

INTRODUCTION TO STATISTICS
LADE, LEC
15th January 2009

Problem 1. (2.5 points) The following table shows the results of a survey among 200 people of different ages about the newspaper they usually read:

Age \ Newspaper	El Universal	Últimas Noticias
[15, 25)	4	6
[25, 40)	32	10
[40, 60)	48	60
[60, 80)	16	24

- a) (0.5 points) Obtain the joint relative frequency distribution of the variables “Newspaper” and “Age”.
- b) (0.75 points) Obtain the marginal relative frequency distribution for both variables.
- c) (0.75 points) Find the distribution of the variable “Age” for the readers of El Universal.
- d) (0.5 points) Calculate approximately the mean age of the readers of El Universal.

Problem 2. (2.5 points) A consumers association wants to compare eight brands of dishwashing liquid by studying the relationship between the price and the cleaning power of each product. The following test has been conducted: 10 ml of each product have been used to wash a series of dishes in standard conditions and the number of dishes washed with each product has been registered. These data, together with the price of 100 ml of each dishwashing liquid, appear in the following table.

X: Price (euros/100 ml)	Y: No. of dishes washed with 10 ml
1.30	26
1.27	25
1.35	22
1.24	32
1.40	33
1.36	29
1.18	15
1.38	33

So we get:

$$\sum_{i=1}^8 x_i = 10.48 \quad \sum_{i=1}^8 y_i = 215 \quad \sum_{i=1}^8 x_i \cdot y_i = 283.81$$

$$\sum_{i=1}^8 x_i^2 = 13.77 \quad \sum_{i=1}^8 y_i^2 = 6053$$

- a) (0.5 points) Represent the data on a scatter plot.

- b) (0.75 points) Calculate the correlation coefficient between the two variables. Interpret the result.
- c) (0.75 points) Calculate the regression line by the least squares method.
- d) (0.5 points) Based on the scatter plot obtained in a), which one of the eight products would you recommend? Give reasons to your answer.

Problem 3. (2.5 points) Let X be a random variable with density function $f(x) = k$ on the interval $[100, 200]$ and $f(x) = 0$ on the rest.

- a) (0.5 points) Obtain the value of constant k .
- b) (0.75 points) Obtain the distribution function of X .
- c) (0.75 points) Obtain the mean and the median of X .
- d) (0.5 points) Calculate the probability that X takes a value lower than 125.

Problem 4. (2.5 points) The grades obtained by E.S.O. students in an ability test follows a normal distribution with mean 95 and standard deviation 10. Taking this into account calculate:

- a) (0.5 points) The proportion of students with a grade greater than 114.6.
- b) (0.5 points) The proportion of students with a grade greater than 120.
- c) (0.5 points) The proportion of students with a grade between 85 and 120.
- d) (0.5 points) An interval of grades (centered in the mean) that includes 95% of the population of E.S.O. students.
- e) (0.5 points) The direction of an educational center wants to construct special classrooms to improve the learning process of students with a punctuation lower than 85. If each new classroom costs 1000 euros and has a capacity of 20 students, calculate the expected budget to construct the new classrooms. Consider that the number of students in that educational center is equal to 500.

IMPORTANT:

Duration of the exam: 2 hours and a half.

Complete each exercise in a different booklet.

Grades in Aula Global: 24/01/09.

Revision of the exam: 29/01/09 at 13:00hs.

You must hand in the 4 booklets.