

EXAM OF STATISTICS (DESCRIPTIVE STATISTICS AND REGRESSION)

2nd Physiotherapy

Version A

June, 18 2019

Name:

DNI:

Group:

Duration: 1 hour and 15 minutes.

- (5 pts.) 1. To see if the confinement due to COVID-19 has influenced the performance of a course, the number of failed subjects of each student in the current course and in the previous year course has been counted, obtaining the table below.

| Failed subjects | Previous year course | Current course |
|-----------------|----------------------|----------------|
| 0 | 7 | 8 |
| 1 | 15 | 12 |
| 2 | 11 | 8 |
| 3 | 5 | 7 |
| 4 | 4 | 3 |
| 5 | 2 | 2 |
| 6 | 1 | 2 |
| 8 | 0 | 1 |

Se pide:

- Draw the box plots of the failed subjects in the current and the previous year courses and compare them.
- Can we assume that both samples come from a normal population?
- In which sample the mean is more representative?
- Which number of failed subjects is greater, 7 in the current course or 6 in the previous year course?

Use the following sums for the computations:

Previous year course: $\sum x_i n_i = 84$, $\sum x_i^2 n_i = 254$, $\sum (x_i - \bar{x})^3 n_i = 122.99$ y $\sum (x_i - \bar{x})^4 n_i = 669.21$.Current course: $\sum y_i n_i = 91$, $\sum y_i^2 n_i = 341$, $\sum (y_i - \bar{y})^3 n_i = 301.16$ y $\sum (y_i - \bar{y})^4 n_i = 2012.88$.

- (5 pts.) 2. A study tries to develop a new technique for detecting a certain antibody. For this, a piezoelectric immunosensor is used, which allows to measure the change in the signal in Hz by varying the concentration of the antibody ($\mu\text{g/ml}$). The table below presents the data collected.

| Concentration ($\mu\text{g/ml}$) | 5 | 8 | 20 | 35 | 50 | 80 | 110 |
|------------------------------------|----|----|-----|-----|-----|-----|-----|
| Signal (Hz) | 50 | 70 | 100 | 150 | 170 | 190 | 200 |

Se pide:

- Compute the logarithmic model of the change in the signal on the concentration of the antibodies.
- It was observed that at a concentration of 100 $\mu\text{g/ml}$ the change in signal tends to stabilize. Predict the value of the signal corresponding to such concentration using the logarithmic model.
- Predict the antibody concentration that corresponds to a change in the signal of 120 using the exponential model.

Use the following sums for the computations (X =Concentration and Y =Signal):

$$\sum x_i = 308 \text{ Hz}, \sum \log(x_i) = 23.2345 \log(\text{Hz}), \sum y_j = 930 \text{ } \mu\text{g/ml}, \sum \log(y_j) = 33.4575 \log(\mu\text{g/ml}), \\ \sum x_i^2 = 22714 \text{ Hz}^2, \sum \log(x_i)^2 = 85.1299 \log(\text{Hz})^2, \sum y_j^2 = 144900 \text{ } \mu\text{g/ml}^2, \sum \log(y_j)^2 = 161.6475 \\ \log(\mu\text{g/ml})^2,$$

$$\sum x_i y_j = 53760 \text{ Hz} \cdot \mu\text{g/ml}, \sum x_i \log(y_j) = 1580.3905 \text{ Hz} \cdot \log(\mu\text{g/ml}), \sum \log(x_i) y_j = 3496.6333 \log(\text{Hz}) \mu\text{g/ml}, \\ \sum \log(x_i) \log(y_j) = 114.7297 \log(\text{Hz}) \log(\mu\text{g/ml}).$$