*Linear Programming Problems*

**Problem 1:**

A farmer has 10 acres to plant in wheat and rye. He has to plant at least 7 acres. However, he has only £1200 to spend and each acre of wheat costs £200 to plant and each acre of rye costs £100 to plant. Moreover, the farmer has to get the planting done in 12 hours and it takes an hour to plant an acre of wheat and 2 hours to plant an acre of rye. If the profit is £500 per acre of wheat and £300 per acre of rye how many acres of each should be planted to maximize profits?

<http://www.sonoma.edu/users/w/wilsonst/Courses/Math_131/lp/Farm.html>

**Problem 2:**

A gold processor has two sources of gold ore, source A and source B. In order to keep his plant running, at least three tons of ore must be processed each day. Ore from source A costs £20 per ton to process, and ore from source B costs £10 per ton to process. Costs must be kept to less than £80 per day. Moreover, Federal Regulations require that the amount of ore from source B cannot exceed twice the amount of ore from source A. If ore from source A yields 2 oz. of gold per ton, and ore from source B yields 3 oz. of gold per ton, how many tons of ore from both sources must be processed each day to maximize the amount of gold extracted subject to the above constraints?

<http://www.sonoma.edu/users/w/wilsonst/Courses/Math_131/lp/Gold.html>

**Problem 3:**

A publisher has orders for 600 copies of a certain text from San Francisco and 400 copies from Sacramento. The company has 700 copies in a warehouse in Novato and 800 copies in a warehouse in Lodi. It costs £5 to ship a text from Novato to San Francisco, but it costs £10 to ship it to Sacramento. It costs £15 to ship a text from Lodi to San Francisco, but it costs £4 to ship it from Lodi to Sacramento. How many copies should the company ship from each warehouse to San Francisco and Sacramento to fill the order at the least cost?

<http://www.sonoma.edu/users/w/wilsonst/Courses/Math_131/lp/Books.html>

**Problem 4:**

At a certain refinery, the refining process requires the production of at least two gallons of gasoline for each gallon of fuel oil. To meet the anticipated demands of winter, at least three million gallons of fuel oil a day will need to be produced. The demand for gasoline, on the other hand, is not more than 6.4 million gallons a day.

If gasoline is selling for £1.90 per gallon and fuel oil sells for £1.50/gal, how much of each should be produced in order to maximize revenue?

<http://www.purplemath.com/modules/linprog2.htm>

**Problem 5:**

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 much 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?

<http://www.purplemath.com/modules/linprog3.htm>

**Problem 6:**

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 shorage volume?

<http://www.purplemath.com/modules/linprog3.htm>

**Problem 7:**

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 protien. 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.

<http://www.purplemath.com/modules/linprog4.htm>

**Problem 8:**

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?

<http://www.purplemath.com/modules/linprog4.htm>

**Problem 9:**

A building supply has two locations in town. The office receives orders from two customers, each requiring 3/4-inch plywood. Customer A needs fifty sheets and Customer B needs seventy sheets.

The warehouse on the east side of town has eighty sheets in stock; the west-side warehouse has forty-five sheets in stock. Delivery costs per sheet are as follows: £0.50 from the eastern warehouse to Customer A, £0.60 from the eastern warehouse to Customer B, £0.40 from the western warehouse to Customer A, and £0.55 from the western warehouse to Customer B.

Find the shipping arrangement which minimizes costs.

<http://www.purplemath.com/modules/linprog5.htm>