

**Stochastic Math Models (550.252)**  
**Homework 7 (Due Thursday, November 03, 2011)**

**General Directions:** You must show all work and document any assumptions to receive full credit. When formulating models, make sure to define your variables and label your objective function and constraints. All work should be done by hand unless otherwise stated.

1. Lawrence & Pasternack 6.9
2. Lawrence & Pasternack 6.20
3. John Reynolds is planning to lease a new car. The car dealership offers three different two-year leasing plans:

Plan	Fixed Monthly Cost	Incremental Cost
A	\$200	\$0.098 per mile
B	\$300	\$0.062 per mile for first 5000 miles; \$0.052 per mile thereafter
C	\$180	First 6000 miles free; \$0.14 per mile thereafter

John estimates that he will drive between 20,000 and 36,000 miles during the two years, with the following probabilities:

$$\Pr(\text{driving } 20,000) = 0.1$$

$$\Pr(\text{driving } 24,000) = 0.2$$

$$\Pr(\text{driving } 28,000) = 0.2$$

$$\Pr(\text{driving } 32,000) = 0.3$$

$$\Pr(\text{driving } 36,000) = 0.2$$

- (a) Construct a payoff table showing the costs to John of leasing the car under the three plans.
  - (b) If John were optimistic, which plan would he choose?
  - (c) If John bases his decision on the expected value criterion, which leasing plan would he choose.
4. Ultima Electronics has just had its ManFriday robot selected for listing in the Neiman Marcus Christmas catalog. The catalog price is \$28,000 per robot; Ultima sells the robot to Neiman Marcus for \$16,000 each. The Neiman Marcus marketing department has advised Ultima that the demand for the robots will be for between one and four units. The production cost for manufacturing the robots is estimated as follows:

Number Produced	Total Manufacturing Cost
1	\$24,000
2	\$31,500
3	\$38,000
4	\$43,500

Any robots produced but not sold by Neiman Marcus can be sold by Ultima to an overseas distributor at a price of \$6000 each. If the store places orders for more robots than the company has produced, Ultima has agreed to substitute a more expensive model which costs \$20,000 per unit to produce.

- (a) Construct the payoff table for this problem.
  - (b) What decision alternatives are dominated?
  - (c) If Ultima management uses the principle of insufficient reason to determine the production decision, how many ManFriday robots should be produced?
  - (d) If Ultima management uses the minimax regret criterion to determine the production decision, how many ManFriday robots should be produced?
  - (e) Suppose the company believes that the probability of demand for one robot will be twice as great as the probability of demand for three robots and four times as great as the probability of demand for four robots. The probability of demand for two robots is estimated to be .30. Using the expected value criterion, determine how many ManFriday robots Ultima should produce.
  - (f) What is the most Ultima should pay for a marketing survey that could improve the probability estimates for the robot's demand?
5. Each of three identical jewelry boxes has two drawers. In each drawer of the first box there is a gold watch. In each drawer of the second box there is a silver watch. In one drawer of the third box there is a gold watch and in the other drawer there is a silver watch. If we select a box at random, open one of the drawers and find it to contain a silver watch, what is the probability that the other drawer of the box has the gold watch?