課程講義(04-1)：線性規劃回顧與進階主題

- **AN EXAMPLE OF LINEAR PROGRAMMING**
  - □ Homewood Masonry -- A Material Production Problem

Resource	HYDIT	FILIT	Availability
Wahash Red Clay	2 m^3/ton	4 m^3/ton	28 m^3/wk
Blending time	5 hr/ton	5 hr/ton	50 hr/wk
Curing vat capacity	8 tons	6 tons	
Profit	\$140/ton	\$160/ton	

1. Algebraic formulation with numerical coefficients

$$\text{Maximize Profit } z = 140x_1 + 160x_2$$

Subject to

$$2x_1 + 4x_2 \le 28$$
$$5x_1 + 5x_2 \le 50$$
$$x_1 \le 8$$
$$x_2 \le 6$$

2. Algebraic formulation with symbolic coefficients

$$\text{Maximize Profit } z = \sum_{j=1}^{2} c_j\, x_j$$

Subject to

$$\sum_{j=1}^{2} a_{ij} x_j \le b_i; \qquad i = 1, \cdots, 4$$

$$\boldsymbol{c} = \{c_j\} = [140, 160] \quad \boldsymbol{b} = \{b_i\} = \begin{bmatrix} 28 \\ 50 \\ 8 \\ 6 \end{bmatrix} \quad \boldsymbol{A} = \{a_{ij}\} = \begin{bmatrix} 2 & 4 \\ 5 & 5 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}$$

3. Matrix formulation

$$\text{Maximize Profit } z = \boldsymbol{c}' \cdot \boldsymbol{x}$$

$$z = [140, 160] \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Subject to

$$\boldsymbol{A} \cdot \boldsymbol{x} \le \boldsymbol{b}$$

$$\begin{bmatrix} 2 & 4 \\ 5 & 5 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \le \begin{bmatrix} 28 \\ 50 \\ 8 \\ 6 \end{bmatrix}$$