LIST 2. NORMAL DISTRIBUTION. LIMIT THEOREMS.

Calculations must be do in [Statistics] - [Probability calculator] – [Distributions…]

Task 1. Random variable X has a standard normal distribution (X~N(0;1)). Calculate:
a) P(X<1,32); P(X>1,45); P(X>-2,15); P(-2,34<X<1,76);
b) P(X<1,58); P(X>2,35); P(X>-1,13); P(-1,41<X<2,78).

Task 2. Random variable X has a normal distribution (X~N(m;σ)). Calculate:
a) **X~N(10;2):** P(X<13); P(X>9); P(X>6); P(2<X<14);
b) **X~N(5;3):** P(X<6,5); P(X>2); P(X>8); P(-1<X<9,5).

Task 3. The durability of steel lines is a random variable X and has a normal distribution N(100MPa, 5MPa). Calculate:

a. the probability that random chosen line has the durability more then 90MPa (i.e. P(X>90));
b. the probability that random chosen line has the durability more then 85MPa and less then 95MPa (i.e. P(85<X<95));
c. how many lines among 1000 have the durability less then 100MPa.

Calculate the number k so as P(X<k)=0,4.

Task 4. The time in which the bulb is shining is a random variable X with normal distribution N(100h, 10h). Calculate:

a. the probability that the time the bulb shining will be more then 65h;
b. the probability that the time the bulb shining will be more then 70h and less then 120h;

Calculate the number k so as P(X<k)=0,1.

Task 5. The waiting time for the bus line A is a random variable with exponential distribution with expected value equal to 10 minutes and variance equal to 100 minutes. Let the waiting times in the next days will be independent random variables. What kind of distribution have the random variable denoting the time the quarterly lose this person to wait for the bus line A (we assume that the quarter has 90 days)? Calculate: **a.** probability that a person loses quarterly more than 910 minutes, **b.** k the number of minutes that a person loses a quarterly less than k minutes with probability 0.95.

Task 6. The defectivaness of footwears which were produced by firm X is equal to 10%. Shop sold 300 pair of shoes . Using the Poisson distribution calculate the probability that:
a. more then 8% customers will lodge a complaint;
b. less then 9% customers will lodge a complaint.
Next, using the Moivre-Laplace theorem, calculate the same probabilities. Compare the results.

Task 7. The Geiger-Miller meter and the source of a radiation are in a position in which the probability that a molecule can be register a molecule is equal to 0,001. During the observation the preparation radiated 2000 molecules. Using the Poisson distribution calculate the probability that the meter will register:
a. less then 4 molecules;
b. more then molecule 2 molecules.
Next, using the Moivre-Laplace theorem, calculate the same probabilities. Compare the results.