

This problem set is due on Mon 13 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

This is a team assignment. Teams can be made up of 3 to 4 class members – each team must consist of students from at least 2 different programs. That is, no team can consist of students from just one program. Also, you cannot work with any classmate who was on your team for Team Assignment #1.

I highly recommend that you all work on each problem rather than solely divide and conquer. It will help you on the final exam. Trust me.

There are six 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
- Make sure team members are listed on the first page
- 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.

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

Good luck!

Chris

## Problems

### Textbook Problems.

Answer the following two problems in SPP: **6.11, 8.9, 8.16**

### Case Problem 1.

You are still with Widget Co. (See Problem Set 3) But, you have now replaced your former boss, and have to work with the Director of Marketing. She has responsibility over determining what the potential costs are for losing a customer or not. She has asked your advice in setting up an inventory policy for one of her items, SKU #VMI1984, to help prepare her for a meeting with your retail customers that sell this item. Please write a short memo that answers the following questions, also submit any supporting spreadsheets or appendices:

- A. What Reorder Point would you recommend for SKU #VMI1984?
- B. How sensitive is this solution to the exact "split", (i.e., 30% versus 70%) between backorders and lost sales?
- C. The Director might need to "play" with this split. Formulate a general solution to this "mixed stockout" problem so that he can plug in a different split and it shows the impact. In addition to creating closed formula for him, also create a table that shows how total costs changes with the split.
- D. Finally, the Director wants to know how the split between backorders, lost sales, and lost customers would differ for specific products. For example, what would this split be for: 1) Replacement blades for a specialty saw that they sell and 2) Standard industrial electrical extension cords?

Here is what you know about the item:

SKU #VMI1984 is managed in a physical distribution system using both Cycle Stock and Safety Stock. Demand for the item is random but stationary and non-seasonal at a rate of 16,000 units per year. The unalterable policy on this item is to set an order quantity equal to 25% of annual demand (i.e., 4,000 units per order). Forecasted lead time demand is about 700 units. Our demand forecasting algorithm has been generating forecast RMSE of 150 units for this item. Lead time usage forecast errors can be assumed to be approximately normally distributed. Demands which occur during a system stockout become either backorders or lost sales. On a random basis, about 70% of all shortages become lost sales at a cost of \$2.00 per lost sale. The other 30% become backorders at a cost of \$1.00 per backorder. This SKU has a purchase cost of \$5.00 per unit. Our system ordering costs are \$300 per order placed. Our inventory holding costs are 20% annually.

**Case Problem 2**

You are planning to carry a new item in your fall fashion collection. The item will only be marketable for a period of 45 days. Production lead time is 60 days, so you only have one opportunity to order. You have a reliable supplier who can make as many as you want at a firm cost of \$40.00 each.

You are confident that you can dispose of any remainder at the end of the season through a liquidator who will pay you \$10.00 each. Customer demand for this item is hard to estimate. Marketing thinks that, at the \$100.00 price, which is the price at which you intend to offer the item, you should sell about 50,000 units. However, the spread about this estimate is considerable. Marketing thinks that any amount of demand between zero and 100,000 units is equally likely to occur.

**Part A**

Assuming that the cost of lost sales is zero, what is the expected profit for this item? How much of it should you order?

**Part B**

Assuming that due to the lost of goodwill or penalties for a low service, the cost for lost sales is \$20.00 per item. What is your expected profit for this item? How much of it should you order? Please show how you derive the appropriate expressions.

**Part C**

The advertising department now suggests that they launch a “targeted” ad campaign for this item. The ad people claim that this program will not raise their estimate of demand; rather, it will reduce the uncertainty, or the range, of the estimate. Specifically, they think that with such a program in place, at least 25,000 units will be demanded, no more than 75,000 units will be demanded, and any amount of demand between 25,000 and 75,000 units will be equally likely. The ad campaign will cost \$100,000. Assuming that there is no cost for lost sales, is this ad campaign a good idea? Under these conditions, how much would you order? How much would you be willing to pay for this targeted ad campaign?

**Case Problem 3**

You are a tour operator and need to buy spots on a Christmas cruise ship ahead of time. This is for a one time only sail during the holiday season for next year. Two types of room are available: standard and deluxe.

- A standard room will cost you \$400/week and will generate revenues of \$1000/week.
- A deluxe room will cost you \$500/week and will generate revenues of \$1600/week.

There is no salvage value for these rooms. Assume that you are selling to two independent markets (standard and deluxe), the demand for each type of room is normally distribute with a mean of 250 and a standard deviation of 75. There are no capacity constraints. In other words, the ship is so large that relative to your operations that it can accommodate orders of any size.

**Part A**

How many rooms of each type should you order?

**Part B**

Use Excel simulation to derive the optimal quantity and compare it with your answer in Part A

**Part C**

You realize that when you run out of standard rooms, the customers who ordered the standard room will be happy to switch to the deluxe room (of course, at no extra charges to the customers). Should the number of rooms you order of each type be higher or lower? Explain why?

**EXTRA CREDIT**

Write a simulation that shows the total profits of the tour operator when upgrades are allowed (at no additional costs to the customer). Determine the optimal number of rooms to be reserved; by how much are the profits different? Explain your answer.