STATISTICS 402 - Assignment 2  
Due February 1, 2010

2. Chapter 2: Review Exercises (pgs. 57-58) – 1, 2, 3, and 4.
3. For each of the following descriptions, answer the following questions using complete sentences.
   - What is the response?
   - What are the conditions of the study (i.e. treatments)?
   - What is the experimental material?
   - What are the outside variables that are controlled? Is there a control group?
   - Is experimental material randomly assigned to the treatments? Is experimental material randomly selected from a larger population?
   - Is there replication within the experiment? Is the experiment repeated?

Finally decide if the experiment can be improved and what you would do to improve the experiment.

a) A research psychologist wishes to investigate the difference in maze test times for mice trained using different types of reinforcement. Thirty mice are available for the experiment. All of the mice are the same age and the same breed. For each mouse a fair 6-sided die is rolled. If the roll is a 1 or 4 the mouse is assigned to group 1 (no reinforcement). If the roll is a 2 or 5 the mouse is assigned to group 2 (positive reinforcement – food given for a correct choice). If the roll is a 3 or 6 the mouse is assigned to group 3 (negative reinforcement – mild electric shock given for an incorrect choice). After rolling the die 30 times there are 7 mice in group 1, 12 mice in group 2 and 11 mice in group 3. The design of the maze used to train the mice is the same for all mice. The maze is disinfected after each training and testing session so that no scent of the previous mice is left on the maze. After training, each mouse runs the maze and the time to complete the maze is recorded.

b) A chemist wants to compare a new, and simpler, method for determining the concentration of a solution with a standard method. She prepares a large batch of solution. She randomly selects 40 test tubes full of the solution from the large batch and randomly assigns 20 of the test tubes to be analyzed using the new method while the other 20 will be analyzed using the standard method. All the analyses will be done by the same technician. The technician finishes analyzing the 20 specimens using the new method in the morning. He takes a break for lunch and does the remaining 20 specimens using the standard method in the afternoon.

c) An aluminum smelting operation makes its own carbon anodes for use in their aluminum smelting pots. The density of the anode is an important quality characteristic because it affects the usable life of the anode. An experiment is conducted to see the effect of bake temperature on anode density. Twenty anodes are made using the same raw materials, methods and people. Five anodes are assigned at random to each of four temperatures, 500, 525, 550 and 575 °C. A temperature is picked at random and the five anodes are baked in the oven at that temperature. One of the remaining temperatures is picked at random and the five anodes are baked in the oven at that temperature. This random selection of a temperature and baking 5 anodes continues until all temperatures have been used once. The density of each anode is then measured. The order in which the anodes have their density measured is completely random.