BAR-ILAN UNIVERSITY

TOPICS IN SUPPLY CHAIN MANAGEMENT
SESSION 2

TRANSPORTATION ISSUES IN THE SUPPLY CHAIN: APPLICATIONS

Problem 1:

A power plant in California uses coal at the rate of 100 000 lbs. each day. It also uses MRO (maintenance, repair and operations) material at the rate of 1 000 lbs. each day. The coal comes from Wyoming and the MRO material comes from Chicago. Coal costs $0.01 per lb. whereas MRO material costs $10 per lb., on average. Holding costs at the power plant are 25%. Transportation choices available are as follows.

Train
Lead time = 15 days
Carload (100 000 lbs.) at $400 per carload
Full train (70 cars) at $15 000 per train

Truck
Lead time = 4 days
Minimum cost = $100
Up to 10 000 lbs. at $0.08/lb.
Between 10 000 and 20 000 lbs. at $0.07/lb. for entire load
Between 20 000 and 40 000 lbs. at $0.06/lb. for entire load
Small TL (40 000 lbs.) for $2 000
Large TL (60 000 lbs.) for $2 600

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

What mode of transportation do you recommend for each of the two products? Why?

Problem 2:

Books-On-Line, an online bookseller, charges its customers a shipping charge of $4 for the first book and $1 for each additional book. The average customer order contains 4 books. Books-On-Line currently has one warehouse in Seattle and ships all orders from there. For shipping purposes, Books-On-Line divides the US into 3 zones – western, central, and eastern. Shipping cost incurred by Books-On-Line per customer order (average 4 books) is $2 with the same zone, $3 between adjacent zones, and $4 between nonadjacent zones.

Weekly demand from each zone is independent and normally distributed with a mean of 50 000 and a standard deviation of 25 000. Each book costs on average $10 and the holding cost incurred by Books-On-Line is 25%. Books-On-Line replenishes inventory every week and aims for a 99.7% CSL. Assume a replenishment lead time of one week.

A warehouse is designed to carry 50% more than the replenishment order + safety stock. The fixed cost of a warehouse is $200 000 + x, x being its capacity in books. The weekly operating cost of a warehouse is $0.01y$, where y is the number of books shipped. Books-On-Line is planning its network strategy. Which zones should have warehouses? Detail all costs involved.

Problem 3:

The manager at Albertson's, a grocery chain also selling online, has 12 orders that are to be delivered to customers. The location and order size for each customer are reported below.

	X-coordinate	Y-coordinate	Order size
DC	0	0	
Customer 1	-12	0	74
Customer 2	-5	6	55
Customer 3	-15	7	68
Customer 4	-12	9	109
Customer 5	-3	15	81
Customer 6	0	20	41
Customer 7	2	17	74
Customer 8	4	7	52
Customer 9	6	1	80
Customer 10	6	15	69
Customer 11	7	20	103
Customer 12	9	7	75

The Albertson's fulfilment store has 5 trucks, each capable of carrying up to 225 units. You are supposed to devise suitable delivery schedules.