

Optimization Word Problems

1. A new farm has 240 acres of land available for plants. Corn yields a profit of \$40/acre and oats yield a profit of \$30/ acre. There are 320 hours available to harvest the plants. Corn takes 2 hours of labor and oats require 1 hour. How many acres of each should be planted to maximize profit?
2. A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators must be shipped each day. If each scientific calculator sold results in a \$2 loss, but each graphing calculator produces a \$5 profit, how many of each type should be made daily to maximize net profits?
3. You need to buy some filing cabinets. You know that Cabinet X costs \$10 per unit, requires six square feet of floor space, and holds eight cubic feet of files. Cabinet Y costs \$20 per unit, requires eight square feet of floor space, and holds twelve cubic feet of files. You have been given \$140 for this purchase, though you don't have to spend that much. The office has room for no more than 72 square feet of cabinets. How many of which model should you buy, in order to maximize storage volume?
4. In order to ensure optimal health (and thus accurate test results), a lab technician needs to feed the rabbits a daily diet containing a minimum of 24 grams (g) of fat, 36 g of carbohydrates, and 4 g of protein, but the rabbits should be fed no more than five ounces of food a day. Rather than order rabbit food that is custom-blended, it is cheaper to order Food X and Food Y, and blend them for an optimal mix. Food X contains 8 g of fat, 12 g of carbohydrates, and 2 g of protein per ounce, and costs \$0.20 per ounce. Food Y contains 12 g of fat, 12 g of carbohydrates, and 1 g of protein per ounce, at a cost of \$0.30 per ounce. What is the optimal blend?
5. A lunch stand makes \$0.75 in profit on each chef's salad and \$1.20 in profit on each Caesar salad. On a typical weekday, it sells between 40 and 60 chef's salads and between 35 and 50 Caesar salads. The total number sold has never exceeded 100 salads. How many of each type of salad should be prepared to maximize profit?
6. Challenge: You have \$12,000 to invest, and three different funds from which to choose. The municipal bond fund has a 7% return, the local bank's CDs have an 8% return, and the high-risk account has an expected (hoped-for) 12% return. To minimize risk, you decide not to invest any more than \$2,000 in the high-risk account. For tax reasons, you need to invest at least three times as much in the municipal bonds as in the bank CDs. Assuming the year-end yields are as expected, what are the optimal investment amounts?

ANSWERS

1. 80 acres of corn and 160 acres of oats
2. 100 scientific calculators and 170 graphing calculators
3. 8 of Cabinet X, and 3 of Cabinet Y
4. 3 ounce of Food X
5. 50 Caesar and 50 Chef
6. \$7500 in municipal bonds, \$2500 in CDs, and \$2000 in high risk