Question 1:

a) Convert to linear program problem:

Decision variables:

x = # of pounds of corn

y = # of pounds of soybean

Objective:

min (0.2*x+0.6*y)

Constraints:

x + y = 90

0.001*x + 0.002*y <= 90*1%

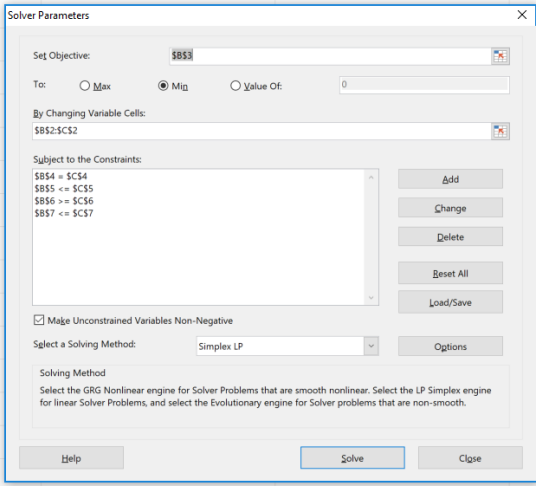
0.09*x + 0.6*y >= 90*30%

0.02*x + 0.06*y <= 90*5%

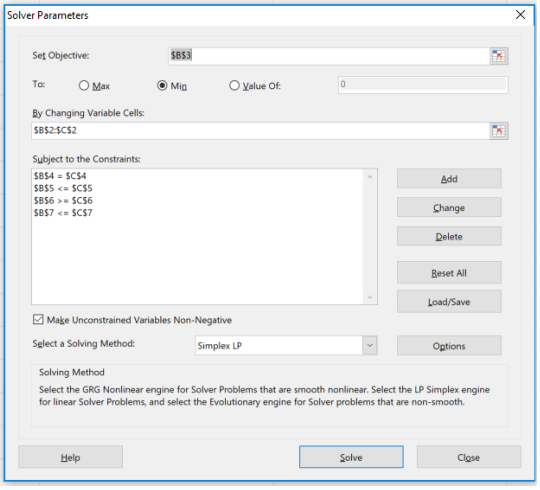
x, y >=0

b) Find the solution with Excel's Solver.

	B	C
1	x	y
2	1	1
3	=0.2*B2+0.6*C2	
4	=B2+C2	90
5	=0.001*B2+0.002*C2	=C4*1%
6	=0.09*B2+0.6*C2	=C4*30%
7	=0.02*B2+0.06*C2	=C4*5%
8		
9		
10		
11		
12		
13		
14		
15		



	B	C
1	x	y
2	52.9411764705882	37.0588235294118
3	=0.2*B2+0.6*C2	
4	=B2+C2	90
5	=0.001*B2+0.002*C2	=C4*1%
6	=0.09*B2+0.6*C2	=C4*30%
7	=0.02*B2+0.06*C2	=C4*5%
8		
9		
10		
11		
12		
13		
14		
15		



The optimal solution to our optimization problem is (x,y)=(52.94, 37.06) providing the objective value of 0.2*x+0.6*y = 32.82

Question 2:

a) Convert to linear program problem:

   a. Decision variables:

      x11: # of labors with 1 month of employment recruited in the 1st month
      x12: # of labors with 2 month of employment recruited in the 1st month
      x13: # of labors with 3 month of employment recruited in the 1st month
      x14: # of labors with 4 month of employment recruited in the 1st month
      x15: # of labors with 5 month of employment recruited in the 1st month
      x21: # of labors with 1 month of employment recruited in the 2nd month
      x22: # of labors with 2 month of employment recruited in the 2nd month
      x23: # of labors with 3 month of employment recruited in the 2nd month
      x24: # of labors with 4 month of employment recruited in the 2nd month
      x31: # of labors with 1 month of employment recruited in the 3rd month
      x32: # of labors with 2 month of employment recruited in the 3rd month
      x33: # of labors with 3 month of employment recruited in the 3rd month
      x41: # of labors with 1 month of employment recruited in the 4th month
      x42: # of labors with 2 month of employment recruited in the 4th month
      x51: # of labors with 1 month of employment recruited in the 5th month

