**Stat 3011 Second Midterm Exam (In-Class Part)     Nov. 15, 2000**

Name ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ Student ID ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

The exam is closed book. You may use a calculator, and one $8\frac{1}{2}$ by 11 sheet of paper with formulas (or anything else) on it, but no other notes. Put all of your work on this test form (use the back if necessary). Show your work or give an explanation of your answer. No credit for numbers with no indication of where they came from.

1. [10 pts.] What is the meaning of a confidence interval? If someone says (0.41, 0.55) is a 95% confidence interval, what does that mean?

2. [15 pts.] A scientist measured tail lengths of 40 wild field mice. The mean was 11.7 cm and the standard deviation was 2.3 cm. Assume the measured mice were a random sample from some specified wild population.

   (a) Calculate an approximate 95% confidence interval for the mean tail length of the population (either interval or plus-or-minus form is acceptable).

   (b) What is being assumed, other than what is specified in the problem statement, for the confidence interval in part (a) to be approximately correct?

(c) What would you do different from part (a) to calculate a 90% confidence interval? (You don't need to actually do the interval, just explain how to do it.)

(d) What would you do different from part (a) to calculate a 95% confidence interval if the mean and standard deviation were the same as in the problem statement but only 10 mice were measured? (You don't need to actually do the interval, just explain how to do it.)

(e) What is being assumed, other than what is specified in the problem statement, for the confidence interval in part (d) to be approximately correct?

3. [15 pts.] A drug company has performed a randomized controlled trial of a new nonsteroidal anti-inflammatory drug for treatment of arthritis. The control group got an old drug (ibuprofen) and the treatment group got the new drug. There were 250 patients in each group. The patients were randomly assigned to treatment or control. Treatments were deemed "successful" if the patient reported "acceptable" or better quality of life. The results were

|  | sample size | successes |
|---|---|---|
| new drug | 250 | 213 |
| control | 250 | 194 |

Calculate a 95% confidence interval for the difference of the true population proportions of successes for the two treatments (either interval or plus-or-minus form is acceptable).

4. [10 pts.] A chemist is going to do a quantitative analysis to determine the amount of lead (in percent by weight) in some paint chips taken from an old house. The federal standard classifies paint as "lead based" if it contains 0.5% lead by weight. The standard deviation of the analysis method the chemist intends to use is known from past experience to be about 0.065%.

How many independent analyses would the chemist have to do to get a 95% confidence interval for the true percent of lead by weight in the paint with about 0.01% for a margin of error?