Homework 2
January 25, 2010
Due: at the start of class on Tuesday, February 2nd

1. David buys fruits and vegetables wholesale and retails them at David’s Produce on La Vista Road. One of the difficult decisions is the amount of bananas to buy. Let us make some simplifying assumptions, and assume that David purchases bananas once a week at 20 cents per pound and retails them at 50 cents per pound during the week. Bananas that are more than a week old are too ripe to sell and David will pay workers to take them away. It costs 2 cent to get rid of each pound of unsold bananas. Suppose that the weekly demand for bananas is uniformly distributed between 500 and 1500 pounds.

(a) How many pound of bananas should David order each week?
(b) What is the optimal expected weekly profit?
(c) Now assume that the demand for bananas is exponentially distributed with mean 1000. How many pound of bananas should be ordered?

2. Suppose that during a football game, lemonade sells for $20 per gallon but only costs $5 per gallon to make. If they run out of lemonade during the game, it will be impossible to get more. On the other hand, leftover lemonade has a negligible value. Assume that you believe the fans would buy 10 gallons with probability 1/10, 11 gallons with probability 4/10, 12 gallons with probability 2/10, 13 gallons with probability 2/10, and 14 gallons with probability 1/10. You need to decide how many gallons of lemonade to have on hand at the beginning of the game.

(a) What is the mean demand?
(b) If 12 gallons are prepared, what is the expected profit from a game?
(c) What is the corresponding expected cost?
(d) What is the optimal amount of lemonade to be prepared for a game?
(e) If the optimal amount is prepared for a game, what is the expected loss from overstock, i.e., the expected holding cost?
(f) Now suppose that the demand was normally distributed with mean 1000 gallons and variance 200 gallons². How much lemonade should be ordered?

3. A camera store specializes in a particular popular and fancy camera. Assume that these cameras become obsolete at the end of the month. They guarantee that if they are out of stock, they will special-order the camera and promise delivery the next day. In fact, what the store does is to purchase the camera from an out of state retailer and have it delivered through an express service. Thus, when the store is out of stock, they actually lose the sales price of the camera and the shipping charge, but they maintain their good reputation. The retail price of the camera is $640, and the special delivery charge adds another $50 to the cost. At the end of each month, there is an inventory holding cost of $25 for each camera in stock (for doing inventory etc). Wholesale cost for the store to purchase the cameras is $380 each. (Assume that the order can only be made at the beginning of the month.)

(a) Assume that the demand is discrete uniform between 10 to 16 cameras a month (inclusive). If 13 cameras are ordered at the beginning of a month, what are the expected overstock cost and the expected understock cost? What is the expected total cost?
(b) What is optimal number of cameras to order to minimize the expected total cost?