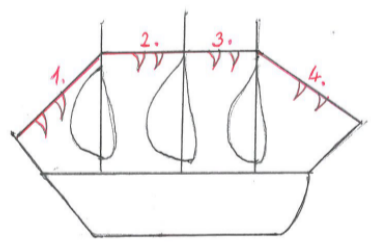
4 Project – submit your solution to `tereza.kovarova@vsb.cz`

Combinatorics

4.1. An international team of voyagers from 11 countries is sailing on a big sailboat. This sailboat has three masts. On ropes between the masts, fore, and stern (4 ropes together) the national flags of participating countries should be displayed. Compute how many ways are there to hang the flags if

(a) we distinguish the order of flags on ropes in the direction from the boat fore to the stern. (We admit for instance also the option that, all the flags are hanged on the first rope between the fore and the first mast. Other ropes would be empty then.)

(b) we distinguish the order of flags on ropes in the direction from the boat fore to the stern. At the same time we require that on any rope at least two flags are hanged.



(3 b)

4.2. Sherlock Holmes and doctor Watson have eight magnets with letters ordered in a row on their fridge. Each magnet has one different letter. Every morning Sherlock swaps magnets - first with seventh, second with eighth, and fourth with fifth. Every evening doctor Watson reorders magnets so that the last three letters become the first three letters of the row. Thus the letters 6,7, and 8 become letters 1, 2, and 3. Sherlock Holmes noticed, that Mrs Brown comes to clean up always as the same word appears on the fridge. How often comes Mrs Brown? (*Use permutations to solve this problem.)*

(2 b)

Graph Theory

4.3. If possible, set the value of x so that the given degree sequence is a non increasing graph sequence. Find two nonisomorphic graphs with the given degree sequence. Justify properly that the graphs are not isomorphic.

a) $(5, 4, 4, x, 2, 2, 2, 2, 2)$

b) $(6, 5, 4, x, 2, 2)$

(3 b)

4.4. Suppose a classroom has 25 students seated at desks in a square 5×5 array. The teacher wants to alter the seating by having every student move to an adjacent seat (one seat forward, one seat backward, to the left, or to the right). Is such a move possible? Explain properly. *(When solving this problem, you can use properties of Hamiltonian cycles.)*

(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. 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 5th 2016 at 23:59**.