1. **(Computer Center Staffing)**

Decision Variables:: x1,x2,x3 :Full time consultants

Y_1, Y_2, Y_3, Y_4 : Part time consultants

a.Objective Function:

The objective is to minimize staffing cost therefore the will be the equation

$Z_{Min}=48(Y_1+Y_2+Y_3+Y_4)+112(X_1+X_2+X_3)$

Constraints:

$X_1+Y_1 \geq 4$

$X_1+X_2+Y_2 \geq 8$

$X_2+X_3+Y_3 \geq 10$

$X_3+Y_4 \geq 6$

$X_1=2, X_2=2, X_3=3$, Y1=2,Y2=4,Y3=5,Y4=3

The min cost is $Z_{Min}=48(Y_1+Y_2+Y_3+Y_4)+112(X_1+X_2+X_3)$

= 48(14)+112(7)

Z_{Min} =$1456

b. since company decided to includes meal break,

The minimum staffing cost is $Z_{Min}=48(Y_1+Y_2+Y_3+Y_4)+112(X_1+X_2+X_3)$

Constraints:

$X_1+Y_1 \geq 4$

$X_1+X_2+Y_2 \geq 8$

$X_2+X_3+Y_3 \geq 10$

$X_3+Y_4 \geq 6$

To make sure each and every part-time has a full time consultant, I will hire two full time consultants in 12PM-8PM shift.

Hence, $X_1=2, X_2=5, X_3=3$, Y1=2,Y2=4,Y3=5,Y4=3

The min cost is $Z_{Min}=48(Y_1+Y_2+Y_3+Y_4)+112(X_1+X_2+X_3)$

$=48(14)+112(10)$

$\mathbf{Z_{Min} = \$1792}$

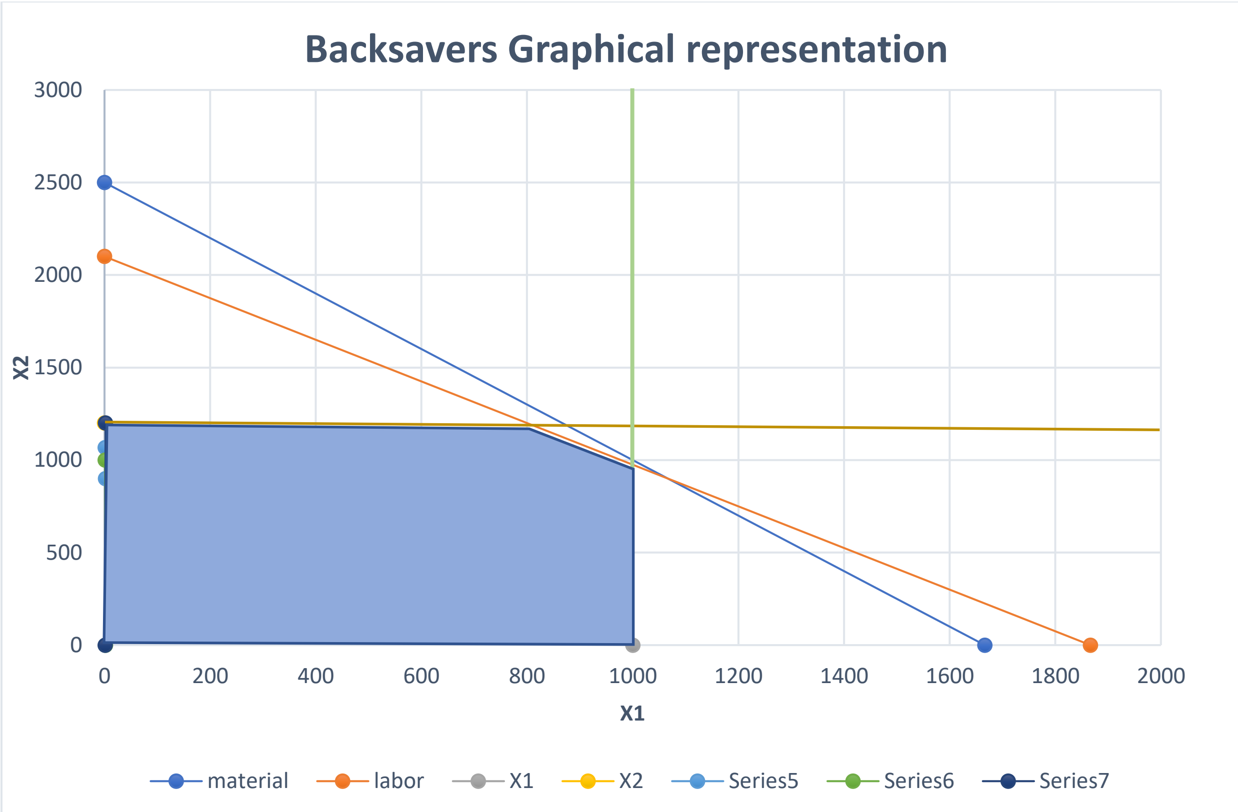
2) Backsavers LP graphical Representation:

	X1	X2	>=	0
Z	32	24		
material	3	2	<=	5000
labor	45	40	<=	84000

intercept	X1	X2	
material	0	2500	5000
	1666.667	0	5000
labor	0	2100	84000
	1866.667	0	84000

X1	≤	1000
X2	≤	1200

In the Graph, we have feasible region at cornor points (0,1200) (1000,0)



3) The decision variables are

x_{1L} = number of large units produced per day at Plant 1,

x_{1M} = number of medium units produced per day at Plant 1,

x_{1S} = number of small units produced per day at Plant 1,

x_{2L} = number of large units produced per day at Plant 2,

x_{2M} = number of medium units produced per day at Plant 2,

x_{2S} = number of small units produced per day at Plant 2,

x_{3L} = number of large units produced per day at Plant 3,

x_{3M} = number of medium units produced per day at Plant 3,

x_{3S} = number of small units produced per day at Plant 3.

The objective is to maximize

$$Z = 420(x_{1L} + x_{2L} + x_{3L}) + 360(x_{1M} + x_{2M} + x_{3M}) + 300(x_{1S} + x_{2S} + x_{3S})$$

subject to the following constraints.

Capacity constraints:

$$x_{1L} + x_{1M} + x_{1S} \le 750$$

$$x_{2L} + x_{2M} + x_{2S} \le 900$$

$$x_{3L} + x_{3M} + x_{3S} \le 450$$

Storage space constraints:

$$20x_{1L} + 15x_{1M} + 12x_{1S} \le 13000$$

$$20x_{2L} + 15x_{2M} + 12x_{2S} \le 12000$$

$$20x_{3L} + 15x_{3M} + 12x_{3S} \le 5000$$

Sale constraints:

$$x_{1L} + x_{2L} + x_{3L} \le 900$$

$$x_{1M} + x_{2M} + x_{3M} \le 1200$$

$$x_{1S} + x_{2S} + x_{3S} \le 750$$

Same capacity percentage constraints:

$$900(x_{1L} + x_{1M} + x_{1S}) - 750(x_{2L} + x_{2M} + x_{2S}) = 0$$

$$450(x_{2L} + x_{2M} + x_{2S}) - 900(x_{3L} + x_{3M} + x_{3S}) = 0$$

Nonnegativity constraints:

$$x_{1L} \ge 0,\ x_{1M} \ge 0,\ x_{1S} \ge 0,\ x_{2L} \ge 0,\ x_{2M} \ge 0,\ x_{2S} \ge 0,$$

$$x_{3L} \ge 0,\ x_{3M} \ge 0,\ x_{3S} \ge 0.$$