d Able – part 1

Input parameters. Let the (symbolic) input parameters be defined as in the problem statement.

Decision variables. Let $x_j = \text{the amount of food } j \text{ in the diet, for } j \in F$.

Objective function and constraints.

\[
\begin{align*}
\text{min} \quad & \sum_{j \in F} c_j x_j \\
\text{s.t.} \quad & \sum_{j \in F} a_{ij} x_j \geq n_i^{\text{min}} \quad \text{for } i \in N \\
& \sum_{j \in F} a_{ij} x_j \leq n_i^{\text{max}} \quad \text{for } i \in N \\
& x_j \geq f_j^{\text{min}} \quad \text{for } j \in F \\
& x_j \leq f_j^{\text{max}} \quad \text{for } j \in F
\end{align*}
\]

The objective (1) is to minimize the total cost of the food in the diet. Constraints (2) and (3) ensure that the food chosen in the diet meets the recommended lower and upper daily limits on all the nutrients. Constraints (4) and (5) ensure that the amounts of food in the diet meet the recommended lower and upper daily limits.

Note that constraints (2) and (3) are repeated for every nutrient, and that constraints (4) and (5) are repeated for every food.