

Math 1313
Chapter 3 – Section 3.2
Linear Programming Problems

An **objective function** is a function, subject to a system of constraints to be optimized (maximized or minimized).

Constraints are a system of equalities or inequalities to which the objective function is subjected.

A **linear programming problem** consists of a linear objective function subject to a system of constraints.

Example 1: The Bax Company produces two models of night lights – Sleep Tight and Rest Well. Each Sleep Tight night light requires 1 hr of work on assembly line I and 3 hr of work on assembly line II. Each Rest Well night light requires 2 hr of work on assembly line I and 4 hr of work on assembly line II. At most 32 hr of assembly time on line I and at most 84 hr of assembly time on line II are available per week. It is anticipated that Bax will realize a profit of \$4 on each Sleep Tight night light and \$6 on each Rest Well night light. How many night lights of each model should be produced per week in order to maximize Bax's profit?

a. Define your variables.

b. Construct and fill in a table with the information given in the problem.

c. State the linear programming problem. Do not solve it.

Example 2: A doctor advises a patient to increase his Vitamin A and B intake. Two vitamin pills are suitable: Extra Energy and Healthier You. Each Extra Energy pill contains 40 mg of Vitamin A and 30 mg of Vitamin B. Each Healthier You pill contains 20 mg of Vitamin A and 40 mg of Vitamin B. Each Extra Energy pill cost 7 cents and each Healthier You pill cost 5 cents. The patient must take at least 2,000 mg of Vitamin A and at least 2,400 mg of Vitamin B. How many pills of each brand should the patient purchase in order to meet the minimum requirements at the lowest cost?

a. Define your variables.

b. Construct and fill in a table with the information given in the problem.

c. State the linear programming problem. Do not solve it.

Example 3: A farmer can use two types of fertilizer on his crops – Best Crops and Fert Fertilizer. Each bag of Best Crops contains 2 pounds of chlorine, 4 pounds of phosphoric acid and 8 pounds of nitrogen. Each bag of Fert Fertilizer contains 1 pound of chlorine, 4 pounds of phosphoric acid and 3 pounds of nitrogen. Tests indicate that the crops need at most 400 pounds of chlorine and at least 1,000 pounds of phosphoric acid. How many bags of each mix should be used, if the farmer wants to minimize the amount of nitrogen added to his crops?

a. Define your variables.

b. Construct and fill in a table with the information given in the problem.

c. State the linear programming problem. Do not solve it.