IE 221 OPERATIONS RESEARCH / PROBABILISTIC MODELS FINAL EXAM , FALL 1998

A bakery bakes its cookies every morning before opening. It costs the bakery \$.15 to bake each cookie, and each cookie is sold for \$.35. At the end of the day, leftover cookies may be sold to a thrift bakery for \$.05 per cookie. The number of cookies sold each day is a random variable described by the following table:

Demand (dozens)	20	30	40	50	60
Probability	.3	.2	.2	.15	.15

(a) How many dozen cookies should be baked each morning?

(b) If the daily demand in dozens of cookies is Normally distributed with μ =50 and σ =20, how many dozen cookies should be baked?

2 ... Given the following data:

Fixed order cost	Cost per item	Sale price per item	Annual holding cost	Annual demand	Lead time demand
\$100	\$5	\$8	40% of item cost	5000 units	N(µ=20,σ=30)

- (a) If the reorder point that minimizes expected cost is 80, what is the shortage cost assuming backlogging?
- (b) If the reorder point that minimizes expected cost is 80, what is the shortage cost assuming lost sales?
- (c) What reorder point would meet 90% of all demand on time?
- 3 ... A machine is used to produce precision tools. If the machine is in good condition today, then 90% of the time, it will be in good condition tomorrow. If the machine is in bad condition today, then 80% of the time, it will be in bad condition tomorrow. If the machine is in good condition, it produces 100 tools per day. If the machine is in bad condition, it produces 60 tools per day. How many tools are produced per day, on average?
- 4 ... At the beginning of each day, a patient in a hospital is classified into one of two conditions: good or critical. At the beginning of the next day, the patient will either still be in the hospital and be in good or critical condition or will be discharged in one of three conditions: improved, unimproved, or dead. The transition probabilities for this situation are as follows:

	Good	Critical
Good	.7	.2
Critical	.55	.41

	Improved	Unimproved	Dead
Good	.06	.03	.01
Critical	.01	.01	.02

- (a) Consider a patient who enters the hospital in good contiion. On the average, how many days does this patient spend in the hospital?
- (b) This morning there were 500 patients in critical condition in the hospital. Tomorrow morning the following admissions will be made: good condition, 50; critical condition, 30. Predict the hospital census tomorrow morning.
- (c) The daily admissions are as follows: 20 patients in good condition and 10 patients in critical condition. How many patients of each type are in the hospital on average?
- (d) What fraction of patients who enter the hospital in good condition will leave the hospital in improved condition?