Probability and Statistics Set no. 5

random variables: binomial distribution (Bernoulli scheme); Poisson distribution

1. There are 3 buses on the same route. The probability of the breakdown of each of them during the working hours is 0.2.

- a) What is the probability that there is no breakdown during the day (all the 3 buses work)?
- b) Determine probability distribution together with the cumulative distribution function.
- c) Calculate expected value E(X) and variance $D^{2}(X)$.
- 2. The chance to inherit a certain feature equals to 0.7. What is the probability that at least 4 from 5 randomly chosen descendants have this feature ?

3. The probability of hitting the target in one shot is p = 1/10. Let X be the number of shots on target in a series of six independent shots. Please find the distribution of a random variable X6. Please calculate the probability that the number of shots on target will be no less than 4.

4. There are 30 phone lines. Phone calls come independently of each other, and incoming calls may take any of the available lines. The probability that a given line is free is 0.3. Please find:

(a) the probability that the number of busy lines is not more than 6;

(b) the most likely number of busy lines.

5. The probability that the randomly chosen product is broken equals to 0.01. What is the probability that among 200 products there are 2 or less which are broken?

6. 2% of orange boxes are spoiled during transport. We have chosen 5 boxes. Let X mark boxes with spoiled oranges of our choice. Please find the distribution of random variable X. Please compare binomial and Poisson's distribution.

7. At ABC company around 1 million bank transactions are done per year. Let's assume that the number of incorrect transactions equals to 0.1 %. During the control 2500 transactions are chosen randomly and their documentation is checked precisely. The task is to determine:

- a) the probability that the controlling procedure reveals no more than 2 incorrect transactions,
- b) the probability distribution of the number of incorrect transactions (make a table for up to 10 incorrect transactions),
- c) expected value E(X), variance $D^2(X)$.