

Example 7.1

Manufacturing

Ted's Toys makes toy cars and toy trucks using plastic and steel. Each car requires 4 ounces of plastic and 3 ounces of steel, while each truck requires 3 ounces of plastic and 6 ounces of steel. Each day Ted has 30 pounds of plastic and 45 pounds of steel to use in making toy cars and trucks, and he can sell all the cars and trucks he makes with these materials. His profit is \$5 per car and \$4 per truck. Ted is motivated by financial goals, and he would like to know how many cars and trucks he should make in order to maximize the total profit from the sale of these toys.

Example 7.2

Nutrition

A hiker is planning her trail food, which is to include a snack mix of peanuts and raisins. Each day she wants 600 calories and 90 grams of carbohydrates from this mix. Each gram of raisins contains .8 gram of carbohydrates and 3 calories and costs 4 cents. Each gram of peanuts contains .2 gram of carbohydrates and 6 calories and costs 5 cents.

Example 7.3

Task scheduling

An account executive divides his time between sales and support activities, primarily paperwork and reading up on new products. Keeping up to date on new products requires that he spend at least 5 hours each week reading trade newspapers and magazines. In addition, each hour he devotes to sales generates .1 hour of paperwork. He prefers sales, and he wants to devote at least half his time to that activity, but there is enough to do in support activities that any time not devoted to sales can be used for that purpose. He plans to devote at most 50 hours per week to his job. Finally, he estimates that the time he devotes to sales is worth \$15 per hour and that the time he devotes to support activities is worth \$10 per hour. (It would cost \$10 per hour to hire a staff person to do that work.)

Example 7.4

Resource allocation

The Plant Power Fertilizer Company makes three types of fertilizer: 20-8-8 for lawns, 4-8-4 for gardens, and 4-4-2 for general purposes. The numbers in each case refer to the percentage by weight of nitrate, phosphate, and potash, respectively, in a sack of fertilizer. The company has 6000 pounds of nitrate, 10,000 pounds of phosphate, and 4000 pounds of potash on hand. The profit is \$3 per 100 pounds of lawn fertilizer, \$8 per 100 pounds of garden fertilizer, and \$6 per 100 pounds of general-purpose fertilizer.

Example 7.5

Task scheduling

The office manager of an accounting firm must allocate the time of the office staff each week among three activities: auditing, business accounting, and tax accounting. Each hour billed as auditing requires 15 minutes of an accountant's time and 30 minutes of clerical time. Each hour billed as business accounting requires 20 minutes of accountant time, 60 minutes of clerical time, and 6 minutes of computer time. Each hour billed as tax accounting requires 30 minutes of accountant time, 45 minutes of clerical time, and 3 minutes of computer time. The net profit to the firm from 1 hour of auditing is \$4, and from business accounting and tax accounting the net profits are \$10 and \$6, respectively. This week the staff available can provide 80 hours of accountant time, 180 hours of clerical time, and 30 hours of computer time.

11. whose solution gives