1. A real estate agent charges a flat fee of $ 500 and a commission equal to 4% of the amount of the building's sale. Assuming this amount is evenly distributed between $ 200,000 and $ 600,000, determine the total expectation and total variance agent's fees.

2. Let X be a symmetric uniform-law variable with respect to 0 and variance 1.
Determine the appropriate value of $\alpha \; and \; \beta$

3. The powertrain of a new vehicle has a 1 year warranty. Its average lifespan is estimated to be 3 years. Her operating time before failure obeys an exponential law.

a) What percentage of vehicles will experience powertrain failure within their first 6 months of use?
b) The dealership makes a profit of $ 1,000 from the sale of a new vehicle. However, he must pay $ 250 for parts and labor if a failure occurs during the period warranty. If we assume that, for each vehicle sold, the dealership honors its guarantee only one times, what is its average profit per vehicle?

4. The processing time of a call in a certain public service follows an exponential law of parameter A. We know that 90% of calls are handled in less than 5 minutes.

a) What is the average call handling time?
b) What is the median time of a call, that is, the time t such that 50% of calls are handled in less than minutes?
c) Knowing that you have been chatting with an agent for 3 minutes, what is the probability that your call will last at least another 3 minutes?

5. A computer scientist uses software to generate random numbers X according to a uniform law on the interval [0; 1].

a) How to generate a random variable Y according to a Bernoulli law with parameter p = 1/3 using generator X?
b) If Bernoulli's law proposed in a) takes the value 1, what is the conditional distribution function of X, $F_{X|Y=1}(x)$?
c) How many independent numbers x1, x2,. . . , xn will need to generate the software, on average, for the computer scientist to observe a first number that is greater than 0.995?
d) What is the probability that, among 15 independent numbers, more than half of these are strictly greater than 0.7?