

决策变量:

用 $i=1$ 表示甲, $i=2$ 表示乙, $i=3$ 表示丙

$j=1$ 表示原材料1, $j=2$ 表示原材料2, $j=3$ 表示原材料3

即用 x_{ij} 表示第 i 种(甲、乙、丙)产品中原材料 j 的含量

目标函数(利润)

$$\begin{aligned} \text{Max } Z = & 50(x_{11} + x_{12} + x_{13}) + 35(x_{21} + x_{22} + x_{23}) + 25(x_{31} \\ & + x_{32} + x_{33}) - 65(x_{11} + x_{21} + x_{31}) - 25(x_{12} + x_{22} + x_{32}) - \\ & 35(x_{13} + x_{23} + x_{33}) \end{aligned}$$

约束条件:

$$\begin{aligned} \text{规格要求: } \left\{ \begin{array}{l} x_{11} \geq (x_{11} + x_{12} + x_{13}) \times 0.5 \\ x_{12} \leq (x_{11} + x_{12} + x_{13}) \times 0.25 \\ x_{21} \geq (x_{21} + x_{22} + x_{23}) \times 0.25 \\ x_{22} \leq (x_{21} + x_{22} + x_{23}) \times 0.5 \end{array} \right. \end{aligned}$$

$$\begin{aligned} \text{原材料要求 } \left\{ \begin{array}{l} x_{11} + x_{21} + x_{31} \leq 100 \\ x_{12} + x_{22} + x_{32} \leq 100 \end{array} \right. \end{aligned}$$

$$x_{13} + x_{23} + x_{33} \leq 60$$

$$x_{ij} \geq 0 \quad i=1,2,3 \quad j=1,2,3$$

整理后约束条件:

$$\begin{cases} -x_{11} + x_{12} + x_{13} \leq 0 \\ -x_{11} + 3x_{12} - x_{13} \leq 0 \\ -3x_{21} + x_{22} + x_{23} \leq 0 \\ -x_{21} + x_{22} - x_{23} \leq 0 \end{cases}$$

$$x_{ij} \geq 0$$

$$x_{11} + x_{21} + x_{31} \leq 100$$

$$x_{12} + x_{22} + x_{32} \leq 100$$

$$x_{13} + x_{23} + x_{33} \leq 60$$

整理后 $\max Z = -15x_{11} + 25x_{12} + 15x_{13} - 30x_{21} + 10x_{22}$
 $+ 0x_{23} - 30x_{31} + 0x_{32} - 10x_{33}$

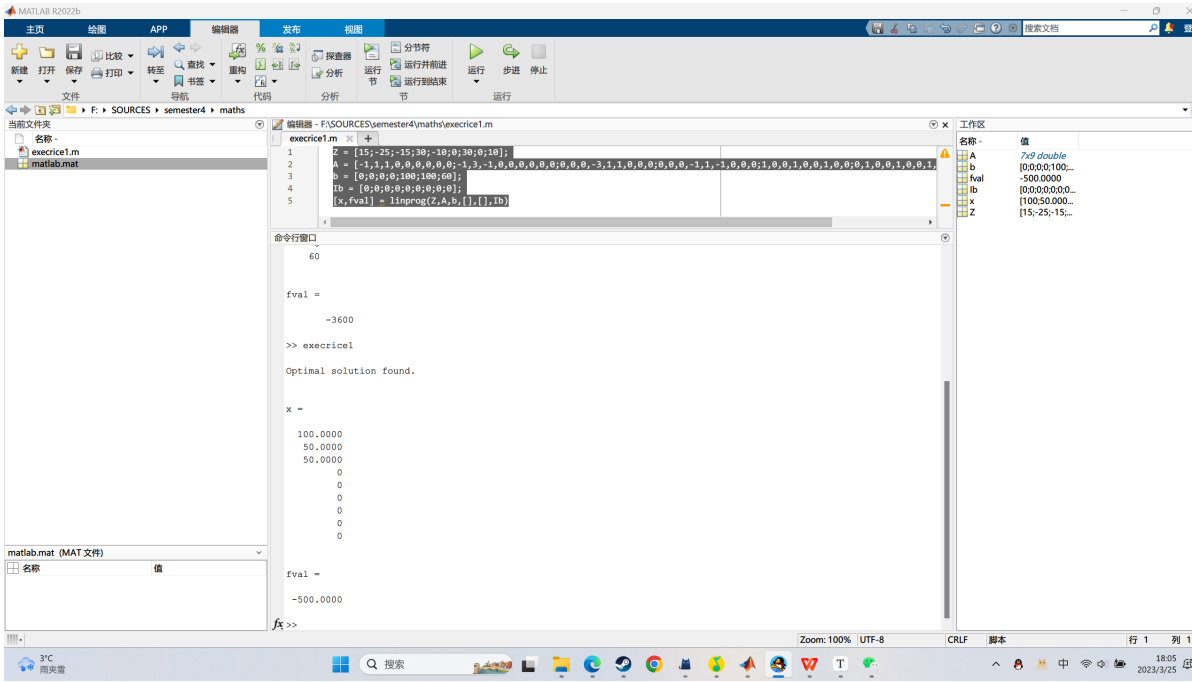
因为matlab的linprog是算的是最小值，故将Z加上负号，即有matlab代码如下：

```

Z = [15;-25;-15;30;-10;0;30;0;10];
A =
[-1,1,1,0,0,0,0,0,0;-1,3,-1,0,0,0,0,0,0;0,0,0,-3,1,1,0,0,0;0,0,0,-1,1,-1,0,0,0;1
,0,0,1,0,0,1,0,0;0,1,0,0,1,0,0,1,0;0,0,1,0,0,1,0,0,1];
b = [0;0;0;0;100;100;60];
Ib = [0;0;0;0;0;0;0;0;0];
[x,fval] = linprog(Z,A,b,[],[],Ib)

```

结果如下:



通过程序返回结果可知 当 $X_{11} = 100, X_{12} = 50, X_{13} = 50$ 其他 x 等于0时 Z 取最大值 $Z_{\max} = 500$