

AMERICAN UNIVERSITY OF BEIRUT
MATHEMATICS 207, FINAL EXAMINATION

February 2, 2001 *Fall 00-01*
Time = 1 hour 30 minutes

Aids Allowed: You are allowed to use one formula sheet, a calculator, Standard Normal table, and Student-t table.

INSTRUCTIONS: Please, PRINT your name and ID number on both the booklet and question/answer sheet. Use the question sheet to answer the multiple choice part while the booklet is to answer the written questions and rough work. Checking more than one answer for the multiple choice question will give you NO points for that particular question. However, this can be corrected by adding the sentence "My answer is —". At the end, include your question sheet in your booklet before you hand in your exam. (GOOD LUCK!)

Part I: Multiple Choice (Each question carries 5 points)

1. A researcher divided subjects into two groups according to gender and then randomly selected members from each group for her sample. What sampling technique was the researcher using?

(a) Cluster (b) systematic (c) stratified (d) simple random sampling
(e) none of the above
2. When data are categorized as, for example, place of residence (rural, suburban, urban), the most appropriate measure of central tendency is

(a) mean (b) median (c) mode (d) mid-range (e) none of the above
3. When a distribution is bell shaped, approximately, what percentage of data values will fall within one standard deviation of the mean?

(a) 68% (b) 90% (c) 95% (d) 99% (e) none of the above

4. According to the Bureau of Labor Statistics the mean telephone expenditure per customer unit was \$690 in 1994. We want to perform a hypothesis test to decide whether last year's mean expenditure has increased over the 1994 mean of \$690. The null and alternative hypotheses are:

$$H_0 : \mu = \$690 \text{ VS } H_a : \mu > \$690.$$

where μ is last year's mean telephone expenditure per consumer unit. Suppose the result of carrying out the hypothesis test lead to non-rejection of the null hypothesis. If in fact that last year's mean telephone expenditure per consumer unit was greater than 1994 mean of \$690, then the conclusion of not rejecting H_0 may be classified as

(a) type I error (b) type II error (c) correct decision (d) Can't tell from the above information

5. A scale used in analytical chemistry gives weights in repeated weighing of the same object that have normal distribution with mean equal to the true weight of the object. The standard deviation of repeated measurements is known to be $\sigma = 0.10$ g. If the 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) 1350 (e) none of the above

6. The scores of four roommates of the School Aptitude Test (SAT) have mean $\bar{x} = 589$ and standard deviation $s = 37$. Assume that those scores constitute a random sample from the pool of all scores of students who have taken the SAT exam. Further, assume that the scores follow a normal distribution with unknown mean μ . Then a 90% confidence interval for μ is

(a) (565.26, 612.74) (b) (552.00, 626.00) (c) (545.47, 632.53) (d) (552.74, 625.26) (e) Can't be determined from the above information.

7. Let A and B be events such that $P(A) = 1/3$, $P(A \text{ or } B) = 1/2$, and $P(A \& B) = 1/10$. Find $P(B)$.

(a) $4/15$ (b) $8/15$ (c) $11/15$ (d) $14/15$ (e) none of the above

Part II: Written questions (Please, show all work!)

1. Given the following data points:

x	0	2	2	6
y	4	2	0	1

- (a) Find the regression equation for the above data points. (10 pts)
(b) Interpret the meaning of the regression line as the "best linear fit" for the above data points. (5 pts)
(c) Obtain R^2 , the coefficient of determination. (5 pts)
2. A factory manager collected data on the number of equipment breakdowns per day. From those data, she derived the probability distribution shown in the table below, where W denotes the number of breakdowns in a given day

w	0	1	2
$P(W=w)$	0.80	0.15	0.05

- (a) Determine μ_W and σ_W . (6 pts)
(b) On the average, how many breakdowns occur per day? (4 pts)
(c) About how many breakdowns are expected during one-year period, assume 250 working days per year? (5 pts)