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Practice Assignment 6

Problem 1) variables: the following variables will represent the necessary transports

x_1 = # of shnupells Mexico → New York

x_2 = # of shnupells Mexico → California

x_3 = # of shnupells Kansas → New York

x_4 = # of shnupells Kansas → New York

objective: min $4x_1 + x_2 + 2x_3 + 3x_4$

s.t. $x_1 + x_2 \leq 8$ (Mexico production)

$x_3 + x_4 \leq 15$ (Kansas production)

$x_1 + x_3 \leq 10$ (New York consumption)

$x_2 + x_4 \leq 13$ (California consumption)

$x_1, x_2, x_3, x_4 \geq 0$

Problem 2) n actors, actor i charges s_i dollars

m investors, investor j will invest p_j dollars if certain actors chosen

variables: x_i is some actor

y_j is some investor

objective: $\max \sum_{i}^{m} y_i \cdot p_i - \sum_{j}^{n} x_j \cdot s_j$

s.t. $x_i \geq y_j$ for all i part of L_j

$0 \leq x_i \leq 1$ for all i

$0 \leq y_j \leq 1$ for all j

This makes it so that if we pick an investor y_j, we must select all of his actors x_i. The profit is found after subtracting the actors salaries.

Problem 3) (a) i. false, because X is not in polynomial time

ii. true, because X reduces from an NP complete problem in polynomial time

(b) i. true, because Y reduced from an NP complete problem and is at least as hard as X

(c) i. yes, because they can both reduce into each other by the definition of being NP complete.

Problem 4) If a problem can be solved in polynomial time, then it can also be proven in polynomial time. Since it took at least quadratic time to traverse the table, finding the max out of those must have taken up to polynomial time since it is NP. Proving it will take no longer than solving it, therefore P = NP. This is because in order to prove it, you must prove that there is no better optimal solution.