Confidence Interval and Hypothesis Testing Questions

1. You were asked to compute a *95%* confidence interval. The resulting interval, however, turned out to be too large to be of use to your client. What could you do to achieve a smaller confidence interval?

2. A test was conducted to determine the length of time required for a student to read a specified amount of material. All students were instructed to read at the maximum speed at which they could still comprehend the material. Sixteen students took the test, with the following results (in minutes):

   25, 18, 27, 29, 20, 19, 25, 24, 32, 21, 24, 19, 23, 28, 31, 22

   Estimate the mean length of time required for a student to read the material, using a *90% confidence interval* and use (a) manual computations as well as (b) StatCrunch. Please note that the sample size is small, so you need to use the appropriate table.

3. The lifetimes (in years) of ten automobile batteries of a certain brand are

   2.4   1.9   2.0   2.1   1.8   2.3   2.1   2.3   1.7   2.0

   Estimate the mean lifetime for all batteries, using a 99% confidence interval. Use the most appropriate method (especially considering the sample size).

4. A large supermarket chain sells longhorn cheese in one-pound (= *16* ounces) packages. As city inspector you weigh *100* randomly selected packages of cheese and note that the sample mean is *15.6* ounces, with a standard deviation of *2.0* ounces. You therefore suspect that the chain is miss-labeling the cheese and that the actual weight of a package is different from the stated *16* ounces. Use your data to test your suspicion against the null hypothesis that the average weight of a package is *16* ounces. Use $\alpha = 0.05$.

5. Using conventional nutritional supplements for calves results in an average weight gain of 20 pounds in a six week period. In a study testing a new mix, 36 calves were fed "ration X" exclusively for six weeks. The weight gain was recorded for each calf, yielding a sample mean of 22.4 pounds with a standard deviation of 9.5 pounds. Can we conclude from this evidence that the new dietary supplement "ration X" results in different numbers of weight gains, on average, than the traditional mix? If so, is "ration X" better or worse than the traditional feed? Use a "5% level of significance".

6. A test was conducted to determine the length of time required for a student to read a specified amount of material while a low-level music was playing to see if students were distracted by the noise. All students were instructed to read at the maximum speed at which they could still comprehend the material. Fourteen students took the test, with the following results (in minutes):

   25, 18, 27, 29, 20, 19, 25, 24, 32, 21, 24, 20, 24, 28

   The average reading time for students in a quiet environment is 22 minutes. Use an appropriate statistical test to determine whether noise is indeed distracting students.

7. Using the General Social Sciences 1996 survey data to find the average number of hours that people watched TV in the US in 1996, you find that the descriptive statistics for the variable 'tvhours' are N = 1000, Mean = 2.96, and Standard Deviation = 2.38. At a conference you hear someone referring to the (supposed) fact that "the average American watches 3.5 hours of TV a day". Would you challenge the speaker, based on the above data (at the 0.05 level)?

8. The manufacturer of car batteries claims that the average lifetime of its batteries (in months) is 20 months. You want to produce batteries with an average lifetime higher than that, but first you want to make sure that the manufactures claim is accurate. You randomly select a sample of six automobile batteries of that brand and find their lifetimes (in months) to be:

   22   17   20   21   17   23

   Setup a statistical test for checking whether the population mean indeed is 20 months or not.