

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

### Combinatorics

- 5.1. How many eight-digit codes are there, which have digits between 0 and 9 and contain precisely six different digits? Solutions obtained by brute force search on the computer will not be considered proper solutions. (2 b)
- 5.2. On the fence there are ten different letters hanging in a row. Every day on his way to school Jimmy always moves the first letter to the very end (sauntering, he moves all the digits by one position to the left and the first letter he moves to the very last place in the row). On his way from school is Jimmy in a hurry (wants to go to the playground) so he only swaps always the third and sixth letter. Will the ten-letter-words repeat eventually? How many different words will Jimmy obtain? Explain! Solutions obtained by brute force search on the computer or by hand will not be considered proper solutions. (3 b)

### Graph Theory

- 5.3. How to obtain from a given code of a rooted tree the number of its leaves without constructing the tree? Explain carefully! (2 b)
- 5.4. We are given a complete bipartite graph  $K_{m,n}$ . What is the expected value of the distance of two randomly chosen distinct vertices in this graph? (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. 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 8.12.2014 at 23:59**.