team 1	3.0	2.4	1.3	3.1	2.4	2.0	1.1	2.7	3.0	2.2	3.6	1.0	1.4	2.5	1.6
Team 2	1.8	1.0	3.5	1.2	3.3	2.6	1.5	2.8	0.4	3.0	2.2	2.7	3.8	2.9	2.1

Is one team better than the other? If not, can both team complete the mission in less than 3 days?