Linear Programming is a mathematical method that is used to determine the best possible outcome or solution from a given set of parameters or list of requirements, which are represented in the form of linear relationships. It is most often used in computer modeling or simulation in order to find the best solution in allocating finite resources such as money, energy, manpower, machine resources, time, space and many other variables. In most cases, the best outcome needed from linear programming is maximum profit or lowest cost.

Application in Engineering

Engineers use linear programming to help solve design and manufacturing problems. For example in air foils meshes engineers seek aerodynamic shape optimization. This allows for the reduction of the drag coefficient of the air foil. Constraints may include coefficient, relative maximum thickness nose radius and trailing edge angle. Shape optimization seeks to make a shock-free airfoil with a feasible shape. Linear programming therefore provides engineers with an essential tool in shape optimization

~~$-R_1 + R_2$~~

$$2x_1 + x_2 \leq 1000$$
$$x_1 + x_2 \leq 800$$

$$Z = 30x_1 + 20x_2$$

$$-30x_1 - 20x_2 + P = 0$$
$$2x_1 + x_2 + S_1 = 1000$$
$$x_1 + x_2 + S_2 = 800$$

x_1	x_2	S_1	S_2	P	
2	1	1	0	0	1000
1	1	0	1	0	800
-30	-20	0	0	1	0

$1000/2 = 500$
$800/1 = 800$

-30 is our pivot column

~~Multiply~~ $\frac{1}{2}R_1 \to R_1$

1	$\frac{1}{2}$	$\frac{1}{2}$	0	0	500
1	1	0	1	0	800
-30	-20	0	0	1	0

← our new R_1

~~R~~ $-1R_1 + R_2 \to R_2$

1	$\frac{1}{2}$	$\frac{1}{2}$	0	0	500
0	$\frac{1}{2}$	$-\frac{1}{2}$	1	0	300
-30	-20	0	0	1	0

$-30R_1 + R_3 \to R_3$

1	$\frac{1}{2}$	$\frac{1}{2}$	0	0	500
0	$\frac{1}{2}$	$-\frac{1}{2}$	1	0	300
0	-5	15	0	1	15000

$2R_2 \to R_2$

x_1	x_2	s_1	s_2	P	b
1	$\frac{1}{2}$	$\frac{1}{2}$	0	0	500
0	$\frac{1}{2}$	$-\frac{1}{2}$	2	0	600
0	-5	15	0	1	15000

$5R_2 + R_3$

x_1	x_2	s_1	s_2	P	b
1	0	1	-1	0	200
0	1	-1	2	0	600
0	-5	15	0	1	15000

x_1	x_2	s_1	s_2	P	b
1	0	1	-1	0	200
0	1	-1	2	0	600
0	0	10	10	1	18000

$x_1 = 200$

$x_2 = 600$

$Z = 18000$