

Question 1

An airline owns an aging fleet of Boeing 727 jet airplanes. It is considering a major purchase of up to 17 new models of Boeing aircrafts;

- a) B-757,
- b) B-767

The decision must take into account numerous cost and capability factors, including the following:

- a) the airline can finance up to \$400 million in purchases
- b) each B-757 will \$35 million, while each B-767 will cost \$22 million
- c) at least one third of the planes purchased should be longer ranged B-757
- d) annual budget is to be no more than \$8 Million
- e) annual maintenance cost per B-757 is estimated to be \$800,000, and it is \$500,000 for each B-767
- f) each B-757 can carry 125,000 passengers per year, while each B-767 can fly 81,000 passengers annually.

The Air Line company has the following goals (ranked in order from most important to least important);

1. At least 1.4 millions passengers should fly.
 2. Air line should operate within maintenance budget constraint of \$8 Millions.
 3. Avoid purchasing more than 17 new aircrafts.
- I Formulate the problem as a Goal Programming problem.
 - II Convert Goal program to linear program format. Use LINGO and find solution.
 - III Interpret solution and give your comments.

Question 2

Northwest General, a large hospital in Providence, Rhode Island, has initiated a new procedure to ensure that patients receive their meals while the food is still as hot as possible. The hospital will continue to prepare the food in its kitchen, but will now deliver it in bulk (not individual servings) to one of three new serving stations in the building. From there, the food will be reheated, meals will be placed on individual trays, loaded onto a cart, and distributed to the various floors and wings of the hospital.

HW#2
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The three new serving stations are as efficiently located as possible to reach the various hallways in the hospital. The number of trays that each station can serve are shown below:

LOCATION	CAPACITY (MEALS)
Station 5A	200
Station 3G	225
Station 1S	275

There are six wings to Northwest General that must be served. The number of patients in each follows:

WING	PATIENTS
1	80
2	120
3	150
4	210
5	60
6	80

The purpose of the new procedure is to increase the temperature of the hot meals that the patient receives. Therefore, the amount of time needed to deliver a tray from a serving station will determine the proper distribution of food from serving station to wing. The table below summarizes the time associated with each possible distribution channel.

DISTRIBUTION TIME (minutes)							
	TO	Wing 1	Wing 2	Wing 3	Wing 4	Wing 5	Wing 6
FROM							
Station 5A		12	11	8	9	6	6
Station 3G		6	12	7	7	5	8
Station 1S		8	9	6	6	7	9

Formulate Linear Programming model. Define decision variables. Solve using LINGO. What is optimal distribution pattern of hot meals.

Question 3

HW#2
(DUE ON 8th NOV, 2008)

Recall **Ship breaking** problem discussed in class; incoming ship from either CAPE TOWN or KINSHASA will either go to ALEXNADRIA-1 or ALEXNADRIA-2 or ALEXNADRIA-3. Suppose we relax this condition. Now, any incoming ship of Type-1 or Type-2 can visit to any of the three facilities; i.e., some of the incoming ships of Type-1 and Type-2 can be routed to ALEXNADRIA-1; some of these ships be routed to ALEXNADRIA-2, and , some of these ships can be routed to ALEXNADRIA-3. Use the data in the following Table, and re-write LP model.

ALEXANDRIA GETS 3RD SHIP BREAKING FACILITY			
Modified Data			
Locations	Capacity units required To process one unit of type Ship_1	Capacity units required To process one unit of type Ship_2	Total Ship Breaking Capacity units / month
Cape Town	1	0	4
Kinshasa	0	2	12
Alexandria 1	3	2	6
Alexandria 2	1	3	10
Alexandria 3	1	2	8
Profit	\$3 M	\$5 M	

Describe decision variables, objective function and constraints. Use LINGO Solver, and find solution. State the allocation of ships to different ports. Is this an improved solution?