

dOpt 2010 - Problems for seventh tutorial

The tutorial of the seventh week of the course concerns (*mixed*) *integer linear programs*.

1. March 2007, Problem D
2. August 2005, Problem 4
3. August 2007, Problem F
4. August 2009, Problem E
5. Consider the following instance of the Knapsack problem. The capacity of the knapsack is 13. We have four items:
 - Item A has value 45\$ and size 10.
 - Item B has value 30\$ and size 3.
 - Item C has value 30\$ and size 5.
 - Item D has value 20\$ and size 5.

We want this instance solved using the branch-and-bound algorithm (and please do do, even if you can solve it by staring at it.....)

- (a) Formulate the instance as an integer linear program P
 - (b) What is the optimal solution x^* to the relaxation P' of P where integrality constraints are ignored?
 - (c) The two subproblem generated by the branch-and-bound algorithm after finding the optimal solution to P' corresponds to including or not including a particular item in the knapsack. Which item?
 - (d) Suppose the branch-and-bound algorithm considers first the subproblem corresponding to *not* including the item. What is the optimal solution to its relaxation? What is the optimal solution to the subproblem itself?
 - (e) Next, the branch-and-bound algorithm considers the subproblem corresponding to including the item. What is the optimal solution to its relaxation? What will the branch-and-bound algorithm do after computing it?
 - (f) What is the optimal solution to the original knapsack instance?
6. March 2008, Problem 3
 7. MILP, exercise 7