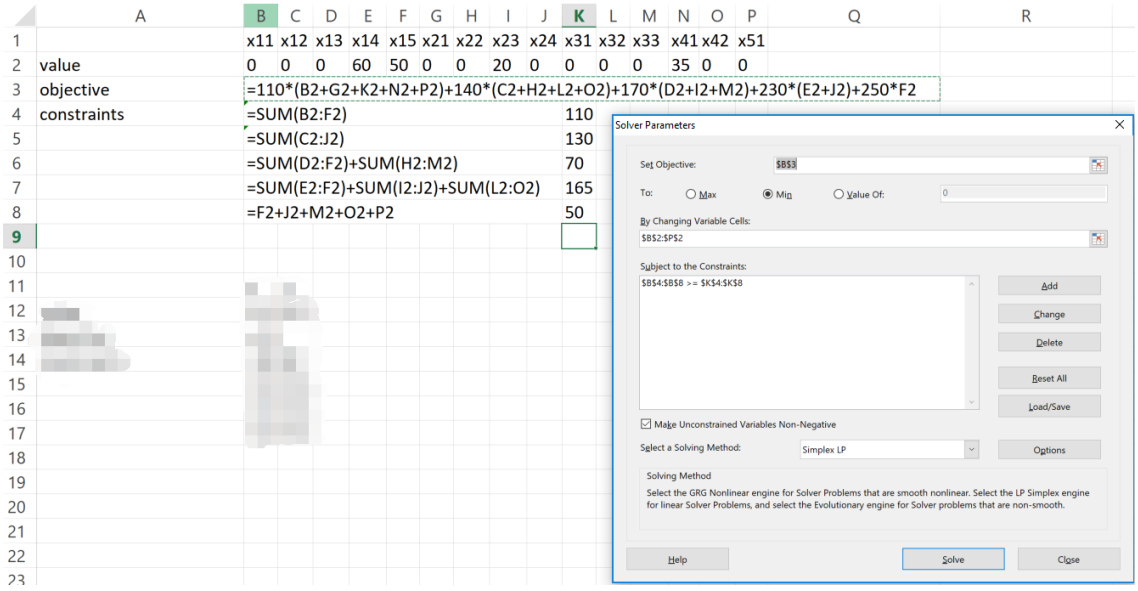
   b. Objective:

      min
      (110*(x11+x21+x31+x41+x51)+140*(x12+x22+x32+x42)+170*(x13+x23+x33)+230*(x14+x24)+250*x15)

   c. Constraints:

      x11+x12+x13+x14+x15>=110
      x12+x13+x14+x15+x21+x22+x23+x24>=130
      x13+x14+x15+x22+x23+x24+x31+x32+x33>=70
      x14+x15+x23+x24+x32+x33+x41+x42>=165
      x15+x24+x33+x42+x51>=50
      x11,x12,x13,x14,x15,x21,x22,x23,x24,x31,x32,x33,x41,x42,x51>=0

b) Find the solution with Excel's Solver.

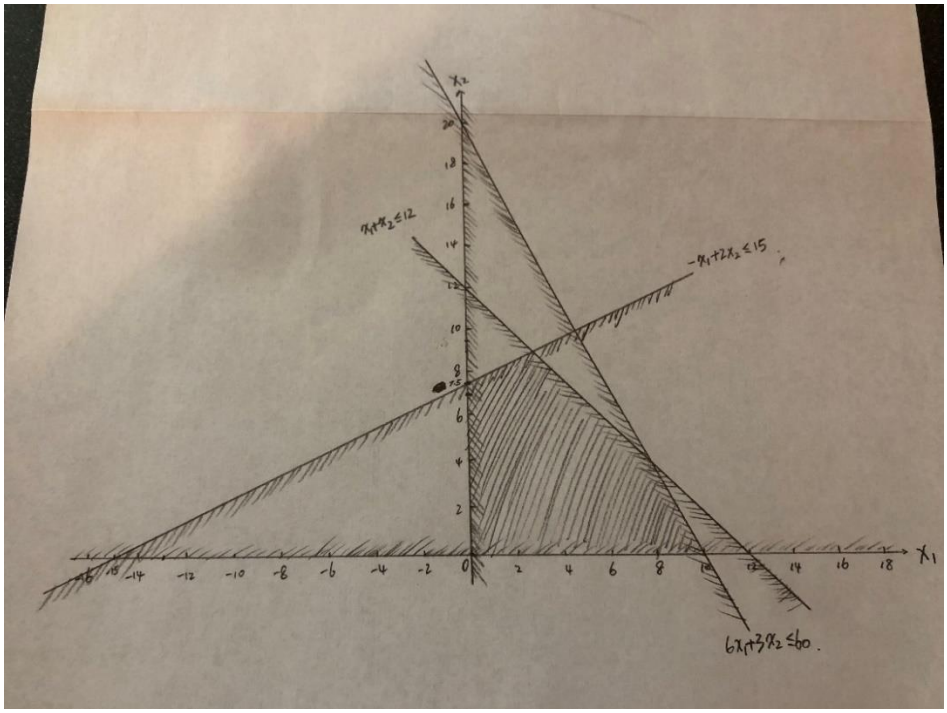


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1		x11	x12	x13	x14	x15	x21	x22	x23	x24	x31	x32	x33	x41	x42	x51		
2	value	0	0	0	60	50	0	0	20	0	0	0	0	35	0	0		
3	objective	=110*(B2+G2+K2+N2+P2)+140*(C2+H2+L2+O2)+170*(D2+I2+M2)+230*(E2+J2)+250*F2																
4	constraints	=SUM(B2:F2)									110							
5		=SUM(C2:J2)									130							
6		=SUM(D2:F2)+SUM(H2:M2)									70							
7		=SUM(E2:F2)+SUM(I2:J2)+SUM(L2:O2)									165							
8		=F2+J2+M2+O2+P2									50							
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		

