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CS 530
FALL 2019

The Simplex Algorithm - In brief,

1. Start with LP in slack form,

$$\text{Maximize } 13a + 23b$$

subject to :

$$\begin{aligned} \text{i.} \quad & 5a + 15b + S_c &= 480 \\ \text{ii.} \quad & 4a + 4b + S_H &= 160 \\ \text{iii.} \quad & 35a + 20b + S_M &= 1190 \\ & a, b, S_c, S_H, S_M \geq 0. \end{aligned}$$

2. FIND a feasible solution.

$$\text{Set } a=b=0 \quad S_c=480, S_H=160, S_M=1190$$

non-basic var. basic var.

3. Pivot on non-basic var.

Choose b and first constraint (i), $\frac{15b}{15}$ (by min ratio rule).Solve for b :

$$b = 32 - \frac{1}{3}a - \frac{1}{15}S_c$$

Eliminate b from (ii), (iii) to obtain:

$$\text{(i)} \quad \frac{1}{3}a + b + \frac{1}{15}S_c = 32 \quad \text{all vars} \geq 0.$$

$$\text{(ii)} \quad \frac{8}{3}a - \frac{4}{15}S_c + S_H = 32$$

$$\text{(iii)} \quad \frac{85}{3}a - \frac{4}{3}S_c + S_M = 550$$

OBJ. FUNCTION:

$$\text{max } \frac{16}{3}a - \frac{23}{15}S_c$$

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4. Pivot on non-basic variable

Choose a and constraint (ii), $(\frac{8}{3}a)$
(coeff $a > 0$) (MRR)

Eliminate a from (i), (iii) to obtain.

$$\begin{array}{lcl}
 \text{i} & b + \frac{1}{10} S_c + \frac{1}{8} S_H & = 28 \\
 \text{ii} & a - \frac{1}{10} S_c + \frac{3}{8} S_H & = 12 \\
 \text{iii} & -\frac{25}{6} S_c + \frac{85}{8} S_H + S_M & = 110
 \end{array}$$

$$a, b, S_c, S_H, S_M \geq 0.$$

Objective function:

$$\max -S_c - 2S_H$$

