Cruise Ship Revenue Management

A small Beirut-based travel company operates one cruise ship, Maria - the Captain's Sweetheart[1](MCS), on the Mediterranean. MCS has a total of 100 cabins distributed over three cabin types: Balcony (35 cabins), sea-view (35 cabins), and inside (30 cabins). A Family with two, three, or more members can stay in one cabin. Conforming to Lebanese regulations, MSC has a lifeboat with a capacity of 275 seats. Regulation also requires that every passenger admitted on-board be allocated a seat on the lifeboat. (Such regulation is adopted internationally, motivated in part by the Titanic disaster.)

It's December 1, 2007, the travel company is starting to accept reservations for MCS cruise on March 1. (Such a long lead time is typical in the cruise industry.) Customers are segmented by the type of cabin (i.e. balcony, sea-view, or inside) they want and by their family size (most typical families have 2, 3, or 4 members). The demand forecasts from the most typical customers segments are in Table 1. The fare prices paid by each of these segments are in Table 2

Table 1 Demand forecasts (in number of families) by customer segmen

Family Size	Preferred Cabin Type		
	Sea-View	Balcony	Inside
2	25	25	22
3	29	29	14
4	14	14	7

Table 2 Fare prices by customer segment

Family Size	Preferred Cabin Type		
	Sea-View	Balcony	Inside
2	$520	$450	$425
3	$640	$563	$525
4	$760	$675	$625

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[1] Named after a Fairuz song "Maria, ya m'sawssiha el cobtane". See Hana Meena's novel, *Hekayat Bahar*, for interesting discussion of this song.

The company's management understands that (i) not all demand can be met; (ii) admitting too many large size families early in the booking period could lead to MSC sailing with empty cabins (due to the lifeboat capacity limitation), so some large size families should be denied booking; and (iii) not all large families reservation requests should be rejected because some offer high revenue, and, besides, demand forecasts may change.

Having heard about Operations Research and Revenue Management from a magazine article, the company's management called you, a respectful OR consultant, and asked you to develop a revenue management solution for their booking problem. That is, you are to help management on deciding which reservation requests to accept and which ones to reject. In particular, you have to address the following.

(a) Formulate a LP to assist management deciding which reservation requests to accept. Define your decision variables and objective function clearly.

(b) (i) Solve the LP developed in (a) using Excel Solver.
   (ii) Name your Excel as "yourlastname_b.xls" (E.g. I would name my file Maddah_b.xls).
   (iii) Email the file to probhw@gmail.com.

(c) (i) How would you verify and validate the model developed in (a) and (b)?
   (ii) Does the solution obtained in (b) make sense? Explain why.

(d) Based on the LP solution in (b), develop a table that explains to management how to decide on each reservation request received.

(e) Suppose that the reservation requests in Table 2 were received by December 8.

Table 3 Reservations requests on December 8

Family Size	Preferred Cabin Type		
	Sea-View	Balcony	Inside
2	2	4	3
3	3	1	2
4	2	1	1

(i) Which reservation requests should be accepted?

(ii) On December 8, the management wants to update the capacity control policy based on the new information in Table 3. Formulate a linear program and solve it using Excel solver to assist management on this. Name the Excel file "yourlastname_e.xls" and email it to probhw@gmail.com as in (b). Develop a table similar to that in (d).

(f) Discuss (briefly in no more than 10 lines, without a formal analysis) the assumptions of the model developed in (a). Explain the implications of these assumptions and how would you relax them in a more complex model.