

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

#### Combinatorics

- 3.1. Mother was carrying a basket with 11 red, 8 blue, 5 green and 5 yellow decorated eastern eggs (eggs of the same color are identical). When entering the room of her autistic son Thomas, she tripped over doorstep and crushed six eggs. Thomas paused in thought for a moment and then he said to his mom the number expressing all the options of which various colors six eggs could be crushed. Determine the number given by Thomas. (2 b)
- 3.2. Suppose we have deck of 8 different playing cards, which we shuffle in the following manner. First, we split the deck to halves. Then, we place the cards of the second half between cards of the first half, so that: the first card of the second half follows the first card of the first half, the second card of the second half follows the second card of the first half, etc. We repeat this shuffling over and over again. How many different orderings of the given 8 cards do we obtain by the specified shuffling? Compare the result to the number of all possible orderings of the given 8 cards. (3 b)

#### Graph Theory

- 3.3. Can an Eulerian graph be of edge connectivity 1? And can an Eulerian graph have vertex connectivity 1? Justify your answer in detail. (3 b)
- 3.4. Suppose  $G$  is a graph with the degree sequence  $(5, 4, 4, 2, 2, 1, 1, 1)$ . We know that the vertex of degree 5 is adjacent to the vertices of degrees 4 and 1. Find and draw such a graph and describe your procedure in brief. Next, find and draw a graph with the given degree sequence, such that the vertex of degree 5 is adjacent only to vertices of degrees 4 and 2. (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](mailto: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 9th 2019 at 23:59**.