Statistics **NYU – Fall 1999**
Prof. Giorgio Topa **V31.0018 – 004**

MIDTERM EXAM

October 21st, 1999

Answer each of the questions in the exam books provided. There are 75 total points. Read the questions carefully and keep your answers brief and to the point. PLEASE WRITE NEATLY. Good luck!

Question 1. [10 points]

The age of patients in an adult care facility averages 71 years old, and has a standard deviation of 8 years. If the distribution is considered mound-shaped and symmetric, calculate the approximate 84^{th} percentile in the age distribution.

Question 2. [20 points]

Stefania (a newcomer to New York) has been set up by a friend for a blind date. She does not know anything about her date, except that he is Roman Catholic. She wants to try to figure out her date's ethnicity. For simplicity, suppose that in NYC there are only three ethnicities: Puertorican, Russian, and Italian. More specifically, NYC is 48 % Puertorican, 22 % Russian, and 30 % Italian. In addition, Stefania is a savvy world traveller and she knows that Catholics make up 40 % of all Puertoricans, 80 % of all Italians, and 12 % of all Russians (All names and numbers in this question are purely fictional).

(a) *(10 points)* Using Bayes Rule, calculate the probability that Stefania's date is Puertorican, given the information she has about the guy's religious affiliation.
(b) *(10 points)* Again using Bayes rule, calculate the probability that Stefania's date is not Italian, given that he is Roman Catholic.

Question 3. [10 points]

You want to buy new batteries for your discman. You go to Nobody Beats the Wiz, and you discover that a new brand "Forever" of batteries is being heavily advertised. The salesman tells you that the average playing time with these new batteries is 30 hours, with a standard deviation of 4 hours. Thoroughly impressed, you buy the FOREVER batteries and try them out. As it turns out, you get 18 hours of music playing time.

(a) *(5 points)* Calculate the z-score for your measurement of 18 hours.
(b) *(5 points)* Assuming that the distribution of playing time is symmetric and mound-shaped, how likely is the salesman's claim to be true?

Question 4. [10 points]

The mean number of patients admitted per day to the pediatric emergency room of Beth Israel hospital is 5.2. Suppose that, on a given day, there are only 8 beds available for patients.

(a) *(5 points)* What is the probability that the hospital will not have enough beds to accommodate its newly admitted patients?
(b) *(5 points)* What is the standard deviation of the number of patients admitted daily?

Question 5. [10 points]

Suppose that a local business has 200 laptop computers and that, unknown to the company, 30 of these are infected with the deadly OUCH virus. The CEO of the company is making a very important presentation at a major client, and has randomly selected three of the laptops to use during the presentation.

(a) *(5 points)* Calculate the probability that all three computers selected for the presentation are infected by the OUCH virus.
(b) *(5 points)* Calculate the probability that at least one of the computers is infected.

Question 6. [15 points]

Some investment analysts believe the January performance of the stock market is an indicator of how the market will perform during the coming year. Suppose an investment analyst provides the following forecasts:

- The probability that the stock market will be up for January is 0.70
- The probability that the stock market will be up for the year is 0.80
- The probability that the stock market will be up for January and up for the year is 0.63

(a) *(5 points)* Given that the stock market is up for January, use the above forecasts to determine the probability that the stock market will be up for the year.
(b) *(5 points)* Suppose the probability that the market will not be up for January but will be up for the year is 0.17. If the stock market is not up for January, what is the probability that it will be up for the year?
(c) *(5 points)* Do the probabilities in (a) and (b) suggest that the stock market's January performance and its annual performance are independent or dependent events? Explain.