This homework is due Thursday, October 30th at the start of class. Late homework will not be accepted except for medical emergencies (with proof). Note that if a question says to explain your answer, you will get no credit without some explanation.

Reading: Chapters 5.1-5.3, 5.5.1, 6.3-6.4, Conceptual Exercises.

1. North American automobile manufacturers have become more concerned with quality because of foreign competition. One aspect of quality is the cost of repairing damage caused by accidents. A manufacturer is considering several new types of bumpers. In order to test how well they react to low-speed collisions, 40 bumpers of each of five different types were installed on midsize cars, which were then driven into a wall at 5 miles per hour. The cost of repairing the damage in each case was assessed. The relevant data are stored in tirebumper.JMP.

   (a) Use graphical analysis to assess whether the assumptions of the ideal model are reasonable.

   (b) What evidence is there that not all bumpers have the same reactions to low-speed collisions? Use the one-way analysis of variance F-test to address this question?

   (c) What evidence is there that bumper 1 differs from bumper 2 in its reaction to low-speed collisions? Assume that this was a planned comparison.

   (d) Find a 95% confidence interval for the difference between the mean cost of bumper 1 from a low-speed collision and the mean cost of bumper 2 from a low-speed collision. Again assume that this was a planned comparison.

   (e) Which bumpers are significantly different in their reaction to low-speed collisions? Assume that no comparisons were planned in advance and use the Tukey-Kramer procedure.

2. Problem 5.23, The Statistical Sleuth. First, use graphical analysis to check that the required assumptions for the ideal model are appropriate. Then answer the question of interest. The data is trex.JMP.

3. Problem 5.24, The Statistical Sleuth. Again, use graphical analysis to check that the required assumptions for the ideal model are appropriate. Although the assumptions are questionable here, go ahead and use the ideal model to answer the question of interest. The data is in zinc.JMP.

4. A researcher looking for evidence of extrasensory perception (ESP) tests 500 subjects. A hypothesis test is conducted for each subject where the null hypothesis is that the subject is randomly guessing and hence does not have ESP. Four subjects have a \( p \)-value of less than 0.01.

   (a) Is it proper to conclude that these four people have ESP? Explain your answer.

   (b) Using the Bonferroni procedure, what \( p \)-value would be needed to conclude that a subject had ESP if the researcher wanted the familywise error rate (for the 500 tests of subjects) to be 0.05?

   (c) Besides using multiple comparisons procedures, what would be the best way for the researcher to test if these four subjects have ESP?