Sets

P products {0, …, 6}

M machines

T months {0, …, 5}

Data

Profit_p profit per unit of product $p \in P$

n_m number of available machines of type $m \in M$

Usage_{pm} required per unit production time for machine $m \in M$ for product $p \in P$

Market_{pt} market limitations on product $p \in P$ in month $t \in T$

Maint_{tm} machines of type $m \in M$ unavailable in month $t \in T$

StoreCost cost per unit per month

MaxStore max storage per product per month

EndStore final amount of each product in storage

InitialStore initial amount of each product in storage

MonthHours Hours per month available on each machine

Variables

x_{pt} units of product $p \in P$ to make in month $t \in T$

s_{pt} units of product $p \in P$ to store at end of month $t \in T$

y_{pt} units of product $p \in P$ to sell in month $t \in T$

Objective

Maximise Profit = $\sum_{t \in T} \sum_{p \in P} \text{Profit}_p \times y_{pt} - \sum_{t \in T} \sum_{p \in P} \text{StoreCost} \times s_{pt}$

Constraints

Market limitations:

$$y_{pt} \leq \text{Market}_{pt} \; \forall p \in P, \forall t \in T$$

Sum of the time spent making products on each machine is less than MonthHours:

$$\sum_{p \in P} \text{Usage}_{pm} \times x_{pt} \; \leq \text{MonthHours} \times (\text{n}_m - \; \text{Maint}_{tm}) \; \forall m \in M, \forall t \in T$$

Inventory constraints:

$$\begin{aligned}
s_{pt} &\leq \; \text{MaxStore} && \forall p \in P, \forall t \in T \\
s_{p5} &= \; \text{EndStore} && \forall p \in P \\
s_{pt} &= x_{pt} - y_{pt} + s_{p(t-1)} && \forall p \in P, \forall t \in T, t > 0 \\
s_{p0} &= x_{p0} - y_{p0} + \text{InitialStore} && \forall p \in P
\end{aligned}$$

x_{pt}, s_{pt}, y_{pt} non-negative integers