Material for

Operation Research Laboratory

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Multiplant production

A company consists of two factories A and B. Each factory makes two products: standard and deluxe. Each unit of product yields the following profit

	standard	deluxe
unit profit	10	15

Each factory use two processes, grinding and polishing for producing its product. The grinding and polishing times in hours for a unit of each type of product in each factory are

	factory A		factory B	
	standard	deluxe	standard	deluxe
grinding	4	2	5	3
polishing	2	5	5	6

Factory A has a grinding capacities of 80 hours per week and polishing capacity of 60 hours per week. Factory B has a grinding capacities of 60 hours per week and polishing capacity of 75 hours per week

Each product (standard or deluxe) requires 4 kg of a raw material. The company has 120 kg of raw material per week Determine the optimum production level (ie profit-maximizing)

The mathematical model

– *Parameters.* $n = 2$ (number of products), $m = 2$ number of factories, r_i for $i = 1 \ldots, n$; raw material availability R.
– *Decision variables.* x_{ij} $i = 1, \ldots, n$ units of products of type i produced in factory j

– *Objective function.* We want to maximize

$$\sum_{i=1}^{n} r_i \sum_{j=1}^{m} x_{ij}$$

– *Constraints.* time availability

The full model is

$$\begin{aligned} \max \quad & \sum_{i=1}^{n} r_i x_i + (b - \sum_{i=1}^{n} c_i x_i) \\ & \sum_{i=1}^{n} c_i x_i \leq b \\ & x_{ij} \in \{0,1\} \quad i = 1, \ldots, n \end{aligned}$$

It ia an integer linear programming problem.