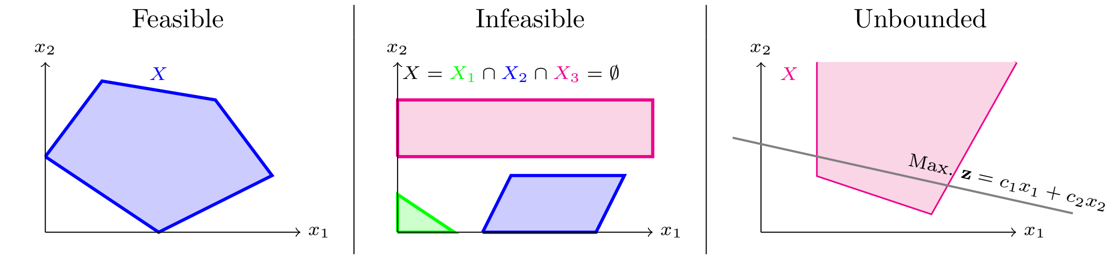
Mathematical programming:

$$\frac{\text{max.}}{\text{min.}}\ f(\mathbf{x})\colon \mathbf{x} \in X$$



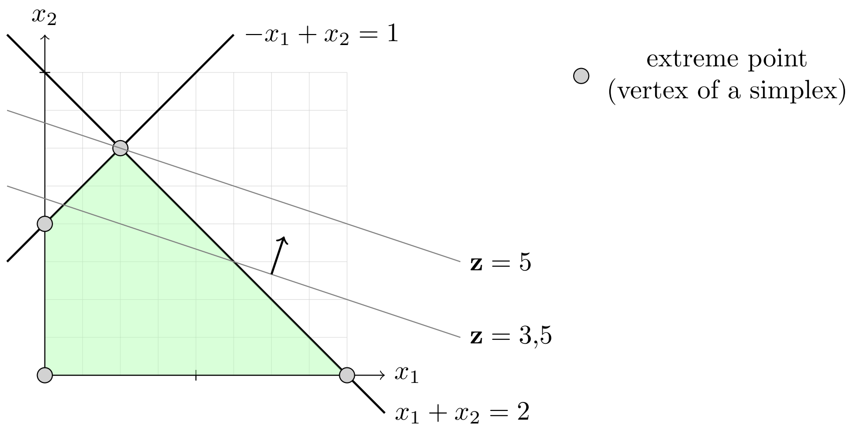
Linear programming:

Abbreviated notation (based on book by *Pióro & Medhi*):

Instead of	**We will write**
$\forall_{i\in I}\, f(x_i) = y_i$	$f(x_i) = y_i \quad i = 1, \ldots, \lvert I\rvert$
$x_{11} + x_{12} + x_{13} = y_1$	$\sum_{i=1}^{3} x_{1i} = y_1$ or $\sum_{i=1}^{3} x_{1i} = y_1$
$\begin{cases} x_{11} + x_{12} + x_{13} = y_1 \\ x_{21} + x_{22} + x_{23} = y_2 \end{cases}$	$\sum_{i=1}^{3} x_{ji} = y_j \quad j = 1, 2$

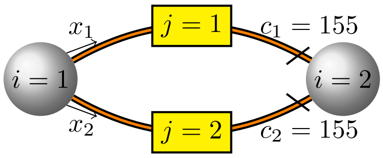
Mathematical description:

Problem formulation	Max $\mathbf{z} = x_1 + 3x_2$ $\begin{cases} -x_1 + x_2 \le 1 \\ x_1 + x_2 \le 2 \\ x_1, x_2 \ge 0 \end{cases}$ By default: $x_1, x_2 \in \mathbb{R}$
Indices	$1, 2$ (e.g., in $x_{\mathbf{1}}$, $x_{\mathbf{2}}$)
Constants	$-1, 0, 1, 2, 3$ (e.g., in $\mathbf{1}x_1 + \mathbf{3}x_2$, $\mathbf{1}x_1 + \mathbf{1}x_2 \le \mathbf{2}$)
Variables	x_1, x_2
Goal function (objective)	$\mathbf{z} = x_1 + 3x_2$
Constraint	E.g., $-x_1 + x_2 \le 1$
Feasible solution	E.g., $\mathbf{x} = \left[1, \frac{1}{2}\right]$, tj. $\begin{cases} x_1 = 1 \\ x_2 = \frac{1}{2} \end{cases}$
Optimal solution	$\mathbf{x}^{\text{opt}} = \left[\frac{1}{2}, 1\frac{1}{2}\right]$
Graphical solution	



Maximum flow problem:

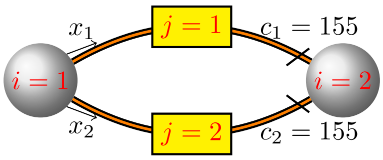
$$\max \sum_j x_j$$



$$x_j \leq c_j \quad j = 1, 2$$

Indices

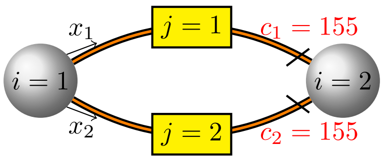
$$\max \sum_j x_j$$



$$x_j \leq c_j \quad j = 1, 2$$

Constants

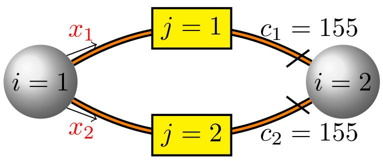
$$\max \sum_j x_j$$



$$x_j \leq c_j \quad j = 1, 2$$

Variables

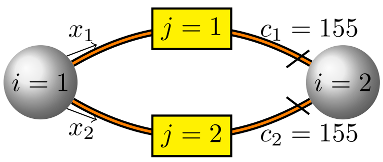
$$\max \sum_j x_j$$



$$x_j \leq c_j \quad j = 1, 2$$

Goal function

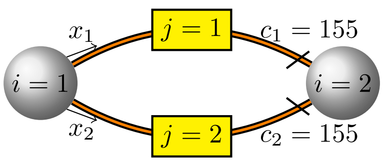
$$\max \sum_j x_j$$



$$x_j \leq c_j \quad j = 1, 2$$

Constraints

$$\max \sum_j x_j$$



$$x_j \leq c_j \quad j = 1, 2$$