

## MATH1058: Problem Sheet 5

**Problem 1** (Nurse roster). *After an intense data mining activity, a surgery has determined the minimum amount of nurses it needs in each day of the week: 10 each Monday, 4 each Tuesday, 8 each Wednesday, 5 each Thursday, 11 each Friday, 5 each Saturday, and 4 each Sunday. Propose a linear or integer linear programming formulation for the problem of finding a roster involving the minimum amount of nurses possible, keeping into account that each nurse works for 5 consecutive days, followed by 2 days off.*

**Problem 2** (Basic solutions, both feasible and infeasible). *Consider the following linear programming problem:*

$$\begin{array}{llll} \max & x_1 & +2x_2 & \\ \text{s.t.} & -x_1 & -2x_2 & \geq -2 \\ & x_1 & & \leq 1 \\ & x_1 & -x_2 & \geq 0 \\ & x_1, & x_2 & \geq 0 \end{array}$$

*Bring it to standard form and construct all its basic solutions, reporting for each of them the corresponding basis  $B$  (and its complement  $N$ ), which variables are basic and which are nonbasic, and the corresponding basic matrix  $A_B$ . Also indicate, for each such basic solution, whether it is feasible or not, and what vertex it corresponds to.*