

A

① The purpose of linear programming is to optimize some objective function given a set of constraints on the values of x and y . These constraints are usually provided as a system of inequalities.

Application in Engineering

① Engineers use LP to solve design and manufacturing problems.

② It is used to allocate scarce resources to competing activities in an optimal manner.

③ It is used in planning, designing and modelling raw materials allocation and production scheduling.

④

B

Objective function

$$\max Z = 30x_1 + 20x_2$$

subject to:

$$2x_1 + x_2 \leq 1000$$

$$x_1 + x_2 \leq 800$$

$$x_1, x_2 \geq 0$$

$$Z - 30x_1 - 20x_2 = 0$$

x_1	x_2	s_1	s_2	Z
2	1	1	0	1000
1	1	0	1	800
-30	-20	0	0	0

$$R_1 = \text{Row 1} / 2, \quad R_3 = 30R_1 + R_3$$

$$R_2 = -R_1 + R_2$$

x_1	x_2	s_1	s_2	Z
1	1/2	1/2	0	500
1	1	0	1	800
-30	-20	0	0	0

1	1/2	1/2	0	500
0	1/2	-1/2	1	300
0	-5	15	0	15000

$$\begin{array}{cccc|c}
 x_1 & x_2 & s_1 & s_2 & z \\
 \hline
 (1) & 1/2 & 1/2 & 0 & 500 \\
 0 & (1/2) & -1/2 & 1 & 300 \\
 \hline
 0 & -5 & 15 & 0 & 15000
 \end{array}$$

$$R_2 \rightarrow 2R_2$$

$$\begin{array}{cccc|c}
 x_1 & x_2 & s_1 & s_2 & z \\
 \hline
 1 & 1/2 & 1/2 & 0 & 500 \\
 0 & (1) & -1 & 2 & 600 \\
 \hline
 0 & -5 & 15 & 0 & 15000
 \end{array}$$

$$R_1 = \frac{-1R_2 + R_1}{2}$$

$$R_3 = 5R_2 + R_3$$

$$\begin{array}{cccc|c}
 x_1 & x_2 & s_1 & s_2 & z \\
 \hline
 1 & 0 & 1 & -1 & 200 \\
 0 & (1) & -1 & 2 & 600 \\
 \hline
 0 & -5 & 15 & 0 & 15000
 \end{array}$$

$$\begin{array}{cccc|c}
 x_1 & x_2 & s_1 & s_2 & z \\
 \hline
 1 & 0 & 1 & -1 & 200 \\
 0 & (1) & -1 & 2 & 600 \\
 \hline
 0 & 0 & 10 & -2 & 18000
 \end{array}$$

$$\begin{array}{l}
 x_1 = 200, \quad x_2 = 600 \text{ and} \\
 z = 18000
 \end{array}$$

In conclusion

So to optimize the objective function
 $\max Z$, X_1 must be equal to 200 and
 X_2 must be equal to 600 respectively.