

Chapter 5

Linear Optimization (Simplex Method)

Exercises

5. 1.

A store sells men's and women's tennis shoes. It makes a profit of \$1 per pair of men's shoes and \$1.20 per pair of women's shoes. It takes two minutes of a salesperson's time and two minutes of a cashier's time to sell a pair of men's shoes. It takes three minutes of a salesperson's time and one minute of a cashier's time per pair of women's shoes. The store is open eight hours per day, during which time there are two salespersons and one cashier on duty.

How many pairs of shoes of each type should the store sell in order to maximize profit each day?

1. Formulate the problem as a linear optimisation model
2. Solve the model by the simplex method.

5. 2.

A company owns a small paint factory that produces both interior and exterior house paints for wholesale distribution. Two basic raw materials, A and B, are used to manufacture the paints. The maximum availability of A is 6 tons a day; that of B is 8 tons a day. The daily requirements of the raw materials per ton of interior and exterior paints are summarised in the following table:

	Tons of Raw Material Per Ton of Paint		Maximum Availability (tons)
	Exterior	Interior	
A	1	2	6
B	2	1	8

A market survey has established that the daily demand for interior paint cannot exceed that of exterior paint by more than 1 ton. The survey also shows that the maximum demand for interior paint is limited to 2 tons daily. The wholesale price per ton is 3000 € for exterior point and 2000 € for interior point.

The company would like to maximise its daily gross income.

1. Formulate the problem as a linear optimisation model.
2. Solve the model by the simplex method.

5. 3.

A furniture maker has 6 units of wood and 28 hours of free time, in which he will make decorative screens. Two models have sold well in the past, so he will restrict himself to those two. He estimates that model I requires 2 units of wood and 7 h of time, while model II

requires 1 unit of wood and 8 h of time. The prices of the models are 120 € and 80 €, respectively.

The furniture maker wishes to maximise his sales revenue.

1. Formulate the problem as a linear optimisation model.
2. Represent the feasible solutions graphically (*Hint: the variables are integer!*)
3. Solve the model by the simplex method.

5. 4.

A firm makes dog food out of chicken and grain. Chicken has 10 grams of protein and 5 grams of fat per ounce, and grain has 2 grams of protein und 2 grams of fat per ounce. A bag of dog food must contain at least 200 grams of protein and at least 150 grams of fat.

Chicken costs 10 cents per ounce and grain costs 1 cent per ounce.

The company wants to know how many ounces of chicken and grain to use in each bag of dog food in order to minimise cost.

1. Formulate the problem as a linear optimisation model
2. Solve the model by the simplex method.

(Last updated: 15.11.2012)