

Assignment Due (by 11:59 P.M.): Wed 23 Sep

**Directions:** You may discuss the exercises with other students and with the instructor, but the work you turn in must be your own. Note that neatness and format (including code in appendix) will contribute 10 points to the total score. This assignment will be graded out of 65 points.

**Exercises:**

1. (15 points) For each of the following studies, answer these three questions: (i) Is the study an experiment or not (and why)? (ii) If the study is an experiment, what is the experimental unit? (iii) If the study is an experiment, is it a good experiment (and why)?
  - (a) Researchers want to compare the effect of two drugs in reducing blood pressure in elderly patients. 100 subjects agree to participate. The first 50 to show up at the clinic are given one drug, while the last 50 are given the other drug. Patients are not told which drug they receive, and the drugs are visually indistinguishable. After two months of taking the drug daily, patients' blood pressures are taken and compared with their blood pressure on the day they first picked up their drug supply.
  - (b) Researchers want to compare the effect of two vitamin supplements on cholesterol. 100 subjects are identified, 50 of which report having been taking one of the vitamin supplements for at least two months, and 50 of which report having been taking the other vitamin supplement for at least two months. The cholesterol levels of these two groups are compared.
  - (c) Researchers want to compare the effect of two diets to strengthen horses' hooves. 50 horses are used in the study, with 25 randomly assigned to receive one diet, and 25 receive the other diet. Each horse receives its feed in an individual stall. At the beginning of the study, the strength of each of the four hooves is measured (in a non-destructive test) on each horse, for a total of 200 measurements. After two months on their assigned diets, the horses' hoof strengths are again measured (200 more measurements). The change in hoof strength is compared between the two diets.
2. (15 points; based on textbook Exercise 2.3, p. 29) Suppose we are studying the effect of diet on height of children, and we have two diets to compare: diet A (a well balanced diet with lots of broccoli) and diet B (a diet rich in potato chips and candy bars). We wish to find the diet that helps children grow (in height) fastest. We have decided to use 20 children in the experiment, and we are contemplating the following methods for matching children with diets. Describe the benefits and risks of using these five methods:
  - (a) Let them choose.
  - (b) In order of study enrollment, take the first 10 for A, the second 10 for B.

- (c) Alternate A, B, A, B, ...
  - (d) Toss a coin for each child in the study: heads  $\rightarrow$  A, tails  $\rightarrow$  B.
  - (e) Get 20 children; choose 10 at random for A, the rest for B.
3. (25 points) Suppose that an appropriate method was chosen Exercise 2 above. After six months on their designated diet, the following changes in children's heights were observed (in cm):

Diet A:	0.01	0.75	0.79	0.12	0.92	0.18	1.44	0.16	0.22	3.53
Diet B:	0.15	0.26	0.82	0.35	0.70	0.67	0.01	0.71	0.71	1.38

Use SAS to perform an appropriate statistical test. Specify (a) the hypotheses, (b) test statistic, (c) sampling distribution, (d) P-value, and (e) conclusion in context. Also (f) briefly discuss (with graphical evidence) the appropriateness of relevant assumptions.

**Appendix:** (10 points) Include SAS code used for this assignment.