

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

Problems	1	2	3	4	5	Sum
Max. scores	7	12	11	11	9	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. In a group of persons 30% are drinking tea, 60% are drinking coffee and 20% are drinking coffee and tea.
 - (a) You pick up one person randomly out of the group. What is the the probability that the person
 - drinks neither tea nor coffee?
 - drinks only coffee?
 - drinks only tea?
 - (b) You pick up one tea-drinker randomly. What is the probability that the person drinks coffee, too?
2. For a family meeting in Munich, one person travels alone from Hamburg, one person travels alone from Berlin, 3 people travel together from Frankfurt and 4 people travel together from Stuttgart. In Munich, 3 people are selected at random. The random variable X indicates the number of persons traveling together among the selected persons. Determine the density, the expected value and the variance of X .
3. Consider a blood test for disease D . Assume that in population the ratio
 - of persons with D is 0.05,
 - of positive test of persons with D is 0.97
 - of negative tests of healthy persons is 0.99
 - (a) Determine the probability
 - of a positive test result and
 - of D in case of a positive test result.
 - (b) 10 persons with a negative test result are selected at random. What is the probability that at least 1 person has D ?

4. You are traveling by train from town A to town C via town B. The scheduled arrival time in town B of the train T1 coming from town A is 3 pm and the scheduled departure time of the train T2 from town B to town C is 3:10 pm. Unfortunately both trains have delays. The delay D1 of train T1 is $N(7,4)$ -distributed and the delay D2 of train T2 is $N(3,1)$ -distributed. Both delays are assumed to be independent.
- (a) What is the probability that you have at least 5 minutes to reach train T2 in town B, if T2 will leave town B according to the timetable?
 - (b) What is the distribution of your changeover time in town B?
 - (c) Determine the probability that you will not get train T2 in town B.
 - (d) Determine your changeover time in town, which will be valid with a probability of at least 0.95.
5. The assembling of a machine consists of 2 steps S1 and S1. The duration D1 of S1 follows a uniform distribution over [5 min,8 min] and the duration D2 of step S2 follows a uniform distribution over [10 min,15 min]. The random variable D1 and D2 are assumed to be independent.
- (a) Determine the expected values and variance of D1 and D2.
 - (b) 100 machine are assembled. Determine an approximate distribution of of total assembling time D.
 - (c) The working time of a worker is 8 hours per day. Determine the probability that one worker assembles 100 machine in four days.