Comments and Review Problems for Exam 1

February 11, 2000

Time and Place of Exam: The exam will be in class, on Thursday, February 18.

Exam Materials: The exam is closed book. You can prepare a formula sheet: a standard-size sheet of paper on which you can write whatever you like, both sides. You should bring a calculator.

Exam Coverage: Questions for the exam will be based on material in the following sections of your textbook:

> **Chapter 1:** Sections 1-1, 1-2, 1-3.
>
> **Chapter 2:** Entire chapter.
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> **Chapter 3:** Entire chapter
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> **Chapter 4:** Entire chapter, *except* for Section 4-7.2 (negative binomial distribution) and Section 4-8 (hypergeometric distribution).
>
> **Chapter 5:** Sections 5-1 through 5-6, inclusive. Section 5-8 (approximation to binomial only), Section 5-9.

I'll do my best to come up with problems which stress concepts, and which do not require difficult computation. There is no required homework for this week; this gives you time to catch up on reading the textbook, and to try some of the review problems below. I will spend part of class on Tuesday reviewing for the test, and Kate, Erique and I will be available during office hours, as usual, to help with any questions. **There will be no sections on the day after the test, but the TAs will hold office hours during the section times.**

Here's an outline of the main concepts which you should understand. This list may not be complete, but I think it comes close to being complete:

- Introduction (Chapters 1 and 2):

    - Roles of statistics in engineering: design of experiments, graphical data summaries, data analysis
    - Variability and "statistical thinking"
    - Population and sample
    - Mean and standard deviation of a population and of a sample
    - Empirical vs. mechanistic models
    - Designed experiments vs. observational studies
    - Boxplot, histogram, time sequence plot
    - Mean, median, mode, symmetry, skewness

- Probability (Chapter 3):

    - Sample space, outcomes, events, mutually exclusive events, random experiment
    - Probability, conditional probability, independence, Bayes theorem
    - Addition rule, total probability rule, supplemental notes on counting rules

- Random variables :Univariate (Chapter 4-5):

    - Properties
        * Discrete or continuous
        * Probability mass function (discrete), probability density (continuous)
        * Cumulative distribution function, and its use in calculating probabilities for continuous random variables.
        * Mean, variance, standard deviation, mathematical expectation
    - Important examples of random variables:
        * Discrete: Bernoulli, binomial, discrete uniform, geometric, Poisson

* Continuous: uniform, normal, exponential
* Situations in which each probability model is likely to be useful
- Concepts specific to normal random variables:
  * Standard normal random variable
  * Calculation of normal probabilities using the standard normal random variable, and the table in Appendix A, pages A-3 and A-4.
  * Practical implications of the central limit theorem
  * Normal distribution as an approximation to the binomial distribution

Everyone has there own approach to studying, but here's some (unsolicited) advice:

1. Go over the homework solutions, and make sure you understand them. Don't hesitate to come to office hours if you need help.

2. Catch up on your reading of the book. The book is reasonably well written, and I don't think these chapters make particularly difficult reading.

3. Do some of the unassigned odd numbered problems, particularly the supplemental problems at the ends of chapters 3-5.

You may want to try some of the following problems for review (Don't turn these in; answers are in the back of the book): 3-83, 3-85, 3-87, 3-97, 3-103, 4-93, 4-97, 4-103, 4-105, 5-111, 5-117, 5-119, 5-120, 5-121.