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

If you speak Czech, please submit the project to odevzdávárna `du0278p`.

Combinatorics

9.1. Children at basic school train addition by counting so called „triangles“. The teacher writes a sequence of integers and then the pupils line by line add two consecutive integers and the sum write one line below. The resulting shape of the computation is a triangle. For example below the assignment

$$5 \quad 8 \quad 3 \quad 4 \quad 1 \quad 6$$

we write

$$13 \; 11 \; 7 \; 5 \quad 7$$

then

$$24 \; 18 \; 12 \; 12$$

next line is

$$42 \; 30 \; 24$$

next line is

$$72 \; 54$$

and finally

$$126.$$

Show how to obtain the resulting sum based just on the given list and not performing all the summation described above. Prove your formula. (5 p)

Graph Theory

9.2. We have a squared rectangular mesh of $m \times n$ squares. In this mesh we travel from the bottom-left corner to the top-right corner, but always we have to follow the drawn lines and we may go only up or right. Inside the mesh we pick one node (crossing of lines), but never the bottom*-left nor the top-right corner. We color the node red, without loss of generality it is the node $[i, j]$, where $i \in [0, m]$ and $j \in [0, n]$. It holds $[i, j]] \neq [0, 0], [m, n]$. Evaluate, how many different paths from the start node to the goal node exist, that follow the restrictions above and at the same time no not pass the red node. (5 p)

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 10th 2018 at 23:59**.