

This problem set is due on Wed 29 November 2006 at the start of class. Please turn in a hard copy of your answers (only printed – no handwritten solutions, please). One full letter grade will be taken off for each portion of a 12 hour period the problem set is submitted late.

## Instructions

There are 4 total problems. Please submit a single Word document that answers each of the problems (and all of their sub questions) clearly, concisely, and completely.

The format for the Word document is as follows:

- Font: Times New Roman, 12 point
- Margins: 1”
- Single spaced
- Number each page on top right corner

If you wish, you may attach a printed out copy of a sampling of your supporting spreadsheet formulas (use the Ctrl-` key to show all formulas). Additionally, you may post your supporting spreadsheet to the class website under the appropriate homework assignment. For all files posted to the website, please use the following naming convention for the file and posting so that we can identify the authors: LastName\_FirstName\_PS#.xls with each tab named for the specific question.

This is an independent assignment and should be completely individual work. Students may use library references, but collaboration between students is NOT permitted for the memo. For the Excel spreadsheet, you are allowed to help each other on functions etc - but no comparing of final answers or results. If in doubt, ask me or Tony.

Please make it easy for Tony to understand what you were trying to do.

Good luck and happy transporting!

Chris

## Problems

### Textbook Problems.

Answer problem in SPP: **7.23**.

### Case Problem 1

Consider the supply chain for auto repair parts that consists of a supplier, the retail store, and the end customer. Suppose that the retailer needs to place an order for a part that soon will be discontinued. This will be the last opportunity to put in an order this part. The cost of this part to the supplier is \$400/unit. The wholesale price (what the retailer pays) for the part is \$1000/unit while the retail price (what the end customer pays) is \$1500/unit. If unsold, these parts cannot salvage because they will be obsolete. Demand is normally distributed with a mean of 600 and a standard deviation of 75

- A) How much should the retailer order? What are the expected profits for the wholesaler, the retailer and the channel? What is the retail order that would yield the highest level of profits for the channel?
- B) In order to encourage the buyer to order the optimal amount, the supplier is instituting a buy back program. What should the buy back price the supplier should charge in order to induce the retailer to buy the optimum quantity?
- C) What should be the wholesale/buyback price be if the supplier wanted the retailer orders to be 10% higher than they are in part A?

**Case Problem 2.**

A power plant in California uses coal at the rate of 100,000 lbs per day. It also uses MRO (Maintenance, Repair, and Operations) material at a rate of 1,000 lbs per day. The coal comes from Wyoming and the MRO material comes from Chicago. Coal costs \$0.01 per lb whereas the MRO material costs \$10 lb on average. Holding costs at the power plant are 25% per year. You have two transportation choices:

**Train**

Lead time = 15 days

Carload (100,000 lbs) costs \$400/carload

Full Train (70 cars) costs \$15,000/ train

**LTL Truck**

Lead time = 4 days

Minimum cost = \$100

Cost for shipment size:

0.08 \$/lb	$\leq 10,000$ lbs
0.07 \$/lb	$10,000 < \text{shipment} \leq 20,000$ lbs
0.06 \$/lb	$20,000 < \text{shipment} \leq 40,000$ lbs

**TL Truck**

Lead time = 3 days

2,000 \$/load - Standard trailer (up to 40,000 lbs)

2,600 \$/load – Reinforced trailer (up to 60,000 lbs)

Safety inventory of coal and MRO materials is kept at twice the consumption during the led time of supply.

- a) What mode of transportation do you recommend for coal and for MRO materials?
- b) Why?

**Case Problem 3:**

A European manufacturer of furniture has a factory located in Munich and four warehouses in Western Europe. The warehouses collect customer orders, which are then shipped from the factory. Upon receipt, the warehouse distributes the customer orders using small trucks. Daily demand at each of the 4 warehouses along with the distance from Munich is shown below:

Warehouse	Daily Demand (Kg)	Distance (km)
Milan	25,000	800
Paris	35,000	1,000
Copenhagen	20,000	600
Madrid	20,000	1,300

All shipments from Munich to the warehouses is by truck. There are three truck sizes available for use – each has a different capacity and cost structure where (dist) is the distance.

Truck	Capacity (kg)	Cost (Euro)
Small	40,000	$100+0.1(\text{dist})$
Medium	60,000	$125+0.1(\text{dist})$
Large	80,000	$150+0.1(\text{dist})$

- a) Find the optimal transportation option (small, medium, large) and transportation cost for one, two, three, and four day replenishment frequency.
- b) What other factors should be considered?