

1 Question 1

1.1 Question 1.(a)

1.1.1 Assumption

A maximum linear programming problem was described in this question. We assume that:

1. We will install central air conditioner K, the number of which is x , and split-type air conditioner Y, the number of which is y .
2. We only install air conditioners once.
3. Although x and y is integer, we consider them as non-negative real number first.

1.1.2 Analysis

We can easily find that there are two constrains, namely, budget constrains and amount constrains.

1. We can not install more than 12 air conditioners or install a negative number of air conditioners.
2. Total budget for all installation is $\text{€}24000 + 300E1$, where $E1 = 9$.

1.1.3 Model

According to analysis above, we can formalize this optimization problem, we have:

$$\begin{aligned} \max_{x,y} \quad & 4x + 2.5y \\ \text{s.t.} \quad & x + y \leq 12 \\ & 3000x + 1500y \leq 24000 + 300E1 \\ & x, y \geq 0 \end{aligned} \tag{1}$$

Obviously, model above isn't a standard form of linear programming problem, we can transform it into standard form, and we have:

$$\begin{aligned} - \min_{x,y,s_1,s_2} \quad & -4x - 2.5y \\ \text{s.t.} \quad & x + y + s_1 = 12 \\ & 3000x + 1500y + s_2 = 24000 + 300E1 \\ & x, y, s_1, s_2 = 0 \end{aligned} \tag{2}$$

Formula (2) is a standard form of LP problem described in Task1.(a).