1. Consider the following problem: max $x_1 + x_2$ s.t. $|x1 - x2| \leq 10$

   Can I solve this problem with a linear program? If so, how?

   Answer:

$$\begin{aligned} \max \quad & x_1 + x_2 \\ s.t. \quad & x_1 - x_2 \leq 10 \\ & x_1 - x_2 \geq -10 \end{aligned}$$

2. Consider the following problem:

$$\min \ \max\{x_1, x_2, x_3\} \ \ s.t.\ 3x_1 + 2x_2 - 5x_3 \leq 8$$

   Can I solve this problem with a linear program? If so, how?

   Answer:

$$\begin{aligned} \min \quad & t \\ s.t. \quad & 3x_1 + 2x_2 - 5x_3 \leq 8 \\ & x_1 \leq t \\ & x_2 \leq t \\ & x_3 \leq t \end{aligned}$$

3. Exercise 7.2 in Algorithms.

   Answer: Let $x_{i,j}$ be the number of shnupells of duckwheat produced in city i and consumed in city j.

$$\begin{aligned} \min \quad & 4 \cdot x_{M,N} + 1 \cdot x_{M,C} + 2 \cdot x_{K,N} + 3x_{K,C} \\ s.t. \quad & x_{K,N} + x_{K,C} \leq 15 \\ & x_{M,N} + x_{M,C} \leq 8 \\ & x_{K,N} + x_{M,N} \leq 10 \\ & x_{K,C} + x_{M,C} \leq 13 \\ & x_{K,N}, x_{M,N}, x_{M,N}, x_{M,C} \geq 0 \end{aligned}$$

4. Exercise 7.29 part (a) in Algorithms.

   Answer: Let $x_j = 1$ mean that investor j is investing in the movie, 0 otherwise. Let $y_i = 1$ mean that actor i is acting in the movie, 0 otherwise.

$$\begin{aligned} \max \quad & \textstyle\sum_{j=1}^{m} x_j p_j - \sum_{i=1}^{n} y_i s_i \\ s.t. \quad & x_j |L_j| \leq \textstyle\sum_{i \in L_j} y_i \\ & x_j, y_i \in \{0, 1\} \end{aligned}$$