Solution to HW2

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October 24, 2019

1 Solution

I will write in the more compact form. You can write it more explicitly if you want. Days will be numbered from 1 to 7 starting from Monday (1) through Sunday (7). Let r_i denote the minimum number of employee required at day i, $i = 1, \ldots, 7$. These are the required number of employees for each day:

r_1	r_2	r_3	r_4	r_5	r_6	r_7
8	6	7	6	9	11	9

Remember that each employee will take any two days off and these days are not necessarily consecutive. How can we minimize the total number of employees we are going to hire ?

Decision Variables:

x_{ij}: Number of workers taking day i and day j off, $1 \leq i < j \leq 7$. (How many decision variables are we going to have, if we define them this way? Think about the combination of 7 taken 2 at a time.)

Model:

$$\min \quad \sum_{i=1}^{6} \sum_{j=i+1}^{7} x_{ij}$$

$$\text{s.t.} \quad \sum_{i=1}^{6} \sum_{j=i+1}^{7} x_{ij} - \sum_{j=1}^{k-1} x_{jk} - \sum_{j=k+1}^{7} x_{kj} \geq r_k, \quad k = 1, \ldots, 7.$$

If you wrote each constraint one by one, how would you write them? Think about it and try to understand our constraint which is in more compact form in this formulation.