EXERCISE 1

Suppose that a certain form of respiratory allergy usually affects 1 in 20 individuals, while food intolerances concern 3.5% of cases.

Assuming that the two events are independent:

1) what is the probability of having both problems?

2) what is the probability of having at least one?

3) what is the probability of having only one?

4) Having a food intolerance, what is the probability of having a respiratory allergy?

A = respiratory allergy

I = food intolerances

P(A)=0,05

P(I)=0,035

1) P (A ∩ I)= **0.05*0.035=0.00175**
2) **P(A ∪ I)=0.05+0.035-0.00175=0.08325**
3) **P[(A** $\cap \bar{I}) \cup (\bar{A} \cap I)]$ =0.05*0.965+0.95*0.035=0.0815
4) P(A|I)=P(A)=0.05

EXERCISE 2

From a study it is estimated that 80% of individuals are of normal weight, 15% overweight, and 5% obese. In these 3 groups, the probability of developing a certain type of cardiovascular disease is respectively 1%, 3% and 6%. Knowing that the population comprises a total of 10,000 individuals, calculate:

a) How many obese individuals should there be overall in this population;
b) What is the probability, randomly extracting an individual from the population, that he is a normal weight subject and falls ill with cardiovascular disease;
c) What is the probability that a randomly chosen individual in this population will develop one of these diseases - and, therefore, how many cases of the disease do we expect in the population.
d) What is the probability that an individual with cardiovascular disease is Normal Weight

C= cardiovascular disease

N= normal weight

S= overweight

O=obese

P(N)=0.8 P(C|N)=0.01

P(S)=0.15 P(C|S)=0.03

P(O)=0.05 P(C|O)=0.06

1. P(O)*10000=500
2. $P(N \cap C) = P(N) \cdot P(C|N) = 0.8 \cdot 0.01 = 0.008$
3. $P(C) = P[(N \cap C) \cup (S \cap C) \cup (O \cap C)] = 0.008 + 0.15 \cdot 0.03 + 0.05 \cdot 0.06 = 0.008 + 0.0045 + 0.003 = 0.0155$

   10000*0.0155 =155

4. P(N|C)= $\frac{P(N \cap C)}{P(C)} = \frac{0.008}{0.0155} = 0.5161$