

## Problems – LO

Motivated by Stevenson, W. J. (1989). Introduction to management science. IRWIN, Boston. The other problems could be found for example in Hillier, F. S., Lieberman, G. J. (2005). Introduction to operations research.

**Problem 1** A computer component company is about to start production of two new computers. Each type of computer will require assembly time, inspection time, and storage space. The manager of the company would like to determine the quantity of each computer to produce in order to maximize the profit. The manager estimates followings

	Type 1	Type 2
Assembly time per unit (hours)	2	5
Inspection time per unit (hours)	2	1
Storage space per unit (cubic feet)	4	4
Profit per unit	\$ 300	\$ 250

The manager also know the availability of company resources. They have 50 available hours of assembly time, 22 available hours of inspection time and 52 cubic feet of storage space. The company marketing manager estimates that whatever combination of these two types of computers is produced, all of the output can be sold for the proposed price.

**Problem 2** A confectionary company produces two sizes of its popular dark chocolate bars: a 3.5-ounce size and a 6-ounce size. The first one costs \$ .4 to make and sells for \$ .7, whereas the second bar costs \$ .6 to make and sells for \$ .95. The company has 20000 ounces of chocolate which can be used for the production. In addition, the manager decided that they need to produce at least 1000 of the 3.5-ounce bars and 1/5,000 of the 6-ounce bars. How many of each type of chocolate should the company produce to maximize its profit? (It is supposed that all products will be sold.)

**Problem 3** A cereal manufacture considers the introducing a new cereal. It would be composed of wheat, rice, and corn flakes. The cost per kilogram and dietary requirements are given in the following table:

	Wheat	Rice	Corn	requirements per 750 g Box
Protein (g per kg)	140	70	70	At least 85g
Carbohydrates (g per kg)	700	900	730	At least 700g
Calories per kg	3100	3800	3500	No more than 2800
Cost per kilogram	\$ 3	\$ 5	\$ 2	

The manager needs to mix optimal product to achieve the requirements at minimum cost. Is it possible to solve this problem in graphical way?

**Problem 4** We have three different juice with different level of sugar and we need to mix a 1-liter bottle with given level of sugar. More precisely, the sugar content of three juices are 10, 15, and 20 percent, respectively. How much of each juice must be used to get 1 liter of juice with 17 percent of sugar?

**Problem 5** A conservative investor has \$ 10 000 to invest. The investor considers three possible investments – municipal bonds, a certificate of deposit (CD), and a money market account. The investor decided not to put more than 40 percent of the investment in bonds and he wants to have proportion allocated to the money market account at least double the amount in the CD.

The annual return is supposed to be 8 percent for bonds, 9 percent for the CD, and 7 percent for the money market account. How can the investor maximize his supposed total annual return?

**Problem 6** *A mill cuts 20-foot pieces of wood into several different lengths: 8-foot, 10-foot, and 12-foot. A mill has 350 of 20-foot pieces stock on hand and a customer has ordered 275 of 8-foot pieces, 100 of 10-foot ones, and 250 of 12-foot ones. Is it possible to satisfy the customer and how to do it with the minimum waste?*