PROBLEM SET 13.3A

1. In each of the following cases, no shortage is allowed, and the lead time between placing and receiving an order is 35 days. Determine the optimal inventory policy and the associated cost per day.
   (a) $K = \$120, h = \$.04, D = 25$ units per day
   (b) $K = \$80, h = \$.03, D = 35$ units per day
   (c) $K = \$100, h = \$.02, D = 50$ units per day
   (d) $K = \$110, h = \$.03, D = 25$ units per day

*2. McBurger orders ground meat at the start of each week to cover the week's demand of 300 lb. The fixed cost per order is $20. It costs about $.03 per lb per day to refrigerate and store the meat.
   (a) Determine the inventory cost per week of the present ordering policy.
   (b) Determine the optimal inventory policy that McBurger should use, assuming zero lead time between the placement and receipt of an order.

3. A company stocks an item that is consumed at the rate of 50 units per day. It costs the company $25 each time an order is placed. An inventory unit held in stock for a week will cost $.36.
   (a) Determine the optimum inventory policy, assuming a lead time of 2 week.
   (b) Determine the optimum number of orders per year (based on 365 days per year).

*4. Two inventory policies have been suggested by the purchasing department of a company:

   Policy 1. Order 150 units. The reorder point is 50 units, and the time between placing and receiving an order is 10 days.

   Policy 2. Order 200 units. The reorder point is 75 units, and the time between placing and receiving an order is 15 days.

   The setup cost per order is $20, and the holding cost per unit inventory per day is $.02.
   (a) Which of the two policies should the company adopt?
   (b) If you were in charge of devising an inventory policy for the company, what would you recommend assuming that the supplier requires a lead time of 22 days?

5. Walmark Store compresses and palletizes empty merchandise cartons for recycling. The store generates five pallets a day. The cost of storing a pallet in the store's back lot is $.10 per day. The company that moves the pallets to the recycling center charges a flat fee of $100 for the rental of its loading equipment plus a variable transportation cost of $3 per pallet. Graph the change in number of pallets with time, and devise an optimal policy for hauling the pallets to the recycling center.

6. A hotel uses an external laundry service to provide clean towels. The hotel generates 600 soiled towels a day. The laundry service picks up the soiled towels and replaces them with clean ones at regular intervals. There is a fixed charge of $81 per pickup and delivery service, in addition to the variable cost of $.60 per towel. It costs the hotel $.02 a day to store a soiled towel and $.01 per day to store a clean one. How often should the hotel use the pickup and delivery service? (*Hint:* There are two types of inventory items in this situation. As the level of the soiled towels increases, that of clean towels decreases at an equal rate.)

7. *Lewis (1996).* An employee of a multinational company is on loan from the United States to the company's subsidiary in Europe. During the year, the employee's financial obligations in the United States (e.g., mortgage and insurance premium payments) amount to $12,000, distributed evenly over the months of the year. The employee can meet these obligations by depositing the entire sum in a U.S. bank prior to departure for Europe. However, at present the interest rate in the United States is quite low (about 1.5% per year) in comparison with the interest rate in Europe (6.5% per year). The cost of sending funds from overseas is $50 per transaction. Determine an optimal policy for transferring funds from Europe to the United States, and discuss the practical implementation of the solution. State all the assumptions.

8. Consider the inventory situation in which the stock is replenished uniformly (rather than instantaneously) at the rate a. Consumption occurs at the constant rate D. Because consumption also occurs during the replenishment period, it is necessary that $a > D$. The setup cost is K per order, and the holding cost is h per unit per unit time. If y is the order size and no shortage is allowed, show that
   (a) The maximum inventory level is $y\left(1 - \frac{D}{a}\right)$.

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