

Statistical Analysis I  
Examination

ORIGINAL

Please note the following

- The exams consists of 6 (equally weighted) problems for solution; for each problem you can get at most 10 points. You do not have to solve the individual problems completely, partial solutions are also possible. It is not enough, however, to give simply the result, but you should clearly display your approach and way to solution.
- For passing the exams you have to achieve a total of (at least) **25 points** from all problems.
- You are allowed to use: Pocket calculators, text books, mathematical and/or statistical tables, manuscripts and notes from the lectures and/or exercises.

Good luck !

**Problem 1** (10 pts)

Twelve merchands donated the following dollar amounts in a fund-raising campaign to beautify a nearby park:

Merchand	1	2	3	4	5	6	7	8	9	10	11	12
Amount	154	137	105	163	132	125	173	128	109	156	138	125

- Calculate the mean and the variance of the variable "Amount per merchand".
- The amount of one of the merchands was increased by \$10. Use the answer from part (a) to calculate the corrected mean and variance.
- Calculate the mean and the variance of the variable "Amount per merchand" if the amounts would be 10% higher for every merchand.

**Problem 2** (10 pts)

Two hundred members of a test panel were shown a preview of a film of a new musical to be released shortly. Each panel member was asked to indicate whether the amount of dancing in the film is too much, about right, or too little. The results, classified by opinion and sex of viewer, were as follows:

Opinion	Male	Female
Too much	18	22
About right	63	47
Too little	29	21

- Calculate all corresponding marginal frequencies. Which percentage of women indicated that the amount of dancing in the film is about right ?
- Compute Cramer's  $V$  from the contingency table and explain your result.

**Problem 3** (10 pts)

A study panel for a professional association suggested the following income guidelines for members in private practice ( $x$  is years of experience and  $y$  is target annual income in thousands of dollars).

$x_i$	5	10	15	20	25	30
$y_i$	39.5	49.0	58.5	68.0	77.5	87.0

- Compute the correlation coefficient between “years of experience” and “annual income”.
- Fit a regression line to the data points, taking “years of experience” as the regression, and “annual income” as the response variable. Calculate the coefficient of determination.
- Predict the annual income when the experience is 23 years.

**Problem 4** (10 pts)

A new word-processing unit is fully warranted during its first year. The number of warranty calls in the first year was counted for each of 130 units. The following data summarize the findings.

$k$	0	1	2	3	4
number of units with $k$ warranty calls	39	45	32	10	4

- Find the probability function of  $X$  - the random number of warranty calls.
- Find the respective probabilities of the two events  
 $A$ : “There are at least 3 calls”,       $B$ : “There are at most 2 calls”.
- Are  $A$  and  $B$  mutually exclusive? Are they exhaustive?

**Problem 5** (10 pts)

A politician believes that 25% of all macroeconomists in senior position would strongly support a proposal he wishes to advance. Suppose that this belief is correct and that five senior macroeconomists are approached at random.

- What is the probability that at least one would strongly support the proposal?
- What is the probability that a majority of the five would strongly support the proposal?
- What are the mean and the standard deviation of the total number of “supporters” (in that group)?

**Problem 6** (10 pts)

A pizza delivery service delivers to a campus dormitory. Delivery times follow a normal distribution with mean 20 minutes and standard deviation 4 minutes.

- What is the probability that a delivery will take between 15 and 25 minutes?
- The service does not charge for a pizza if delivery takes more than 30 minutes. What is the probability of getting a free pizza from a single order?
- During final exams week, a student plans to order pizza on five consecutive evenings. Assume that these delivery times are independent of each other. What is the probability that the student will get at least one free pizza?