Math 663-102, Spring 2012

Final Exam

Name:_____

Student ID:_____

May, 04   Must show all work to get full credit!

I pledge I have not violated the NJIT Honor Code_____

1. a. – c. The probability that patients are treated (T) given they have a particular disease (D) is 0.76. Thirty three percent (1/3) of all patients have the disease. The proportion of all patients not treated is 0.75.

   a. What is the probability of all patients not treated and have the disease.   (5 points)

   b. Are the events not treated and disease mutually exclusive?   (3 points)

   c. Are the events treated and disease independent? Why or why not?
                                                    (Page 138, #5)   (5 points)

2. Suppose that we are interested in whether there is a difference between the mean numbers of sick days taken by men and women in a local company. The numbers of sick days taken by men and women are shown below. Run the appropriate test at the 1% level of significance keeping in mind that the data sets are integer valued. Compute the p-value of the test. State your null and alternate hypotheses and draw conclusion.   Men: 5   10   2   0   6   4   5

   Women: 8   9   3   5   0   4   15   (15 points)

3. The following table was derived from a study of HIV patient, and the data reflect the numbers of subjects classified by their primary HIV risk factor and gender. Test if there is a relationship between HIV risk factor and gender using a 10% level of significance.

	HIV Risk Factor		
Gender	HIV drug user	Homosexual	other
Female	25	21	24
Male	20	34	13

(15 points)

4. a. – c. Heights of children are approximately normally distributed at each age and gender. If the mean height of 5-year-old girls is 42 inches, with a standard deviation of 2.4 inches, find the following:

   a. The probability that a 5-year-old girl is between 40 and 45 inches. (5 points)

   b. Suppose that the smallest 10% and the largest 10% of heights are considered "abnormal." What range of heights is "normal"?   (7 points)

   c. The probability that a sample mean height of a random sample of forty 5-year-olds girls exceeds 41.5 inches. (Page 146, # 32 & Page 168 # 3) (8 points)

5. a. – c. A randomized trial is conducted comparing two different prenatal care programs among women at high risk for preterm delivery. The programs differ in intensity of medical intervention. Women who meet the criteria for high risk of preterm delivery are asked to participate in the study and are randomly assigned to one of the prenatal care programs. At the time of delivery, they are classified as preterm or term delivery.

	Preterm Delivery	Term Delivery
Intensive Prenatal Care:	25	21
Standard Prenatal Care:	20	34

a. Estimate the relative risk of preterm delivery for women in the intensive prenatal care program as compared to the standard.   (3 points)

b. Construct a 99% confidence interval for the relative risk.   (8 points)

c. Based on your answer in 5 b. would you reject the null hypothesis that true relative risk equals one versus the alternate hypothesis that true relative risk not equal to one. Give reason for your answer and draw conclusion. What is the significance level of this test?   (Page 402, #8)   (7 points)

6. a. – d. An investigator is interested in comparing the cardiovascular fitness of elite runners on three different training courses, each of which covers ten miles. The courses differ in terms of terrain, Course 1 is flat, Course 2 has graded inclines, and Course 3 includes steep inclines. Each runner's heart rate is monitored at mile 5 of the run on each course. Ten runners are involved and their heart rates measured. The data results are summarized in the form of the following Analysis of Variance table. Fill in the blank portions of the table as needed and test if there is a significant difference in the mean heart rates of runners on the three courses? Run the appropriated test at a 5% level of significance. Draw conclusion.   (P. 438, Example 9.10)   (10 points)

Source of Variation	Sums of Squares (SS)	Degrees of Freedom	Mean Squares (MS)	F
Between Subjects	2,228.7			
Between Treatments	477			
Within				
Total	2,975.9			

7.   An investigation is performed to understand the relationship between age and satisfaction with medical care. Each individual in the investigation is asked to rate satisfaction with medical care on a scale of 0 to 100, with 100 denoting complete satisfaction. Other data, including socio-demographic characteristics(age, gender, race) are also recorded on each individual. A total of 200 individuals are involved in the investigation, and the following results were obtained: $r = 0.43$ ($p = 0.0001$),

$$\text{satisfaction} = 45.2 + 0.9(\text{age}).$$

a. Estimate the satisfaction rating of a 40-year old individual.   (3 points)

b. Interpret the estimated slope.   (3 points)

c. What percentage of the variability in satisfaction is explained by age? (3 points)