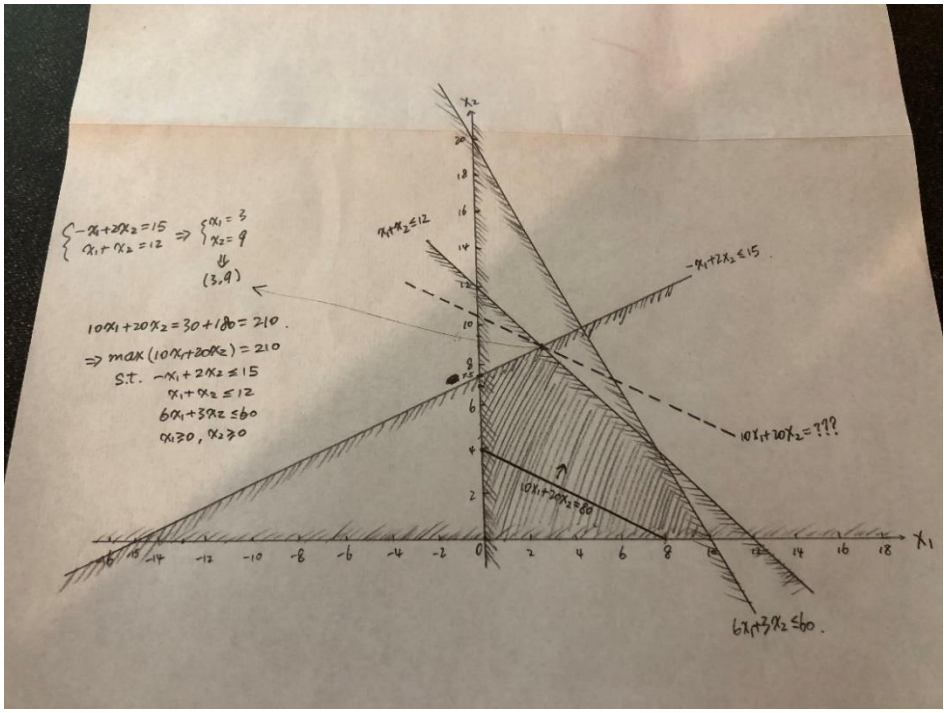
The optimal solution to our optimization problem is (x14,x15,x23,x41)=(60,50,20,35), where all the other decision variables = 0, providing the objective value of 33550.

Question 3:

(a)



(b)



Solution: The optimal values of the decision variables are (x1, x2) = (3, 9). The optimal value of the objective function is 210.

Question 4：

a) Convert to linear program problem:
   a. Decision variables:

      x11: # of units shipped from factory 1 to Customer 1
      x12: # of units shipped from factory 1 to Customer 2
      x13: # of units shipped from factory 1 to Customer 3
      x21: # of units shipped from factory 2 to Customer 1
      x22: # of units shipped from factory 2 to Customer 2
      x23: # of units shipped from factory 2 to Customer 3

   b. Objective:

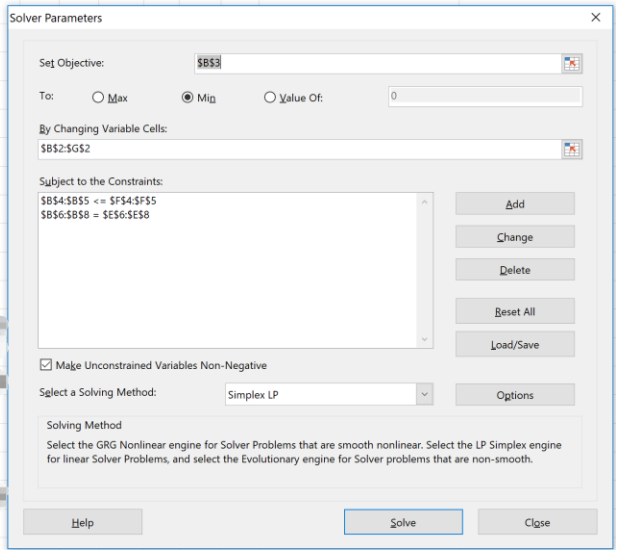
      min (600*x11+800*x12+700*x13+400*x21+900*x22+600*x23)

   c. Constraints:

      x11+x12+x13<=400
      x21+x22+x23<=500
      x11+x21=300
      x12+x22=200
      x13+x23=400
      x11,x12,x13,x21,x22,x23>=0

b) Find the solution with Excel's Solver:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1		x11	x12	x13	x21	x22	x23											
2	value	0	200	200	300	0	200											
3	objective	=600*B2+800*C2+700*D2+400*E2+900*F2+600*G2																
4	constraints	=B2+C2+D2		<=	400													
5		=E2+F2+G2		<=	500													
6		=B2+E2	=	300														
7		=C2+F2	=	200														
8		=D2+G2	=	400														
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		



Optimal values of the decision variables are (x11,x12,x13,x21,x22,x23)=(0,200,200,300,0,200).

Optimal values of the objective function is 540000.