1. A new hair-growth product is in development and first treatments are made and evaluated using a continuous score ranging from 0 for “baldness” to 10 for “full hair”. Hair scores are measured on volunteers before and after treatment with the new product and the change (after – before) is reported: 0, 0.6, 0.1, −0.2, −3  
   Sample mean = −0.5 and sample s.d. = 1.428  
   Throughout this problem you may treat these differences as draws from a normal distribution. Using a one sample t-test you will draw conclusions on the effectiveness of the hair-product.
   1. Write down the null and the alternative hypotheses and compute the relevant t-statistic.
   2. Using the appropriate probability table determine or at least give bounds for the p-value of a significance test.
   3. Comment briefly on what your significance test calculations imply about the effectiveness of the new hair product.
2. In 1999, it was reported that the mean serum cholesterol level for female undergraduates was 168 mg/dl. A recent study at Baylor University investigated the lipid levels in a randomly selected cohort of *n* = 71 sedentary university female undergraduates. The data is given in *cholbaylor.txt.*
   1. Compute using a software the sample mean and standard deviation. Remember to specify their units.
   2. Obtain a box-plot and a histogram of the observations. Does the data look symmetrically distributed about the mean?
   3. Is there any evidence that cholesterol levels of sedentary students differ from the previously reported average? To answer the question, write down the null and alternative hypotheses, clearly defining any notation you use. Compute the relevant test statistic and its degrees of freedom. Compute the p-value and provide a conclusion under the context of the problem.
3. The Deely Laboratory analyzes specimens of a pharmaceutical product to determine the concentration of the active ingredient. Such chemical analyses are not perfectly precise. Repeated measurements on the same specimen will give slightly different results. The results of repeated measurements follow a Normal distribution quite closely. The analysis procedure has no bias, so that the mean μ of the population of all measurements is the true concentration in the specimen. The laboratory analyzes each specimen 10 times and reports the mean result. The Deely Laboratory has been asked to evaluate the claim that the concentration of the active ingredient in a specimen is 0.86 grams per liter. The 10 observations are given in *deely.csv.*
   1. Compute using a software the sample mean and standard deviation. Remember to specify their units.
   2. Obtain a box-plot and a histogram of the observations. Does the data look symmetrically distributed about the mean?
   3. Is there any evidence that the mean concentration is different from 0.86g/l? To answer the question, write down the null and alternative hypotheses, clearly defining any notation you use. Compute the relevant test statistic and its degrees of freedom. Compute the p-value and provide a conclusion under the context of the problem.