AMERICAN UNIVERSITY OF BEIRUT
STATISTICS 210 FINAL EXAMINATION
August 14, 2004
Time=1 hour 30 minutes

Aids allowed: Calculator, one formula sheet, Standard Normal Table, and Student-t table.

Instructions: Please, PRINT your name and ID number on both the booklet and the question sheet. Use the question sheet to answer the multiple choice part. Use the booklet to show your work for partial credits. At the end, include your question sheet in your booklet before you hand in your exam. (GOOD LUCK!)

(1) The number of children under six year old in Sweden is shown in the following frequency table:

X	0	1	2	3
frequency	47779	9628	3939	681

Suppose a Swedish family is selected at random. What is the probability that it has either no children or 3 children?

(a) 0.01 (b) 0.07 (c) 0.23 (d) 0.78 (e) none of the above.

(2) Refer to question (1). The standard deviation of the number of children per Swedish family is

(a) 0.0961 (b) 0.3939 (c) 0.4900 (d) 0.6276 (e) none of the above

(3) An opinion poll asks a sample of 500 adults whether they giving parents of school-age children vouchers that can be exchanged for education at any public or private school at their choice. Each school would be paid by the government on the basis of how many vouchers it collects. Suppose that in fact 45% of the population favour this idea. What is the approximate probability of at least half of the sample are in favour?

(a) 0.0103 (b) 0.0139 (c) 0.1037 (d) 0.9861 (e) none of the above

(4) The annual rate of return on common stocks (as measured by Standard and Poor's 500-stock index) varies from year to year according to a normal distribution with mean 12% and standard deviation of 20%. A rate of return less than zero means the investor has lost money. What is the probability that the average rate of return over five years is less than zero?

(a) 0.9099 (b) 0.9641 (c) 0.9772 (d) 0.9901 (e) none of the above

(5) A scale used in analytical chemistry gives weights in repeated weighing of the same object that have a normal distribution with mean equal to the true weight of the object (that is the scale is unbiased). The standard deviation of repeated weighing is known to be σ = 0.10 g. If a student wants to estimate the true weight within 0.01 g. with 95% confidence . How many weighings should she average to achieve this?

(a) 350 (b) 385 (c) 400 (d) 450 (e) none of the above

(6) The yield of irrigated corn under standard conditions of culture in 1000-sq.m. plots on AREC experimental farm is normally distributed with mean μ = 120 kg and σ = 6 kg. How many 1000-sq.m. plots must a researcher plant if she wants the sample mean yield, $\bar{x}$, to have a standard deviation of 2 kg per 1000-sq.m. plot?

(a) 6 (b) 9 (c) 12 (d) 18 (e) none of the above

(7) A 95% confidence interval intended for the mean achievement score for a population of third grade students is (44.2,54.2). The sample mean is

(a) 44.2 (b) 58.0 (c) 49.2 (d) 54.2 (e) none of the above

(8) The developer of a new filter for filter-tipped cigarettes claims that it leaves less nicotine in the smoke than does the current filter. Because cigarette brands differ in a number of ways, he tests each filter on one cigarette of each of nine brands and records the difference between the nicotine contents for the current filter and the new filter. The sample mean difference is $\bar{x}$ = 1.32 mg and the sample standard deviation is s = 2.38 mg.
Let $\mu_d = \mu(\text{old}) - \mu(\text{new})$ denote the mean difference of nicotine contents between the two filters. Identify the hypothesis of interest here:

(a) H_0: $\mu_d = 0$ vs H_a: $\mu_d > 0$
(b) H_0: $\mu_d = 0$ vs H_a: $\mu_d < 0$
(c) H_0: $\mu_d = 0$ vs H_a: $\mu_d \neq 0$
(d) H_0: $\mu_d = 1.32$ vs H_a: $\mu_d \neq 1.32$
(e) none of the above

(9) Refer to previous question (9). What a 90% confidence interval for the mean difference between nicotine contents for the current filter and the new filter will be? (Assume the difference in the nicotine content follows a normal distribution)

(a) (-1.000,3.640) (b) (-0.137,2.777) (c) (0.000,2.640)
(d) (1.000,2.640) (e) none of the above

(10) In agriculture field trial a corn variety was planted in seven separate locations, which may have different mean yields due to difference in soil and climate. At the end of the experiment, seven independent 95% confidence intervals were calculated, one for each location.

What is the probability that every one of the seven intervals covers the true mean?

(a) 0.60 (b) 0.70 (c) 0.80 (d) 0.90 (e) none of the above

(11) You read in a journal a report of a study that found a statistically significant result at the 5% significance level. What can you say about the significance of this result at the 1% significance level?

(a) It is not certainly significant at the 1% level
(b) It may or may not be significant at the 1%level.
(c) It is certainly significant at the 1% level.
(d) We can't tell because we don't have type II error.