

DECISIONS FOR MONEY MAKING STRATEGIES

Industrial and Manufacturing Systems Engineering (IMSE)

Kansas State University Open House Competition 2007

The U.S. is in need of engineers to modernize and improve service and production systems. Industrial Engineering provides individuals with numerous tools to improve such systems. Industrial Engineering has been effectively used to decrease cost, increase profits and improve customer satisfaction in numerous sectors. Some successful applications have involved health care, transportation systems, production systems, airlines, sports scheduling, amusement parks, energy, and food production systems. This contest will help students understand the difficulty of maintaining proper levels of inventory with an uncertain demand.

The Contest:

Your team is the ultimate authority for ordering items for your business. The team with the most money after 10 weeks of selling and ordering items is declared the winner. During each of the ten weeks, the team must decide how many items to order for the upcoming week. Different ordering decisions will lead to different costs and can have a large impact on the profit. The team with the highest profit is declared the winner.

The item that this contest focuses on sells for \$50. There is a \$500 shipping charge on each order and if you order 150 or fewer items, then each item costs \$30. If you order between 150 and 249, then each item costs \$27. If you order 250 or more items, then the cost is \$24 per item. The demands are unknown and will be randomly selected between 75 and 125 with each integer demand being equally likely.

Each item in inventory costs \$5 due to storage space, capital spent, etc. Each item with a shortage (demand exceeds inventory) costs \$15 due to a loss of customer satisfaction. In addition, any shortage will be a lost sale opportunity. The amount of inventory (shortage) for the current week is the amount of inventory from the prior week plus the amount ordered the previous week minus the current week's demand. For instance if your business had 20 units in inventory last week and ordered 80 units and the demand for current week is 110, then the business is short 10 products that week. The costs for the week are \$5(20) inventory costs + \$30(80) ordering costs, \$15(10) shortage costs, \$500 shipping charge and \$50(100) revenue from sales (10 customers didn't buy from your business). So this week's profit is \$5,000-\$100-\$2,400-\$150-\$500= \$1,850. Finally, any part left over during the 10th week is worth \$24. The table below shows a set of orders and demands and the overall profit to assist you with your calculations. www.imse.ksu.edu/~openhousecompetition has a longer problem description and random demands to allow teams to practice.

Eligibility and Prizes:

The contest is open to all Junior and Senior high school students. Each team must have at least two, but not more than three students. The team must register (include team name and members) by emailing Jen Bolton bolton@ksu.edu or Cassie Boyer casboyer@ksu.edu by March 31, 2007. The team must be at KSU's IMSE Department Office (2037 Durland Hall, located near the intersection of Denison and College Heights, Manhattan, KS) at 4:00 pm on Friday, April 13, 2007. At 4:00 pm., the contest will start. The demand for the first week will be announced and each team will provide their order quantity for the next week. The profit will be calculated for the current week and the process will continue with the next demand being given followed by the orders until the 10th week is reached. All teams will receive identical demands and the contest should end around 5 p.m. **Each member of the winning team will receive a \$750 scholarship and each member of the second and third place teams will receive a \$500 scholarship. These scholarships will only be awarded if the students enroll in IMSE at KSU.**

Week	Beginning Inventory	Number of Parts Arriving	Start of Week	Week's Demand		Ending Inventory		Ending Shortage		Next Week's Order		Week's Total Profit
				Amt	Revenue	Amt	Cost	Amt	Cost	Amt.	Cost	
1	0	120	120	88	4400	32	160	0	0	85	3050	1190
2	32	85	117	95	4750	22	110	0	0	70	2600	2040
3	22	70	92	117	4600	0	0	25	375	210	6170	-1945
4	0	210	210	113	5650	97	485	0	0	0	0	5165
5	97	0	97	102	4850	0	0	5	75	295	7580	-2805
6	0	295	295	82	4100	213	1065	0	0	0	0	3035
7	213	0	213	88	4400	125	625	0	0	0	0	3775
8	125	0	125	96	4800	29	145	0	0	100	3500	1155
9	29	100	129	119	5950	10	50	0	0	110	3800	2100
10	10	110	120	104	5200	16	80	0	0		0	5184
TOTAL PROFIT (sum of last column)												18894