

10 Project – submit your solution to tereza.kovarova@vsb.cz

Combinatorics

- 10.1. There are 20 pieces of candy of five different flavors in a bag. The flavors are: cherry, lemon, orange, mango, and cola. We know in the bag there is at least one candy of each flavor, and there are twice as many lemon candy than there are cherry candy. In how many ways can the flavors be mixed in the bag? (3 b)
- 10.2. In a shooting competition participates a team of three shooters: Alex, Bernard, and Cohen. In each round the team takes a total of ten shots on ten targets: Alex shoots twice, Bernard three times, and Cohen five times. Alex hits a target with probability $\frac{2}{3}$. Bernards hits a target with probability $\frac{3}{4}$. Cohen hits a target with probability $\frac{4}{5}$. What is the expected value of the total of targets hit by the team? (2 b)

Graph Theory

- 10.3. How many edges at most can a bipartite graph G with 12 vertices have? Construct such a graph. Explain what is a bipartite graph. How many bipartite graphs with 12 vertices exist? Explain why G has the most number of edges. When counting different bipartite graphs distinguish the vertices by labels: u_1, u_2, \dots, u_m in one partite set and w_1, w_2, \dots, w_n in the other partite set; no need to discuss non-isomorphic cases. (2 b)
- 10.4. We have a graph G with the vertex set $[2, 9]$. Two vertices i, j are joined by an edge if and only if the numbers i and j are relatively prime. Describe the metrics of G (the matrix of distances). Explain in detail how you constructed the metrics. (3 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. Show your work by explaining the steps carefully. 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 tereza.kovarova@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 December 5th 2016 at 23:59**.