Cartoon Exam

This is a crude sketch of what your first midterm might look like. Naturally, it wouldn’t be much of a test if it looked exactly like any of these questions, but the broad ideas are represented. It is a good exercise to try to make up your own questions for each area. The exam will cover the material from weeks 1 through 3, meaning chapters 1 through 4 of the book. Good luck!

Short-answer questions

The exam will most likely include one or two short-answer questions. These will be designed to test whether or not you’ve understood some broader concepts. The first two chapters of your text introduce a number of fundamental concepts that you should review for the exam. Here are a couple possible question sketches.

1. Given the description of a research question, you are asked to either design a survey/experiment or to critique a proposed survey/experiment. You might also be given some data that was collected using a particular survey/experiment and asked to explain what kinds of conclusions could reasonably be drawn given the survey/experimental setup. Remember blocking and randomization? Those concepts could come in here.

2. Given some numerical summary, write down its formula and explain what it represents, what it could be used for and how it compares to other summaries. An easy example would be the mean and standard deviation. (Naturally, you will have notes with you so I expect everyone will be able to write down the definition of, say, the median; the real purpose of the question is to see that you understand what the summary is telling you.)

3. Interpret one or more graphical displays, explaining the important features evident in the underlying data set. Here we will be looking for important features and not a verbal description of the plot. You should have some experience interpreting plots from your lab work.

Computational questions

There will also be questions that are less conversational and more computational.
You will be asked to work with outcomes, events and probability; you should remember the multiplication and addition rules as well as the form of the addition rule when events are not mutually exclusive.

1. Given some experimental setup, you might be asked to list all the possible outcomes, and define an event in terms of a subset of these outcomes. You could be asked about its complement or its union/intersection (the “or” and “and”) with another event. I might then give you probabilities and you will be asked to compute the probabilities for different events, as well as their combination with “and” and “or.” Here we’re essentially testing definitions, as well as the addition rule for probabilities. (Which means you should be able to recognize mutually exclusive events.)

2. Given one or more graphical displays, you might be asked to read off numerical summaries about a data set. You might be asked to make specific comparisons between two data sets; say comparing the number of outliers on a pair of boxplots or the positions of the medians.

3. Two-by-two tables are almost certainly going to appear on the exam. One set of problems involve simple table manipulations; I give you some partial information and you construct the rest of the table entries. In class, we did this with three numbers. (How many numbers do you need to be able to compete a table?) Once you have the table filled in, you will undoubtedly be asked to form some conditional probabilities. In class we discussed the interpretation of \( \text{pr}(\text{pos}|\text{sick}) \) and \( \text{pr}(\text{neg}|\text{well}) \) and in lab we looked at the difference between \( \text{pr}(\text{spam}|\text{viagra}) \) and \( \text{pr}(\text{viagra}|\text{spam}) \). So in addition to the computation of conditional probabilities, you can be asked about their interpretation.

4. Tree diagrams were covered both in class and in the text and there could be a question in which you compute the probability of an event using a tree.

5. Finally, there might be a question that involves conditional probability, independence and Bayes’ rule that doesn’t specifically force you to use a two-by-two table. Your homework has been a bit “wordier” and doesn’t walk you through the specific construction of a table (although it might help to make one in some cases). The multiplication rule would appear here somewhere.