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

Combinatorics

2.1. John has nice combination number lock with 8 digits for his travel suitcase. Unfortunately, John does not remember the right combination of numbers to open his lock. How many number combinations at most he has to try to open his lock if on each digit position he has to set one of the digits from 0 up to 9? Moreover, he remembers that the correct code (the correct number combination) consists of two 9's, three or four 1's and certainly no two 1's stand next to each other. (2 b)

2.2. A private pilot wishes to insure his airplain for \$200,000. The insurance company estimates that a total loss may occur with probability 0.002, a 50% loss with probability 0.01, and a 25% loss with probability 0.1. Ignoring all other partial losses, what premium should the insuraance company charge each year to realize an average profit of \$500? (3 b)

Graph Theory

2.3. Find two different graphs G and G' so that G and also G' is a complement graph to a graph with the degree sequence $(7, 6, 6, 5, 5, 5, 5, 5, 5, 5)$. Further, G has to contain an open Eulerian trail and G' must not be Eulerian neither it has to contain an open Eulerian trail. Give arguments to justify (prove) that G and G' contains (contains not) an open Eulerian trail. (Find the definition of the complement of a graph on the web – for instance here: `https://en.wikipedia.org/wiki/Complement_graph`) (2 b)

2.4. To the graph of a path on six vertices P_6 add consecutively one edge (to create a graph G_1) and two edges (to create a graph G_2) so that the maximum distance between pairs of vertices in a new graph (G_1 and G_2) is the smallest possible. In graphs G_1 and G_2 determine the maximum distance from each vertex and give arguments to justify that the constructed graphs G_1 and G_2 are the graphs with the smallest maximum distance between vertices. (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 uncompresed 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 11th 2017 at 23:59**.