EXAM OF STATISTICS
(PROBABILITY AND RANDOM VARIABLES)

2nd Physiotherapy **Version A** **May, 27 2019**

Name: DNI: Group:

Duration: 1 hour and 15 minutes.

(4 pts.) 1. It has been observed that the concentration of a metabolite in urine can be used as a diagnostic test for a disease. The concentration (in mg/dl) in healthy individuals follows a normal distribution with mean 90 and standard deviation 8, while in sick individuals follows a normal distribution with mean 120 and standard deviation 10.

(a) If the cut-off point is set at 105 mg/dl (positive above and negative below), what is the sensitivity and the specificity of the test?

(b) If the cut-off point is set at 105 mg/dl and we assume a prevalence of 10%, what is the probability of a correct diagnostic?

(c) If we want a sensitivity of 95%, where must we set the cut-off point? What would the specificity of the test be ?

(3 pts.) 2. Let A and B be two events of a random experiment, such that A is three times as likely as B, $P(A \cup B) = 0.8$ and $P(A \cap B) = 0.2$.

(a) Compute $P(A)$ and $P(B)$.

(b) Compute $P(A - B)$ and $P(B - A)$.

(c) Compute $P(\bar{A} \cup \bar{B})$ and $P(\bar{A} \cap \bar{B})$.

(d) Compute $P(A|B)$ and $P(B|A)$.

(e) Are A and B independent?

(3 pts.) 3. The employees of a courier company send an average of 246.2 messages in a period of 12 hours. It is also known that the mean of messages sent by males is 256.2 and by females is 237.4 in the same period.

(a) Compute the probability that a random person of the company sends 5 messages in a period of half an hour.

(b) If we draw randomly 10 women of this company, what is the probability that at least 3 of them sends more than one message in a period of one hour?

(c) If we draw randomly 100 men of this company, what is the probability that none of them sends less than 2 messages in a period of a quarter of an hour?