Inventory system

* The inventory system has a periodic review of length N, at which time the inventory level is checked.

* An order is made to bring the inventory up to level

* At the end of first review period, an order quantity, Q_1, is placed.

* In the third cycle, the amount in the inventory drops below zero indicating a shortage.

* To avoid shortages, a buffer or safety stock would need to be carried.

* These units are back ordered.

* When the order arrives, the demand for the back ordered items are satisfied first.

max level in inventory
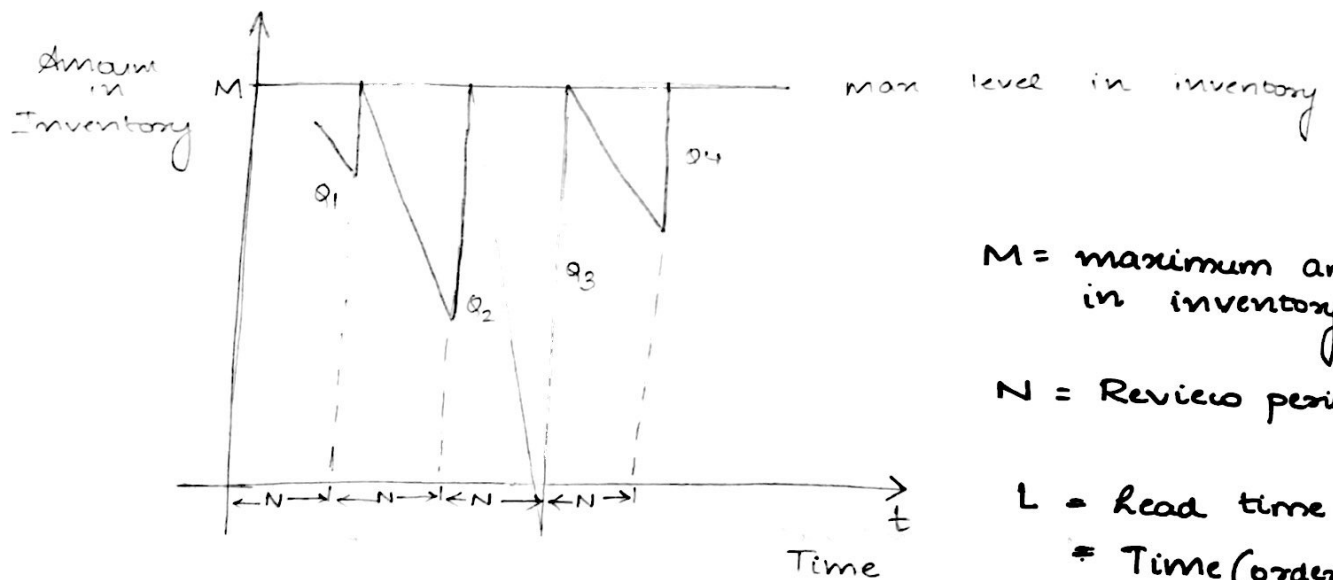
M = maximum amount in inventory

N = Review period

L = Lead time
  = Time (order received) − Time (order placed)

2. Suppose max. inventory level M is 11 units & review period N is 5 days. Estimate by simulation the average ending units in the inventory & no. of days when a shortage condition occurs. The distribution of no. of units demanded is shown ①. The lead time is a random variable whose distr. is shown in table ②. Assume that orders are placed at the close of business & are received for inventory at the beg. of business as determined by lead time.

Demand	probability	
0	0.10	1 – 10
1	0.25	11 – 35
2	0.35	36 – 70
3	0.21	71 – 91
4	0.09	92 – 00

lead time (days)	probability	
1	0.6	1 – 6
2	0.3	7 – 0
3	0.1	9 – 0

Random digit

i) for demand : 24, 35, 65, 81, 54, 03, 87, 27, 73, 76, 47, 45, 46, 17, 09, 42, 87, 26, 36, 40, 07, 63, 19, 88, 94

ii) lead time : 5, 0, 3, 4, 8

Cycle	Day	Beginning inventory	Demand	Ending inventory	Shortage quantity	Order quantity	Days until order arrive
1.	1.	3	1	$(3-1)$ ²	0	–	1
	2	2	1	1	0	–	0
	3	9 (8 units have arr)	2	7	0	–	–
	4	7	3	4	0	–	–
	5	4	2	2	0	9	(1) lead time
2.	1	2	0	2	0	–	0
	2	11	3	8	0	–	–
	3	8	1	7	0	–	–
	4	7	3	4	0	–	–
	5	4	2	2	0	9	3
3.	1	2	2	0	0	–	2
	2	0	2	0	2	–	1
	3	0	2	0	4	–	0
	4	⑤	1	4	0	–	–
	5	4	0	4	0	7	1

finish shortage first (9-4)

Cycle	Day	Beginning inventory	Demand	Ending inventory	Shortage quantity	Order quantity	Days until order arrive
4.	1	4	2	2	0	–	0
	2	9	3	6	0	–	–
	3	1	1	5	0	–	–
	4	5	2	3	0	–	–
	5	3	2	1	0	10	1
5.	1	1	0	1	0	–	0
	2	11	2	9	0	–	–
	3	9	1	8	0	–	–
	4	8	3	5	0	–	–
	5	5	4				