Mathematical Model for Production Optimization

Parameters

- $NumProducts$: Number of different products

- $NumMachines$: Number of different machines

- $ProduceTime_{k,m}$: Time to produce one unit of product k on machine m, for $k = 1, \ldots, NumProducts$ and $m = 1, \ldots, NumMachines$

- $AvailableTime_m$: Total available time on machine m, for $m = 1, \ldots, NumMachines$

- $Profit_k$: Profit from producing one unit of product k, for $k = 1, \ldots, NumProducts$

Decision Variables

- x_k: Quantity of product k to be produced, for $k = 1, \ldots, NumProducts$

Objective Function

Maximize the total profit:

$$\text{Maximize} \quad Z = \sum_{k=1}^{NumProducts} Profit_k \cdot x_k$$

Constraints

1. Non-negativity constraints for each product:

$$x_k \geq 0 \quad \text{for } k = 1, \ldots, NumProducts$$

2. Production time constraints for each machine:

$$\sum_{k=1}^{NumProducts} ProduceTime_{k,m} \cdot x_k \leq AvailableTime_m \quad \text{for } m = 1, \ldots, NumMachines$$