

CSC373 Worksheet 6 Solution

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1. Notes:

- **Linear Programming**

- Is a method to achieve the best outcome (such as maximum profit or lowest cost) in a mathematical model whose requirements are represented by linear relationships. ^[1]
- Is named to make it sound cool for government funding
 - * Like dynamic programming
- Applications
 - * Microeconomics (maximize profits, minimize costs)
 - * Company management

- **Standard Form**

- Is a form of linear programming
- Are about maximizing, not minimizing ^[2]
- All variables involved are restricted to be non-negative ^[3]
- All constraints are equalities, with constant, non-negative right-hand ^[3] sides

Example:

Minimize

$$80x + 60y$$

subject to

$$x + y - s_1 = 1$$

$$-.05x + .07y + s_2 = 0$$

$$x, y, s_1, s_2 \geq 0.$$

- **Converting Linear Programming to Standard Form**

- 1) Multiply inequality by -1 to get non-negative RHS ^[3]
- 2) Convert inequalities to equalities by adding or subtracting non-negative slack variables ^[3]
- 3) Resolve unrestrictive variables by writing the variable as the difference of two new non-negative variables ^[3]

Example:

Minimize

$$80x + 60y$$

subject to

$$x + y \geq 1$$

$$-.05x + .07y \leq 0$$

$$x, y \geq 0.$$

Introduce two new variables $s_1, s_2 \geq 0$.
Convert inequalities to equalities

Minimize

$$80x + 60y$$

subject to

$$x + y - s_1 = 1$$

$$-.05x + .07y + s_2 = 0$$

$$x, y, s_1, s_2 \geq 0.$$

References:

- 1) Wikipedia, Linear Programming, [link](#)
- 2) Instituto de Matematicas, Standard form for Linear Programs, [link](#)
- 3) University of Notre Dame, Converting an LP to standard form, [link](#)