

# S H E E T 4

## Simplex Method

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### IM423 – OPERATIONS RESEARCH

Use the simplex method (in algebraic form) to solve the following LP models.

1. Maximize  $Z = x_1 + 2x_2 + 2x_3$

Subject to

$$\begin{aligned} 5x_1 + 2x_2 + 3x_3 &\leq 15 \\ x_1 + 4x_2 + 2x_3 &\leq 12 \\ 2x_1 + x_3 &\leq 8 \end{aligned}$$

and

$$\begin{aligned} x_1 &\geq 0 \\ x_2 &\geq 0 \\ x_3 &\geq 0 \end{aligned}$$

2. Maximize  $Z = 2x_1 + 4x_2 + 3x_3$

Subject to

$$\begin{aligned} 3x_1 + 4x_2 + 2x_3 &\leq 60 \\ x_1 + 3x_2 + 2x_3 &\leq 80 \end{aligned}$$

and

$$\begin{aligned} x_1 &\geq 0 \\ x_2 &\geq 0 \\ x_3 &\geq 0 \end{aligned}$$

3. Maximize  $Z = 4x_1 + 3x_2 + 6x_3$

Subject to

$$\begin{aligned} 3x_1 + x_2 + 3x_3 &\leq 30 \\ 2x_1 + 2x_2 + 3x_3 &\leq 40 \end{aligned}$$

and

$$\begin{aligned} x_1 &\geq 0 \\ x_2 &\geq 0 \\ x_3 &\geq 0 \end{aligned}$$

4. Maximize  $Z = x_1 + 2x_2 + 4x_3$

Subject to

$$\begin{aligned} 3x_1 + x_2 + 5x_3 &\leq 10 \\ x_1 + 4x_2 + x_3 &\leq 8 \\ 2x_1 + 2x_3 &\leq 7 \end{aligned}$$

and

$$\begin{aligned} x_1 &\geq 0 \\ x_2 &\geq 0 \\ x_3 &\geq 0 \end{aligned}$$

5. Maximize  $Z = x_1 + 2x_2 + 2x_3$

Subject to

$$\begin{aligned} 5x_1 + 2x_2 + 3x_3 &\leq 15 \\ x_1 + 4x_2 + 2x_3 &\leq 12 \\ 2x_1 + x_3 &\leq 8 \end{aligned}$$

and

$$\begin{aligned} x_1 &\geq 0 \\ x_2 &\geq 0 \\ x_3 &\geq 0 \end{aligned}$$

$$6. \text{ Maximize } Z = 5x_1 + 3x_2 + 4x_3$$

Subject to

$$2x_1 + x_2 + x_3 \leq 20$$

$$3x_1 + x_2 + 2x_3 \leq 30$$

and

$$x_1 \geq 0 \quad x_2 \geq 0 \quad x_3 \geq 0$$

$$7. \text{ Maximize } Z = 2x_1 + 4x_2 + 3x_3$$

Subject to

$$x_1 + 3x_2 + 2x_3 \leq 30$$

$$x_1 + x_2 + x_3 \leq 24$$

$$3x_1 + 5x_2 + 3x_3 \leq 60$$

and

$$x_1 \geq 0 \quad x_2 \geq 0 \quad x_3 \geq 0$$

$$8. \text{ Maximize } Z = x_1 + x_2 + 3x_3 + 2x_4$$

Subject to

$$x_1 + 2x_2 - 3x_3 + 5x_4 \leq 4$$

$$5x_1 - 2x_2 + 6x_4 \leq 8$$

$$2x_1 + 3x_2 - 2x_3 + 3x_4 \leq 3$$

$$-x_1 + x_3 + 2x_4 \leq 0$$

and

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