

The following problems are borrowed from

http://www.math.tamu.edu/~jwhitfld/TQG_Algl/2006-2007/LinearProgramming.pdf

Problem 1

A furniture manufacturer makes two types of furniture – chairs and sofas. The production of the sofas and chairs requires three operations – carpentry, finishing, and upholstery. Manufacturing a chair requires 3 hours of carpentry, 9 hours of finishing, and 2 hours of upholstery. Manufacturing a sofa requires 2 hours of carpentry, 4 hours of finishing, and 10 hours of upholstery. The factory has allocated at most 66 labor hours for carpentry, 180 labor hours for finishing, and 200 labor hours for upholstery. The profit per chair is \$90 and the profit per sofa is \$75. How many chairs and how many sofas should be produced each day to maximize the profit?

Problem 2

$$\text{Maximize } P = 6x + 8y \text{ subject to } \begin{cases} -x + 2y \leq 6 \\ -x + y \leq 7 \\ y \leq 8 \\ x, y \geq 0 \end{cases}$$

Problem 3

A contractor is planning to build a new housing development consisting of colonial, split-level, and ranch-style houses. A colonial house requires one-half acre of land, \$60,000 capital and 4,000 labor-hours to construct, and returns a profit of \$20,000. A split-level house requires one-half acre of land \$60,000 capital, and 3000 labor-hours to construct and returns a profit of \$18,000. A ranch house requires 1 acre of land, \$80,000 capital, and 4,000 labor-hours to construct, and returns a profit of \$24,000. The contractor has available 30 acres of land, \$3,200,000 capital, and 180,000 labor-hours. (Barnett 10e)*

How many houses of each type should be constructed to maximize the contractor's profit? What is the maximum profit.

The following problems are borrowed from DPV:

Problem 4

Moe is deciding how much Regular Duff beer and how much Duff Strong beer to order each week. Regular Duff costs Moe \$1 per pint and he sells it at \$2 per pint; Duff Strong costs Moe \$1.50 per pint and he sells it at \$3 per pint. However, as part of a complicated marketing scam, the Duff company will only sell a pint of Duff Strong for each two pints or more of Regular Duff that Moe buys. Furthermore, due to past events that are better left untold, Duff will not sell Moe more than 3,000 pints per week. Moe knows that he can sell however much beer he has. Formulate a linear program for deciding how much Regular Duff and how much Duff Strong to buy, so as to maximize Moe's profit. Solve the program geometrically.

Problem 5

The Canine Products company offers two dog foods, Frisky Pup and Husky Hound, that are made from a blend of cereal and meat. A package of Frisky Pup requires 1 pound of cereal and 1.5 pounds of meat, and sells for \$7. A package of Husky Hound uses 2 pounds of cereal and 1 pound of meat, and sells for \$6. Raw cereal costs \$1 per pound and raw meat costs \$2 per pound. It also costs \$1.40 to package the Frisky Pup and \$0.60 to package the Husky Hound. A total of 240,000 pounds of cereal and 180,000 pounds of meat are available each month. The only production bottleneck is that the factory can only package 110,000 bags of Frisky Pup per month. Needless to say, management would like to maximize profit.

Problem 6

$$\max x_1 - 2x_3$$

$$x_1 - x_2 \leq 1$$

$$2x_2 - x_3 \leq 1$$

$$x_1, x_2, x_3 \geq 0$$