

11 Project – submit your solution to petr.kovar@vsb.cz

If you speak Czech, please submit the project to odevzdávárna a3ym7so.

Combinatorics

- 11.1. How many six-digit pin codes with digits 0–9 and precisely four or five different digits are there? (2 b)
- 11.2. A new system for ticketing speeding cars is tested on the highway. When passing five toll gates, these gates measure the speed of a passing car and the license plate is being scanned. If the car passes through the gate with a speed higher than the speed limit, the system will automatically log the incident and send the owner of the car a letter with a ticket for 800 CZK.
- If there is more such incidents within the measured part of the highway, each additional incident is charged by 500 CZK „only“. The system works with 90% success, i.e. the probability that a speeding car passing the toll gate will be recognized correctly is $p = \frac{9}{10}$.
- Suppose the measurement of each car on different gates are independent events. What is the expected value of a ticket the owner will pay if the car is speeding on the entire part of the highway with five toll gates?
- Hint:* First find the probability that the speeding car will be recognized correctly at all five toll gates, that it will be recognized correctly at four gates, and so on. (3 b)

Graph Theory

- 11.3. a) Let T be a tree. Is every its subgraph an induced subgraph? Explain.
- b) How many different subgraphs has path P_n , provided we distinguish the vertices by denoting them? Explain carefully. We denote the vertices of P_n by v_1, v_2, \dots, v_n . Now the trivial subgraph with single vertex v_1 we consider different from the trivial subgraph with single vertex v_2 .
- c) How does the number of subgraphs change if we distinguish only non-isomorphic subgraphs? Explain. (3 b)
- 11.4. In a code sequence of a tree we replace every zero by two zeros and every one by two ones. Will the resulting sequence be a code of some tree? If yes, explain how the structure of this graph depends on the structure of the original subgraph. In not, give an example of such sequence. (2 b)

Guidelines

Write the project using a computer, include the title with your name, student ID, number of the project, year and a grading table (see the sample project). The project will contain a detailed description of your solution for each problem. If you skip a problem, mark it clearly in the text by saying „*I did not solve the problem number X*“.

Submit your project to petr.kovar@vsb.cz as an uncompressed PDF file, use your student ID in the name of your submitted file.

You will be awarded 0 upto 2 or 0 upto 3 points for each of the problems.

Submit your project no later than on **Monday 7.12.2015 at 23:59**.