Examination Statistics
Prof. Dr. Falkenberg
Course of Study: Computer Sciences
22.6.2021
Part: Inferential Statistics
Editing Time: 30 Minutes

Problems	1	2	3	4	Sum
Max. scores	8	16	9	17	50

Further instructions:

1. Submit all you want to be assessed (derivations, answers, interpretations, commands, diagrams, etc.).
2. You are allowed to submit totally ONE (1) computer file in every part of the exam. The file with the last time stamp will be corrected, other files NOT!!!
3. The computer file should be a .pdf-document.
4. Please notice, not only the solution but the derivation of the solution has to be given.

Good Luck!
Dr. Falkenberg

1. A delivery of goods from an unknown manufacturer consists of 12 units of an article. It has been determined that 1 of the 12 units is defective. It is known that only three potential manufacturers come into consideration and that according to the experience their deliveries have a reject rate of p1 = 0.05, p2 = 0.1 and p3 = 0.12.
   Which of the three manufacturers is probably the sender of the delivery?

2. A large candy manufacturer produces, packages and sells packs of candy targeted to weigh 52 grams. A quality control manager working for the company was concerned that the variation in the actual weights of the targeted 52-gram packs was larger than acceptable. That is, he was concerned that some packs weighed significantly less than 52-grams and some weighed significantly more than 52 grams. In an attempt to estimate, the standard deviation of the weights of all of the 52-gram packs the manufacturer makes, he took a random sample of n = 10 packs off of the factory line.

   53, 51.2, 46.5, 50, 47.6, 49.7, 50.2, 56.4, 53.1, 51.6

   The weights are assumed to be normally distributed.

   (a) Use the random sample to derive a 95% confidence interval for the standard deviation σ.

   (b) Calculate an upper 90% confidence bound of sigma.

   (c) How many percent is the upper confidence bound greater than the estimated standard deviation?

   (d) The upper confidence limit should not exceed 1.5 times the estimated standard deviation. Determine the corresponding confidence level.

3. In a Heart study the blood pressure of n=3539 participants are measured and 99% confidence intervals of the expected values of the systolic and the diastolic blood pressure are calculated.

   (a) What is the meaning of confidence interval?

   (b) Let the 99% confidence interval for the systolic blood pressure be (126.7, 127.9).

   - What will happen if the confidence level will be reduced?
   - If the sample size will be doubled, what will happen?
   - You conduct a t-test at a 1 percent level regarding the hypothesis that the true mean μ is 128. Will the hypothesis be rejected or not?

4. Hein Blöd claims he can predict the suit of a face-down playing card. To check his statement he is shown the back of a randomly chosen playing card 32 times and asked each time to which of the four suits (clubs, spades, hearts, diamonds) the card belongs.

   (a) Clearly define the parameter of interest?

   (b) State H0 and H1 in terms of this parameter.

   (c) In the context of the problem, describe what a type 1 error means.

   (d) Assume that Hein Blöd has predicted 20 times the correct suit correctly. Conduct an appropriate test at 5% level. What is your decision?
   Hint: R function binom.test()

   (e) Calculate the p-value.

   (f) If Hein Blöd is able to predict the suit of face-down playing card with probability 0.3, what is the probability of a type II error?