## Review of Completely Randomized Designs

Respond to the following questions individually then discuss your answers as a group. You should hand in your individual response. We will discuss your group responses and then I will lecture on other topics.

The cotton fiber data from your book lists the tensile strength for samples of thread for threads with either 15%, 20%, 25%, 30% or 35% cotton by weight.

Weight Percent of Cotton

| 15 | 20 | 25 | 30 | 35 |
|---|---|---|---|---|
| 7 | 12 | 14 | 19 | 7 |
| 7 | 17 | 18 | 25 | 10 |
| 15 | 12 | 18 | 22 | 11 |
| 11 | 18 | 19 | 19 | 15 |
| 9 | 18 | 19 | 23 | 11 |

Use the SAS source code and data set provided to generate output. Answer the following questions.

1. Based on the plot of strength vs. percent cotton, what would you say was the relationship between these two variables?
2. Does mean fiber strength depend on percent cotton? Write this as a statistical hypothesis test and record the F-test and p-value from your handout.
3. Two different multiple comparison tests (Tukey's studentized range and Bonferroni's method) were conducted–do the results from these tests agree? Which one would you prefer in this case? Summarize your findings from this test.
4. Based on the residual plot, does the variation in fiber strength seem to be equal regardless of percent cotton?

## Notes on using SAS

If you are not familiar with SAS, here are the steps needed to run the code provided on the home page. I will provide you with alternative methods for inputting data as well.

For the first version, you should go to the course home page and save both the SAS source code (save it as a text file and rename it cotton.sas) and data set (save it as a text file and name it fiber.txt) as text files on your Z drive. I will assume that you have created a subdirectory called stat706 on your Z drive and that is where the files are stored. You may want to check the files in Note Pad to make sure no html code is embedded in them (This was a problem in Internet Explorer, but not Netscape Communicator). Delete any such code, save the file and proceed. Some students find it convenient to open Notepad, and simply copy and paste the text from the webpage directly into a Notepad document, which they then save.

Double click on the source code file, and it should be loaded into the program editor window in SAS (changes can be made to the source code at this point, if needed). If this does not work, double click on the SAS icon, select Menu in the Program Editor window, then select File and open cotton.sas. Now click the Submit button under the Tools menu (or click F4, or click the running man symbol, or ...), and output will appear in the Output window. The output can then be printed or saved to your Z drive as a list file (by default). If the program fails to run, the Log window will contain error messages, though they are usually inscrutable to beginning users. Again, students often find it easier to open the Program Editor in SAS, then copy and paste the source code into the Program Editor window, then save it as a SAS file.

There is an alternate form of data entry to the INFILE command which loads the data into a temporary SAS data library (called the WORK library). This approach works best when your data file has been saved in Excel, but can be used with text files if the data has been carefully formatted. In this case, we will assume that the file fiber.txt has been saved in an Excel 97 Workbook–make sure to put the variable names Percent and Strength in the first row of the Excel worksheet.

Click on the SAS icon on the desktop, and then select Import Data from the File menu. The file type Excel 97 should be selected by default. In the Next window, browse to find the Excel worksheet (most likely saved as fiber.xls). In the Next window, you name the SAS library–we will use the default library WORK and name our file FIBER. Press Finish and SAS should display a message saying the file WORK.FIBER has been successfully created. You can select Libraries in the Explorer window, select Work, and then click on Fiber to see the file.

At this point, you can reload cotton.sas into the Program Editor. Replace the DATA and INFILE commands with the following:

```
DATA A;
SET WORK.FIBER;
```

then run the program. Note that we could replace SET WORK.FIBER with SET FIBER since WORK is the default directory; I use the above format to emphasize the use of a directory. Since data is frequently saved in Excel files, this approach is often more convenient than the first method (though it is inconvenient in this particular case since the source code for reading a text file was already available).