AMERICAN UNIVERSITY OF BEIRUT

MATH/STAT 236, Final Exam

June 22, 2002

Time = 1 hour

(1) Two independent simple random samples of sizes 200 and 450 were chosen one after the other (without replacement) from a population of 2400 students in a non-residential college. Each student was asked the distance from college that he or she lived. The sample means and variances were

$\bar{x}_1 = 5.14$ $\bar{x}_2 = 4.90$

$s_1^2 = 3.87$ $s_2^2 = 4.02$

Calculate an approximate 99% confidence interval for the mean distance from the college that students live.

(2) In a private library the books are kept on 130 shelves of similar size. The number of books on 15 shelves picked at random were found to be:

28, 23, 25, 33, 31, 18, 22, 29, 30, 22, 26, 20, 21, 28, 25.

Estimate the total number, X_T, of books in the library and calculate an approximate 95% confidence interval for X_T.

(3) In studying lung function in a group of 560 workers in a coal mine an estimate was required of the mean value of some relevant measure X. A simple random sample of 10 workers was chosen and their X values, x_i, determined by an appropriate test. A note was made of their heights, y_i. The results were:

x	3.0	3.5	3.3	3.1	4.1	3.2	3.7	2.9	3.9	3.4
y	68	72	67	69	63	62	66	71	70	64

From routine medical records the average height for the group of 560 workers is known to be $\bar{Y}$=68.2. Estimate $\bar{X}$ from the data and calculate an approximate standard error.

(4) A survey is to be conducted to estimate the total number of books borrowed from 217 public libraries in a county authority during a particular week. It is possible to classify the libraries as small, medium, and large in size, on the basis of their stocks of books. The numbers of books borrowed from libraries in the three groups are thought to be roughly in the proportions 1:2:3. It is further anticipated that the within-group variances of number of books borrowed will be proportional to the square root of the corresponding means. There are 71 small, 126 medium, and 20 large libraries.

A total sample size of 40 is required. If sampling costs in each group are the same, how should sample sizes in a stratified random sample be allocated to the three groups?