# Optimization

Kunlei Lian

August 24, 2023

Let $\mathcal{S} = \{1, 2, \cdots, 10\}$ denote the set of stores under consideration. Let $\mathcal{T} = \{A, B, C\}$ indicate all the available types of pizzas to display. The price and cost of a certain pizza type is dependent on the store location and type, and are represented by $p_{st}$ and $c_{st}$. The demand of pizza is related to its display quantity *quantity*:

$$d_{st} = \alpha \cdot quantity^{\beta}, \tag{1}$$

where both $\alpha$ and $\beta$ are given parameters.

To model this problem, we define the following decision variables:

- $x_{st}$: a non-negative integer variable that represents the number of pizzas to display for store $s$ and type $t$.

The problem could be formulated as,

$$\text{max.} \quad \sum_{s\in\mathcal{S}}\sum_{t\in\mathcal{T}} p_{st}\alpha_{st}x_{st}^{\beta_{st}} \tag{2}$$

$$\text{s.t.} \quad \sum_{t\in\mathcal{T}} x_{st} \leq 20, \ \forall s \in \mathcal{S} \tag{3}$$

$$\sum_{s\in\mathcal{S}}\sum_{t\in\mathcal{T}} c_{st}x_{st} \leq 100000 \tag{4}$$

$$x_{st} \in N_0 = \{0, 1, 2, \cdots\}, \ \forall s \in \mathcal{S}, t \in \mathcal{T} \tag{5}$$