

Statistics 5303 — Exam 2  
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This exam is open book, open notes; you may use a calculator. **Do your own work!** Use the back if more space is needed. There are seven questions, each worth 10 points. Please attach your data analysis notes for these data sets to your exam with the paper clips provided in the front of the room.

Questions 1 through 3 relate to the hybrid data. **Provide some justification for your answers!**

(1) Draw the Hasse diagram for this experiment.

(2) What are the appropriate test denominators for parental lines, inbred tester lines, and their interaction?

(3) Describe your conclusions for this experiment with respect to the parental lines, inbred tester lines, and their interaction?

For questions 4 and 5, describe the experimental design that you would choose for each situation. Tell me about units, treatments, blocks, etc.

(4) A sociologist is developing a new questionnaire and response scale (a weighted combination of the answers to the questions) to assess where an individual lies on the liberal to conservative spectrum in social attitudes. The new scale is supposed to match an existing scale, and we need to conduct an experiment to test the equality of average scores.

The best experiment would give both questionnaires to many people, but that is infeasible; each subject will only receive one questionnaire. Subjects will be students in introductory sociology classes at the U of M, and we have resources to question 80 students. We anticipate that students planning to major in sociology may have different attitudes from nonmajors. We also anticipate that older, nontraditional students could have different attitudes from traditional students. (Assume that there is no problem with finding subjects, obtaining their consent, or obtaining their answers.)

(5) Air flow through heating and air conditioning vents can become noisy if the vent system is not properly designed. This can be a problem for concert halls and similar rooms. The noise seems to depend mostly on the kind of “bend” or “elbow” that is used to form turns in the vent. Unfortunately, the noise of a given vent also seems to depend rather delicately on just exactly how the vent was assembled, not simply the overall design, so we can’t tell how a design will work from a single vent. We have four designs to compare, and can afford to make 20 vents and measure them for noise.

For each of questions 6 and 7, describe the design and give a skeleton anova.

(6) One of the problems encountered when restoring a wetland is that reed canary grass will take over and crowd out all other vegetation. We wish to compare eight treatments for their efficacy in keeping the fraction of reed canary grass down. The treatments are the factorial combinations of burning (yes or no), tilling (yes or no), and herbicide (yes or no). We have 16 plots, eight in a site that is always wet and eight in a site that sometimes gets a little dry. At each site we randomly assign the eight treatments to plots.

(7) A consumer testing agency is trying to compare four over-the-counter acne medications (creams). They have obtained 96 teenagers as subjects, and they expect considerable subject to subject variation. To combat this variation, they want each subject to use more than one medication. They feel that it is unrealistic to divide the faces into four small patches with a different cream for each patch, so they just divide each face into left- and right-hand halves. Each subject then uses two medications, one for the right-hand side of the face, and one for the left side. They keep a record of blemishes, and the response for each side of the face will be the total number of blemishes on that side in a six-week study period. The medications are assigned to the face halves at random subject to the restrictions that each pair of medications is used for the same number of subjects.