Stat 402 B – Exam 1 Take-home Problems
Due at the beginning of the exam on Friday, February 18, 2011

1. [30 pts] In 1993 researchers at the University of California at Irvine did an experiment with 36 college undergraduates. The undergraduates took a spatial-temporal (the ability to mentally manipulate objects in three-dimensional space) intelligence test, listened to 10 minutes of a Mozart sonata and again took a spatial-temporal intelligence test. The results showed that students’ spatial-temporal intelligence increased 8 to 9 points, on average after listening to Mozart. We wish to design an experiment to see if the music students listen to while studying for a statistics exam affects the scores they receive. Students participating in the experiment will be selected from the 1,000 undergraduate students enrolled in an introductory statistics class at a large Midwestern university that have given their consent to participate. Each student selected for the experiment will be given an Ipod with one of four general categories of music. The four categories are: Classical, Country Western, Rap/Hip Hop and Rock. The students will be given the Ipods one week prior to the statistics exam. They will be instructed to study on their own and must listen to the music on the Ipod given to them any time they are studying for the statistics exam. All the students in the experiment will be given the same statistics exam and they will all take it on the same day at the same time and will be given 50 minutes to complete the exam. The exams will be graded on a 100 point scale. All grading will be done by the same individual and that individual will not know what music a particular student listened to while studying for the exam.

a) [3] What are the response, conditions and experimental material for the experiment?
b) [2] Give two outside variables that are controlled in this experiment and explain how they are controlled.
c) [3] Explain how you would include a control group in the experiment. Be specific about what the students in the control group will do.
d) [3] Explain the advantages of having a control group for the experiment.
e) [4] Explain how you would randomly select 100 students from the 1,000 undergraduate students enrolled in an introductory statistics class at a large Midwestern university that have given their consent to participate. You should include enough detail so that I can follow your explanation and produce a random selection.
f) [6] Given the 100 randomly selected students:
   i. Explain how to use JMP to randomly assign the 100 students to a control group and four treatments so that each control/treatment group has the same number of students. I should be able to follow your explanation to use JMP to produce a random assignment.
   ii. Turn in your JMP data table that shows the random assignment. The JMP table must clearly show the assignment of 100 randomly selected students to control/treatment groups.
g) [2] How many participants would you need for the experiment if you have the four music groups and a control group and you wanted to be able to detect a 0.8 standard deviation difference in population means with Alpha = 0.05 and Beta = 0.10?
h) [3] You only have money to buy 80 Ipods. Give a combination of Alpha, Beta and the difference in population means that will use up but not exceed your budget.
i) [4] Suppose at the end of the experiment there are statistically significant differences among sample mean scores. Specifically, suppose the students studying while listening to Classical music had the highest sample mean score on the statistics exam and that the differences in sample mean scores when compared to all the other music categories and control were statistically significant. What generalization can you make?