MONT 107N – Understanding Randomness
Information and Sample Questions for Final Exam

General Information

The final exam will be given on Tuesday, May 11 from 8:30am to 11:30am in our regular classroom, Stein 307. The exam will be roughly twice as long as the midterm. If you are well-prepared and work steadily, I expect that you will complete it within two hours. However, if you need more time, you will have until 11:30am to work on the exam.

The final will cover the material from Parts V - VIII (Chapters 16 - 29) of Freedman, Pisani, Purves. This means in particular:

1. Box models for chance processes, the "Law of Averages," EV and SE, models for totals versus models for counting/classifying.
2. The Central Limit Theorem and using the normal curve to determine probabilities of various outcomes.
3. Sampling and chance errors in sampling. (Be aware that there is a "correction factor" for sampling without replacement, but that that factor is very close to 1 when the population is large and the sample size is relatively small compared to the population size.)
4. Accuracy for percentages, confidence intervals for percentages in the large sample case – a different way to use the SE, but a somewhat difficult concept. Be sure you understand exactly what the "95% confidence" refers to and the ramifications of this.
5. Accuracy for averages, confidence intervals for averages in the large sample case.
6. Tests of significance – large sample (z-) tests for percents and averages, differences of percents and differences of averages. Small sample (t-) tests for averages.
7. χ^2 tests for "goodness of fit" and for independence (understand the difference and when to recognize the one you want).
8. Chance models and genetics – I might ask you to do something with data gathered by Mendel as part of his experiments, for instance.

I will supply copies of any tables you need to use. *To minimize the need to memorize a lot of stuff, you may bring one side of a* 3×5 *inch index card to the exam with any formulas or other information you want to include and consult it at any time. I will collect these cards with the exam.*

Review Session

If there is interest, I would be happy to run a pre-exam review session for the class. Either morning or afternoon of Friday, May 7 after about 2:00pm would be possible.

Suggestions on How to Study for This Exam

Review the problems from the problem sets and the posted solutions if there were problems you lost points on. Try those again, and if necessary look at some of the "regular"

problems in the text that have answers to practice. The main tricky thing about the material we have looked at this semester is deciding what kind of question you are trying to answer. For example, is the question asking about the total of a collection of numbers produced by a chance process, or is it asking about a percentage, or an average, or the difference of two averages (that is, is it asking for a two-sample test), etc.? And what is the sample size? (This is how you distinguish between z- and t-tests.) Or is it really a question about goodness of fit or independence, in which case you really want a χ^2-test? If you think that out first, you will see which formulas are applicable.

The appropriate SE formula is the most important component for much of this:

- SE for *sum* of n draws with replacement $= \sqrt{n} \times SD$ of box.
- SE for *average* of n draws with replacement

$$= \sqrt{n} \times \frac{\text{SD of box}}{n} = \frac{\text{SD of box}}{\sqrt{n}}$$

  (this works for all boxes, including the 0/1 boxes used when dealing with questions about percents).
- SE for *percent* $= \frac{\text{SD of 0/1 box}}{\sqrt{n}} \times 100\%$
- For problems about differences of sums, etc. the total SE is $SE = \sqrt{SE_1^2 + SE_2^2}$.

Please take note

No use of cell phones, pagers, I-pods, or any other electronic devices beyond a calculator will be allowed during the exam – please turn them off and stow them in your backpack.