Statistics I Final Exam, 20th May 2011.

Bachelor's Degrees in ADE, DER-ADE.

EXAM RULES: 1) Use separate booklets for each problem.
2) Perform the calculations with at least two significant decimal places.
3) You may not leave the exam during the first 30 minutes.
4) You are not allowed to leave the classroom without handing in the exam.

Problem 1 (3 pts)
Part A The following contingency table, based on 500 surveyed people, shows the data on the monthly telephone bill (in euros) and gender:

Bill	Men	Women
$[0, 6)$	59	76
$[6, 12)$	42	62
$[12, 30)$	54	51
$[30, 60)$	67	39
$[60, 120]$	28	22

a) Indicate the type of variables under consideration (qualitative nominal/ordinal, quantitative continuous/discrete). Find their absolute marginal distributions.

b) Is it true that the average monthly bill for men is higher than that for women? Justify.

c) Among the surveyed people with the telephone bill under 12 euros, what percentage were men?

Part B We take a sample of 1000 hotel prices from Europe. Taking into account the following output from `R Commander`:

```
 numSummary(hotel.prices,statistics=c("mean","sd","quantiles"))
mean      sd        0%       25%       50%      75%      100%     n
147.9907 92.81217 50.15713 77.41145 116.7258 189.3803 523.5089 1000
```

d) What can you say about the asymmetry of the distribution? Draw a boxplot.

e) What kind of measure of central tendency should be used with this data set? Justify. Give its value.

f) Which measure of variability appears in the `R Commander` output? Suggest an alternative measure and give its value.

Problem 2 (4 pts) In *Estadística I*, 4% of the students are awarded a final grade of "10". Of those who obtain a final grade of "10", 80% obtained a "10" on the midterm. On the other hand, of those who fail to obtain a final grade of "10", 5% earned a "10" on the midterm.

a) If we select one student at random, what is the probability that she/he obtained a "10" on the midterm?

b) What is the probability that a student with a "10" on the midterm will obtain a final grade of "10"?

c) Focus now exclusively on the students who obtained a final grade of "10". We randomly select 100 of them and are interested in the number of those students who failed to obtain a midterm grade of "10". Call this variable X. Determine the distribution of X (give its name and parameter(s)) and then calculate the expected value and the standard deviation of X.

d) Use part c) to approximate the probability that there will be more than 25 students who failed to obtain a midterm grade of "10" (out of those 100 with a final grade of "10"). From what theorem is this approximation derived?

Problem 3 (3 pts) We have a random sample of $n = 10$ stock returns from a given sector of the market:

returns (in %)	7.3	5.6	8.3	8.3	6.3	6.7	7.2	8.2	7.5	7.7

Assuming that the returns follow a normal distribution with the standard deviation of 1,

a) Calculate a 95% confidence interval for the population mean of the returns.

b) Determine the standard deviation of the sample mean of the returns. What would have happened with the confidence interval if the sample size had been $n = 100$. Justify.

c) Assuming that the population mean of the returns is 6.5, calculate the probability that the sample mean of the returns (for $n = 10$) is smaller than 6.