(1) (Sp 06) (a) Describe the difference between and observational study and an experimental study.
(b) What advantage does an experimental study have versus an observational study?

(2) (Fall 2006) Name three strategies for reducing effects of extraneous variables. You can just
name the strategies; you don’t need to explain them.

(3) (Fall 2006) The accuracy of identifying individuals with fingerprinting has been called into
question lately. We are setting up an experiment to check how accurate fingerprinting identification
is. We will give test fingerprints to technicians and ask them to test their identification methods on
these test cases. Explain briefly how the concept of “blind” measurements could be useful in
addressing this question.

(4) (Fall 2006) You are planning a factorial study investigating the effects of plane design (straight
wing, t-wing) and paper type (notebook, construction) on distances flown by paper airplanes. You
plan to build 3 planes of each type. How might blocking be used to minimize effects of run order?
How many blocks would you have in this experiment? How would randomization come into play
here?

(5) (Sp 2007) Supervised (or managed) variables are either controlled variables or experimental
variables.
(a) What is a controlled variable?
(b) Give an example of an experimental variable in your project.

(6) (Sp 2007) According to the text (p. 42) “The goal of randomization is to average between sets
of experimental conditions the effects of unsupervised extraneous variables. To put it differently,
sets of experimental conditions are treated fairly, giving them equal opportunity to shine.” Suppose
Terry and I are planning an experiment to compare how far drivers of two different materials, say
graphite and titanium, drive golf balls. We have a large number of golf balls available. Terry says
that since randomization takes care of any bias from extraneous variables, a completely randomized
design is just as good as a randomized block design for our experiment, so we should do the simpler
completely randomized experiment. What do you think? Explain your reasoning. (A short, clear
explanation is good.)

(7) (Sp 2007) (Also includes chapter 3 material.)
Duran, Leng and Patterson studied the drilling of holes using laser drilling. Blueprint specifications
on these holes called for the holes to be drilled at a 45° angle. The resulting measurements of the
angles of drilled holes were

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42.8  42.2  42.7  43.1  40.0  43.5
42.3  40.3  41.3  43.5  39.5  41.1  42.1
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(a) Using a calculator, find the sample mean sample standard deviation.
(b) Comment on the precision and accuracy of this drilling method.
(8) (Sp 2007) Suppose I want to investigate the effect of a hole in a racquetball on its bounce. To test this, I take 2 balls and poke a hole in one of the balls. I then videotape three bounces of each ball to record the heights of the 6 bounces.
(a) What is the major drawback of this experimental design?
(b) Starting with only 4 new balls, what would be a better way to perform the experiment?

(9) (Fall 2007) A parts warehouse has 900 parts in its inventory. The parts have part numbers 1, 2, …, 900. We plan to take a random sample of 5 parts in order to compare the inventory to what is actually in stock.
(a) How would you use the following random number table to choose these 5 parts? Show how you chose your five part numbers. Drawing circles around the chosen numbers will largely show what you did. List your final part numbers chosen.

73494 53422 75093 342291 50242 79821 82735 10983 38627 82671 01738 33209 23819 37811

(b) Explain how you would use Excel to choose the 5 part numbers out of 900 inventoried parts.

(10) (Fall 2007) A group of students plans to investigate the effects of temperature on power of AA batteries. They will test batteries at 4 temperatures. The group of students happens to have 5 unopened 4-packs of AA batteries. They have a total of 20 batteries and will test 5 batteries at each temperature.
(a) Explain how the batteries would be randomized to treatments if the experiment is run as a completely randomized design.
(b) What would be a potentially better way to conduct the experiment? What is the name for this type of design?