

MTH 2201 Applied Max/Min Problems

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Name _____

1. A walnut grower estimates, from past records, that if 20 trees are planted per acre, each tree will average 60 pounds of walnuts per year. If, for each additional tree (up to 15) planted per acre, the average yield per tree drops 2 pounds, how many trees should be planted to maximize the yield per acre? What is the maximum yield?

(a) 1. Ans: plant 25 trees per acre, maximum yield is 1,250 pounds per acre.

2. A company manufactures and sells x tv sets per month. The total cost (per month) is given by the function:

$$C(x) = \$72,000 + \$60x$$

The price per tv set is given by the function:

$$p(x) = \$200 - \$\frac{x}{30}$$

Assuming that the company's production capability tops out at 6000 sets per month,

- (a) How many tv sets should the company produce each month?
- (b) What price will they charge per set, when they are making maximum profit?

1. ans

1. 2,100 sets

2. \$130 per set, \$75,000 maximum profit

3. Given the setup in the previous problem, suppose that the state government taxes the company \$5 for each tv set produced.

- (a) How many tv sets should the company produce each month?
- (b) What price will they charge per set, when they are making maximum profit?

1. ans

1. 2,025 sets

2. \$132.50 per set, \$64,687.50 maximum profit

4. A car rental agency rents an average of 2000 cars per day, at a rate of \$30 per day. It is estimated that for each \$1 increase in rental rate, 25 fewer cars will be rented. What rate should be charged so that the company has the largest possible revenue?

(a) 1. ans \$55

5. An appliance store sells 2500 tv sets per year. It costs \$10 to store one set per year (So if a particular tv set stays on the shelf for 6 months, it costs \$5 to store the set for the 6 months.) For each order of television sets, there is a fixed cost of \$20 per order. The store is also charged \$90 per tv set ordered (cost of construction). How many times per year should the store order tv sets, in order to minimize their cost? (Assume that all orders are the same size, or within one tv set of being the same size.)

(a) 1. Ans: 25 times per year

6. An appliance store sells 600 refrigerators per year. It costs \$30 to store one refrigerator per year (So if a particular refrigerator stays on the shelf for 6 months, it costs \$15 to store the refrigerator for the 6 months.) For each order of refrigerators, there is a fixed cost of \$40 per order. The store is also charged \$350 per refrigerator ordered (cost of construction). How many times per year should the store order refrigerators, and what size should each order be, in order to minimize their cost? (Assume that all orders are the same size)

(a) 1. Ans: order approximately 15 times, approximately 40 refrigerators per order.

7. A Department Store sells 900 CD players per year. The cost for storing the CD players until they are sold is \$8 per year, per CD player (and \$4 to store a CD player for half a year, etc.). Each time a new batch of CD players is ordered, an ordering charge of \$16 is assessed. Furthermore, the actual cost of the CD players (manufacturing cost) is \$50 per player. How many times per year should the store order CD players, in order to minimize total cost?

(You may assume the following:

(a) The CD players sell at a constant rate.

(b) Every batch of CD players ordered is the same size.

(c) Each order is placed at just the right time, to insure that as the last CD player in inventory is being sold, the next shipment of CD players arrives

1. Ans: 15 times per year

8. An excursion boat with a capacity of 500 people runs a charter trip for a group of 275 people at \$8.50 per person (i.e., the company won't run a charter trip with less than 275 passengers). The company offers a reduction in fare (to all of the passengers) of \$0.02 per person for every additional passenger over the required minimum of 275 passengers.

(a) How many passengers will maximize the revenue?

1. Ans: 350 passengers

(b) When the company is making maximum revenue, what will the cost per passenger be?

1. Ans: \$7.00

- (c) How many passengers will minimize the revenue?
1. 500 passengers
9. At a speed of x miles per hour, with $30 \leq x \leq 60$, a truck averages $\frac{360}{x}$ miles per gallon of gas. Suppose the driver of the truck is paid \$10 per hour, and suppose that the price of gas is \$1.44 per gallon.
- (a) If all other costs for a 300 mile trip are independent of the speed at which the truck is driven, what constant speed will minimize the cost of the trip?
1. Ans: 50 mph
- (b) What will be the minimum cost for gas and wages?
1. Ans: \$120.00
- (c) What will be the maximum cost for gas and wages?
1. Ans: \$136.00