STAT 305 D Homework 2

Due January 31, 2012 at 12:40 PM in class

1. Vardeman and Jobe Chapter 1 Exercise 2 (page 23): If factor A has levels 1, 2, and 3, factor B has levels 1 and 2, and factor C has levels 1 and 2, list the combinations of A, B, and C that make up a full factorial arrangement.

2. Vardeman and Jobe Chapter 1 Exercise 10 (page 24): Give an example of a 2×3 full factorial data structure that might arise in a student study of the breaking strengths of wooden dowels. (Name the two factors involved, their levels, and write out all six different combinations. You must create the factors yourself. They are not given to you in this problem.) Then make up a data collection form for the study. Plan to record both the breaking strength and whether the break was clean or splintered for each dowel, supposing that three dowels of each type are to be tested.

3. Vardeman and Jobe Chapter 2 Exercise 3 (page 64):

   An experiment is to be performed to compare the effects of two different methods for loading gears in a carburizing furnace on the amount of distortion produced in a heat treating process. Thrust face runout will be measured for gears laid and for gears hung while treating.

   a. 20 gears are to be used in the study. Randomly divide up the gears into a group (of 10) to be laid and a group (of 10) to be hung, using Table B.1 (available at http://will-landau.com/stat305/tables/random-digits.pdf). Describe carefully how you do this. If you use the table, begin in the upper left corner.

   b. What are some purposes of the randomization used in part (a)?

4. Now, suppose you want to distinguish between the big gears (10 of them) and the small gears (10 of them). You want to design an improved study to test the effect of gear arrangement on gear distortion. This new study takes the different gear sizes into account. (After all, small gears may distort less than big gears, or vice versa.) You plan to lay 5 small gears, hang 5 small gears, lay 5 big gears, and hang 5 big gears.

   a. Name the design of the study. Also, construct a table with all sample units as rows and variables as columns to show all the combinations of levels of the variables.

   b. Carry out the appropriate randomization to assign the 20 gears to the appropriate treatment groups for the experiment.

5. Vardeman and Jobe Chapter 3 Section 1 problem 1 (page 77):

The following are percent yields from 40 runs of a chemical process, taken from J. S. Hunter's article "The Technology of Quality" (*RCA Engineer*, May/June 1985):

65.6, 65.6, 66.2, 66.8, 67.2, 67.5, 67.8, 67.8, 68.0, 68.0, 68.2, 68.3, 68.3, 68.4, 68.9, 69.0, 69.1, 69.2, 69.3, 69.5, 69.5, 69.5, 69.8, 69.9, 70.0, 70.2, 70.4, 70.6, 70.6, 70.7, 70.8, 70.9, 71.3, 71.7, 72.0, 72.6, 72.7, 72.8, 73.5, 74.2

Make a dot diagram, a stem-and-leaf plot, a frequency table, and a histogram of these data.

Roughly, what is the distributional shape of the data?

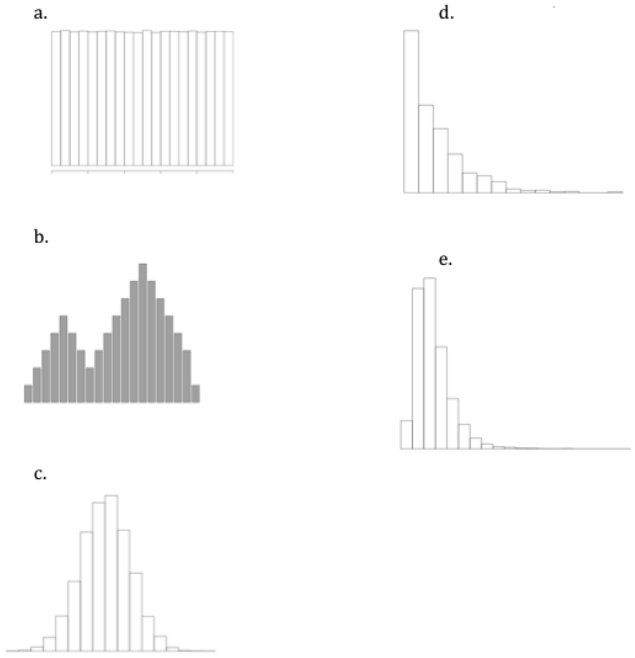
6. Vardeman and Jobe Chapter 3 Section 2, part (a) of problem 1 (page 92):

The following are data (from *Introduction to Contemporary Statistical Methods* by L. H. Koopmans) on the impact strength of sheets of insulating material cut in two different ways. (The values are in ft lb.)

Lengthwise Cuts	Crosswise Cuts
1.15	.89
.84	.69
.88	.46
.91	.85
.86	.73
.88	.67
.92	.78
.87	.77
.93	.80
.95	.79

Find the medians, quartiles, and the .37 quantiles of the two datasets.

7. Identify the following distributional shapes:



8. Weekly feedback. You get full credit as long as you write something.

    1. Is there any aspect of the subject matter that you currently struggle with? If so, what specifically do you find difficult or confusing? The more detailed you are, the better I can help you.
    2. Do you have any questions or concerns about the material, class logistics, or anything else? If so, fire away.