Advanced Algorithms

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Academic Year 2013-2014

Lab 6 – Solution of assignments

Assignment 05

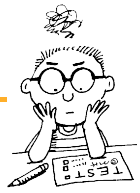
Exercise 7.5 page 223 DPV

- 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

1. Formulate the problem as a linear program in two variables.
2. Graph the feasible region, give the coordinates of every vertex, and circle the vertex maximizing profit. What is the maximum profit possible?

Assignment 05



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Solution

- Let *F* be the number of packages of Frisky Pup and *H* of Husky Hound
- The problem is modeled as follows

  max 7F+6H-F-2*1.5F-2H-2H-1.4F-0.6H=1.6F +1.4H

  (1) F + 2H ≤ 240000

  (2) 1.5F + H ≤ 180000

  (3) F ≤ 110000

  (4) F ≥ 0

  (5) H ≥ 0

Assignment 05

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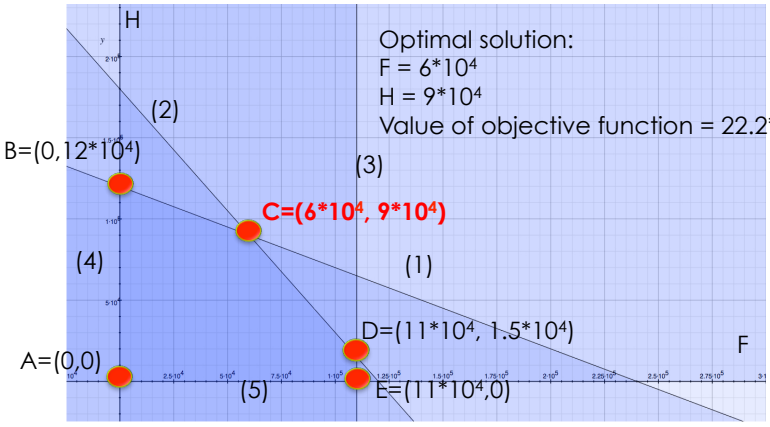
Solution (cont.)

- The graphical representation of the solution is as follows



Assignment 05

Exercise

A nonferrous metals company makes four different alloys from two metals. The requirements are given below. Find the optimal product mix that maximizes gross revenue

	proportion of metal in alloy				
Metal	1	2	3	4	Availability
1	0.5	0.6	0.3	0.1	25
2	0.5	0.4	0.7	0.9	40
Alloy price	750	650	1200	2200	

Assignment 05

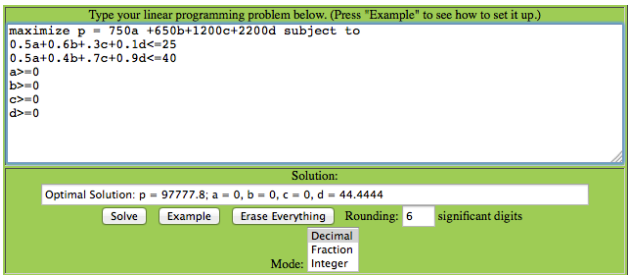
Exercise

Solution

- Let x_j (j=1,…4) the amount of alloy j
- The problem is modeled as follows

  max 750x1+650x2+1200x3+2200x4
  0.5x1+0.6x2+0.3x3+0.1x4 ≤ 25
  0.5x1+0.4x2+0.7x3+0.9x4 ≤ 40
  x1, x2, x3, x4 ≥0

- The optimal solution is



Assignment 05

Exercise

1. Make an example of linear program has not feasible region (i.e., there are no solutions)
2. Make an example of linear problem for which the optimal solution is unbounded

(These questions anticipate some topic of the next lecture, so do your best. Wrong answers do not affects the evaluation of the assignment)

Assignment 05

Exercise

Solution

See Lecture 7