15/ENG02/003
Aikpokpodion Enoch E

- Defining the variables
  x = printers produced weekly
  y = keyboards produced weekly

- Defining objective function, Z

$$Z = 30x + 20y$$

subject to

$$2x + y \leq 1000$$
$$x + y \leq 800$$
$$x \leq 350$$
for $x, y \geq 0$

Adding slack variables to the constraints

$$2x + y + S_1 \leq 1000$$
$$x + y + S_2 \leq 800$$
$$x + S_3 \leq 350$$

- moving all the variables of the objective function to LHS $z - 30x - 20y = 0$

x	y	S_1	S_2	S_3	Z	
2	1	1	0	0	0	1000
1	1	0	1	0	0	800
1	0	0	0	1	0	350
-30	-20	0	0	0	1	0

From the table, It is not maximal because there is a negative entry on the last row.
Using the most negative indicator in the last row [-30]

$$\begin{array}{c} \begin{array}{cccccc} x & y & S_1 & S_2 & S_3 & Z \end{array} \\ \left[\begin{array}{cccccc|c} 2 & 1 & 1 & 0 & 0 & 0 & 1000 \\ 1 & 1 & 0 & 1 & 0 & 0 & 800 \\ 1 & 0 & 0 & 0 & 1 & 0 & 350 \\ \hline -30 & -20 & 0 & 0 & 0 & 1 & 0 \end{array}\right] \end{array}$$

Dividing the column by the values in the ~~col~~ indicator column

$$\begin{array}{c} R_1 \\ R_2 \\ R_3 \\ R_4 \end{array} \left[\begin{array}{cccccc|c} 2 & 1 & 1 & 0 & 0 & 0 & 1000 \\ 1 & 1 & 0 & 1 & 0 & 0 & 800 \\ 1 & 0 & 0 & 0 & 1 & 0 & 350 \\ \hline -30 & -20 & 0 & 0 & 0 & 1 & 0 \end{array}\right] \quad \begin{array}{l} \frac{1000}{2} = 500 \\ \frac{800}{1} = 800 \\ \frac{350}{1} = 350 \end{array}$$

The smallest non-negative value, would indicate the pivot element

where R_1 indicates Row 1
$R_2 \Rightarrow$ Row 2
$R_3 \Rightarrow$ Row 3
$R_4 \Rightarrow$ Row 4

$1 \times R_3 \rightarrow R_3 \Rightarrow [1\ 0\ 0\ 0\ 1\ 0\ 350]$

$-2R_3 + R_1 \rightarrow R_1 \Rightarrow [-2\ 0\ 0\ 0\ -2\ 0\ -700] + [2\ 1\ 1\ 0\ 0\ 0\ 1000]$

$-1R_3 + R_2 \rightarrow R_2 \Rightarrow [-1\ 0\ 0\ 0\ -1\ 0\ -350] + [1\ 1\ 0\ 1\ 0\ 0\ 800]$

$30R_3 + R_4 \rightarrow R_4 \Rightarrow [30\ 0\ 0\ 0\ 30\ 0\ 10500] + [-30\ -20\ 0\ 0\ 0\ 1\ 0]$

$\therefore$ ~~$R_1 = [2\,0\,0\,0\,2\,0$~~

$\therefore R_1 = [0\ 1\ 1\ 0\ -2\ 0\ 300]$
$R_2 = [0\ 1\ 0\ 1\ -1\ 0\ 450]$
$R_3 = [1\ 0\ 0\ 0\ 1\ 0\ 350]$
$R_4 = [0\ -20\ 0\ 0\ 30\ 0\ 10500]$

x	y	S_1	S_2	S_3	Z				
0	1	1	0	-2	0	300	$\frac{300}{1}$	300	300
0	1	0	1	-1	0	450	$\frac{450}{1}$		~~4~~ -20
1	0	0	0	1	0	350			
0	-20	0	0	30	1	10500			

x	y	S_1	S_2	S_3	Z		
0	1	1	0	-2	0	300	$1R_1 \rightarrow R_1$
0	0	-1	1	1	0	150	$-1R_1 + R_2 \rightarrow R_2$
1	-1	-1	0	1	0	50	$-1R_1 + R_3 \rightarrow R_3$
0	0	20	0	-10	20	10500	$20R_1 + R_4 \rightarrow R_4$

linear programming (also called linear optimization) is an optimization technique used for a system of linear constraints and a linear objective function. An objective function defines the quantity to be optimized and the ~~[illegible]~~ goal of linear programming is to find the values of the variable that maximizes or minimizes the objective function

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