Recall: **The general form of a linear program**

For the objective variables $x_1, \ldots, x_n$ find the minimum (or the maximum) of the objective function

$$z = c_1x_1 + \ldots + c_nx_n$$

subject to the constraints:

$$a_{i1}x_1 + \ldots + a_{in}x_n \begin{array}{c}\leq\\=\\\geq\end{array} b_i$$

for $i = 1, \ldots, m$, and possibly $x_j \geq 0$ for $j = 1, \ldots, n$.

The *equality* (or *standard*) form of a linear program:

- we are looking for the maximum;
- all constraints are of the form

$$a_{i1}x_1 + \ldots + a_{in}x_n = b_i$$

- we require that $x_j \geq 0$ for $j = 1, \ldots, n$.

Fact

Every linear program can be converted to the equality form.

Example. Convert the following linear program to the equality form.

Minimize the function

$$z = 6x_1 - 10x_2$$

subject to the constraints:

$$\begin{aligned} 5x_1 + 7x_2 &\leq 8 \\ 4x_1 + 2x_2 &\geq 10 \\ x_1 &\geq 0 \\ x_2 &\in \mathbb{R} \end{aligned}$$

The *inequality* form of a linear program:

- we are looking for the maximum;
- all constraints are of the form

$$a_{i1}x_1 + \ldots + a_{in}x_n \leq b_i$$

- we require that $x_j \geq 0$ for $j = 1, \ldots, n$.

Fact

Every linear program can be converted to the inequality form.