Exercises for Statistics II

Problem 1. (Simulation of Confidence Interval): In this question, we will do a simulation of confidence interval, in which we take random samples from a normally distributioned population with a size of n = 6. The mean of the population is μ= 355 (pretend that you don't know this parameter,) and the standard deviation σ is equal to 2, which is assumed to be known. We simulate r = 100, with a 95% confidence interval (z = 1.96), and we take note from the number of times that the considered interval contains the true value of the parameter of interests (355). If the interval indeed capture the value of μ, the variable success takes the value of 1, and otherwise, it takes the value of 0. Use the program to explain what effect will be on the confidence interval with the following changes (each change is treated separately):

(a) An increase in the sample size in n =20 and n = 50 (attention, when varing the value of n, you also need to modify the line with the nulldata command)
(b) A change in the level of confidence interval to 90% and 99% (to obtain the value of corresponding z, you can use the statistic tables in the Tool menu).
(c) An increase in the number of iterations to r=1000.
(d) Using the initial parameters, try to modify the program for the case of unknown variance. Compare the confidence interval of this case with that of the previous case. (Use Tools → Tables... to find the values of the student t distribution.)

Problem 2. (Hypothesis Testing): A taxi company is going to equip its vehicles with two different types of tires, A and B. A sample of 12 tires of type A had an average durability of $\overline{x_A} = 40000$ km with a standard deviation of $s_A = 5950$ km; a sample of equal size of the B type reached an average durability of $\overline{x_B} = 38000$ km with a standard deviation of $s_B = 5150$ km. Can you reject the hypothesis that both bypes of the tires have the same average durability at a significance level of 5%? (Assume that the durability of the tires is a normally distributed random variable and that the population variances σ_A^2 and σ_B^2 are identicle.)

Problem 3. (Variance Analysis): A company decides on an evaluation of 20 candidates from 4 universities: I, II, III, IV, with 5 from each. The following table summarizes the points got about each one of the candidates in a test made by the company:

Candidato #	1	2	3	4	5
Universidad I	3	4	3	2	3
Universidad II	3	6	6	7	3
Universidad III	15	7	8	8	7
Universidad IV	9	8	9	9	10

Use the variance analysis to determine, based on the above results, if the hypothesis that the graduates from different institutions are equally qualified can be rejected.