

A wedding planner must perform a seating plan for a wedding guests so that guests are saved from the mad panic of trying to find a seat on a table with their friends/family, and people are placed where they'll be happiest!

Explicitly, the wedding planner should provide a table layout for the guests by assigning n guests to m table, as k guests per table (i.e. each table has k seats) (assume $m * k = n$, there as many seats as many guests). The wedding planner knows in advance the seating preferences of all guests. Assume the guests seating preferences is summarized in a n -by- n matrix $P(n, n)$ such that P_{ij} is the preference of guest i to be seated at the same table as guest j

$$P_{ij} = \begin{cases} A: & \text{guest } i \text{ absolutely wants to be steated at the same table with guest } j \\ I: & \text{guest } i \text{ is indferent to be steated with guest } j \text{ at the same table} \\ X: & \text{guest } i \text{ absolutely wants to NOT be steated at the same table from guest } j \end{cases}$$

| | Guest 1 | Guest 2 | Guest 3 | . . . | Guest i | . . . | Guest n | |
|---------|---------|---------|---------|-------|---------|-------|---------|---------------------------|
| Guest 1 | | X | I | | I | | A | Guest 1 Preference Vector |
| Guest 2 | A | | A | | X | | I | |
| Guest 3 | X | A | | | A | | I | |
| . | | | | | | | | |
| . | | | | | | | | |
| Guest i | I | A | X | | | | I | Guest i Preference Vector |
| . | | | | | | | | |
| . | | | | | | | | |
| Guest n | A | I | I | | X | | | Guest n Preference Vector |

P(n,n) Seating Preference Matrix

Note that the matrix preference is not necessarily symmetric, therefore P_{ij} can be different from P_{ji} .
Example $P_{ij} = A$ and $P_{ji} = X$: guest i wants absolutely to seat close to guest j , while guest j may want to be absolutely away from guest i .

Question1-Propose a generic linear program formulating the wedding planner challenge of finding the **best** table layout.

Hint 1: clearly define the objective function, what is “best” layout? There might be more than one objective, debate most convenient one, or consider more than one.

Hint 2: Transform the preference relation to a preference score for example ($A=10, I=0, X=-50$)

Question2-Build your model on Cplex OPL and solve for two data sets:

Data Set 1: provided in the excel file.

Data Set 2: generate a data set randomly ($n>30$ guests)

Must connect OPL to Excel to read Data

Question3-Propose a graphical display/ layout of your solution (see example fig 1) and explain how you evaluate your solution (why do you think this is the best layout)

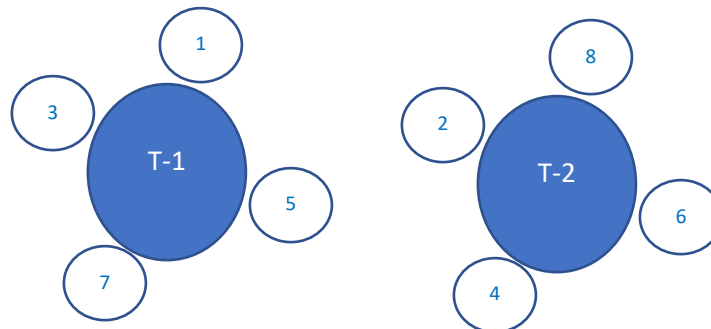


Fig: Example of Two Tables/ 8 guests' layout