Lab Nr. 9, Probability and Statistics

Confidence Intervals
For the Mean and Variance of a Population

Write Matlab routines that find $100(1-\alpha)\%$ two-sided confidence intervals, for the following:
- the mean of a population, given a sample from a normal population or a large sample and known σ;
- the mean of a population, given a sample from a normal population;
- the variance and the standard deviation of a population.

Applications

1. In a study of the size of various computer systems, the random variable X, the number of files stored, is considered. Past experience indicates that $\sigma = 5$. These data are obtained:

7	7	4	5	9	9
4	12	8	1	8	7
3	13	2	1	17	7
12	5	6	2	1	13
14	10	2	4	9	11
3	5	12	6	10	7

Find a $100(1-\alpha)\%$ confidence interval for the average number of files stored.

2. The weights of chocolate bars of a certain brand are studied. A sample of 20 yields the following data:

$$X = \begin{pmatrix} 99.8 & 99.9 & 98.0 & 100.1 & 100.5 & 100.0 & 100.2 \\ 2 & 5 & 3 & 4 & 2 & 2 & 2 \end{pmatrix}$$

Assuming the weights of the chocolate bars are approximately normally distributed, find a $100(1-\alpha)\%$ confidence interval for the average weight of the chocolate bars.

3. When programming from a terminal, one random variable of concern is the response time (in seconds). For one particular installation, a random sample yields the following data:

1.48	1.26	1.52	1.56	1.48	1.46
1.30	1.28	1.43	1.43	1.55	1.57
1.51	1.53	1.68	1.37	1.47	1.61
1.49	1.43	1.64	1.51	1.60	1.65
1.60	1.64	1.51	1.51	1.53	1.74

Assuming the response times of the terminals are approximately normally distributed, find $100(1-\alpha)\%$ confidence intervals for the variance and for the standard deviation.