

4 Software

For the following problems, formulate an integer linear programming model and find the optimal solution. You may use a modeling language/solver of your choice. In addition to the obtained optimal solution and optimal value, turn in your well-commented source code of the model.

Online access to various solvers: <http://neos-server.org/neos/solvers/index.html>

Exercise 1. Find the chromatic number (i.e. the smallest number of colors needed to color the vertices so that no two adjacent vertices share the same color) and the corresponding coloring of the graph $G = (V, E)$ with $V = \{1, \dots, 8\}$ and

$$E = \{(1, 3), (1, 4), (1, 5), (1, 8), (2, 3), (2, 6), (2, 8), (3, 5), (3, 8), (4, 6), (5, 7), (5, 8), (6, 8), (7, 8)\}.$$

[2.5 b]

Exercise 2. A construction company buys steel rods of length 4 m. The next construction project requires 640 pieces of 70 cm long rods, 500 pieces of length 130 cm and 200 pieces of length 260 cm. Find the minimum number of 4 m rods needed for the project and decide how to cut them.

[2.5 b]

Exercise 3. Solve the symmetric TSP with 5 cities and distance matrix

$$(c_e) = \begin{pmatrix} - & 10 & 2 & 4 & 6 \\ - & - & 9 & 3 & 1 \\ - & - & - & 5 & 6 \\ - & - & - & - & 2 \end{pmatrix}.$$

[2.5 b]

Exercise 4. Solve the following Sudoku problem:

4		5						
			7		2	6		
3	6				1		9	
								5
	1					7		
						5		
			9	8		1	2	7
		9	5	4			3	

[2.5 b]