

Nurse scheduling

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1 Problem statement

Companies that operate 24 hours a day, seven days a week, such as factories or hospitals, need to solve a common problem: how to schedule workers in multiple daily shifts so that each shift is staffed by enough workers to maintain operations. In this next example, a hospital supervisor needs to create a weekly schedule for four nurses, subject to the following conditions:

- Each day is divided into three 8-hour shifts.
- On each day, all nurses are assigned to different shifts and one nurse has the day off.
- Each nurse works five or six days a week.
- No shift is staffed by more than two different nurses in a week.
- If a nurse works shifts 2 or 3 on a given day, he must also work the same shift either the previous day or the following day.

2 Tasks

1. Formulate and solve the nurse scheduling problem stated above.
2. So far, this has been a feasibility problem (there was no objective function). However, now we have the personnel data in Table ???. What is the best schedule while incorporating the information in the table?
3. Finally, consider a second set of nurses in Table ??. We now have to have two nurses per shift and at most 4 different nurses in a week, but there are some nurses that don't

like to work with other nurses (see Table ?? in the appropriate column). Find the best schedule.

Table 1: The initial data for the schedule.

Name	Regular rate per shift [DKK/hr]	Max number of shifts per week at regular rate	Overtime rate per shift [DKK/hr]
Anne	4000	4	8000
Martin	3800	6	7000
Julie	5500	5	10000
David	6000	5	7000

Table 2: Additional data for the schedule.

Name	Regular rate per shift [DKK/hr]	Max number of shifts per week at regular rate	Overtime rate per shift [DKK/hr]	Incompatibilities
Jenny	5000	3	-	Anne, Julie
Patrik	6500	6	9000	Mie, David
Mie	4500	7	8000	Patrik
Rasmus	6000	6	9000	Jenny, Anne