Assignment #9 Solutions

due Friday, November 1st, 2019

1

(a) Let x_1 be the number of acres of corn.
x_2 be the number of acres of wheat.
x_3 be the number of acres of soybeans.
The model is as follows:

$$\min z = P_1 d_1^-, P_2 d_2^+, P_3 d_3^-, P_4 d_1^+, P_5 d_4^-, P_6(3d_5^- + 4d_6^- + 2d_7^-)$$
$$s.t.$$
$$7x_1 + 10x_2 + 8x_3 + d_1^- - d_1^+ = 6000$$
$$100x_1 + 120x_2 + 170x_3 + d_2^- - d_2^+ = 80,000$$
$$30x_1 + 40x_2 + 20x_3 + d_3^- - d_3^+ = 105,000$$
$$x_1 + x_2 + x_3 + d_4^- - d_4^+ = 1,000$$
$$x_1 + d_5^- - d_5^+ = 200$$
$$x_2 + d_6^- - d_6^+ = 500$$
$$x_3 + d_7^- - d_7^+ = 300$$
$$x_i, integer, i = 1, 2, 3. d_j^-, d_j^+ \geq 0, j = 1, ..., 7$$

Integer constraint can be dropped.

(b) We can solve the model using excel, shown in Fig 2, 3, 4, 5, 6,7. From the result, we can see that

$$x_1 = 2, \quad x_2 = 665, \quad x_3 = 0$$

1	**Goal programming for Problem 1**																						
2																							
3	*Priority 1*																						
4	Minimize	d1^-																					
5																							
6																							
7	Objective function	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8	Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used	Constraint	Value		
9	Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=	6000		
10	Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=	80000		
11	Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=	105000		
12	available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=	1000		
13	Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=	200		
14	Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=	500		
15	Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=	300		
16																							
17																							
18	x1	0																					
19	x2	667																					
20	x3	0																					
21	d1^-	0																					
22	d1^+	670																					
23	d2^-	0																					
24	d2^+	40																					
25	d3^-	78320																					
26	d3^+	0																					
27	d4^-	333																					
28	d4^+	0																					
29	d5^-	200																					
30	d5^+	0																					
31	d6^-	0																					
32	d6^+	167																					
33	d7^-	300																					
34	d7^+	0																					
35		0																					

Figure 1: Excel in Question 1, Priority 1

Goal programming for Problem 1																							
Priority 1																							
Minimize	d1^-																						
Objective function	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used	Constraint	Value			
Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=	6000			
Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=	80000			
Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=	105000			
available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=	1000			
Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=	200			
Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=	500			
Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=	300			
x1	0																						
x2	667																						
x3	0																						
d1^-	0																						
d1^+	670																						
d2^-	0																						
d2^+	40																						
d3^-	78320																						
d3^+	0																						
d4^-	333																						
d4^+	0																						
d5^-	200																						
d5^+	0																						
d6^-	0																						
d6^+	167																						
d7^-	300																						
d7^+	0																						
	0																						

Figure 2: Excel in Question 1, Priority 1

Goal programming for Problem 1																							
Priority 2																							
Minimize	d2^+																						
Objective function	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0				
Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used	Constraint	Value			
Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=	6000			
Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=	80000			
Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=	105000			
available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=	1000			
Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=	200			
Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=	500			
Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=	300			
Priority 1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	=	0			
x1	0																						
x2	666																						
x3	0																						
d1^-	0																						
d1^+	660																						
d2^-	80																						
d2^+	0																						
d3^-	78360																						
d3^+	0																						
d4^-	334																						
d4^+	0																						
d5^-	200																						
d5^+	0																						
d6^-	0																						
d6^+	166																						
d7^-	300																						
d7^+	0																						
	0																						

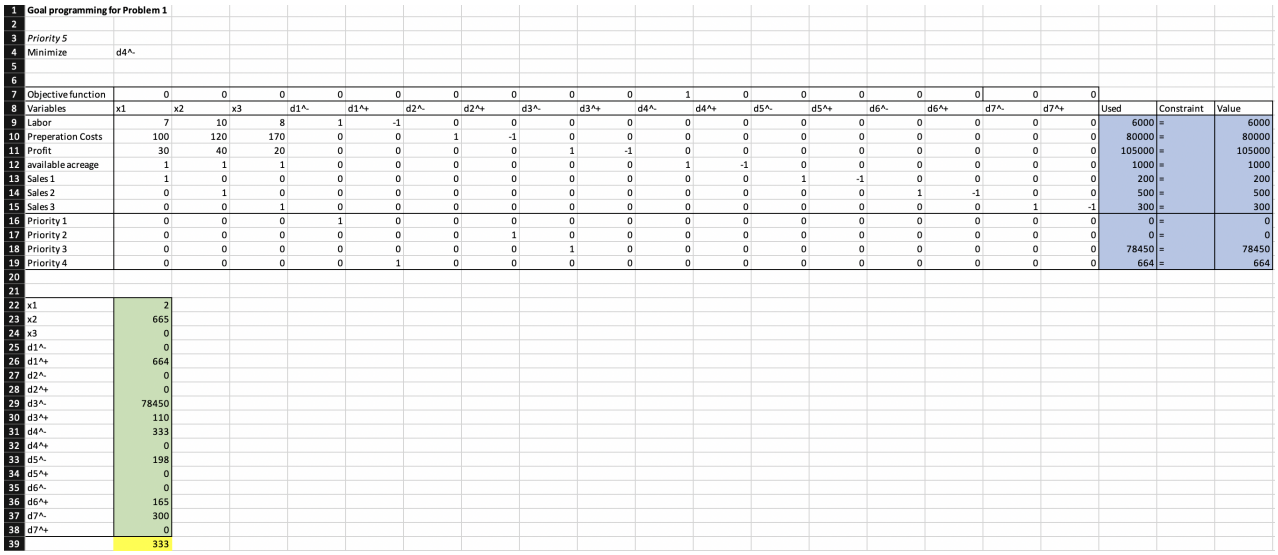
Figure 3: Excel in Question 1, Priority 2

1	**Goal programming for Problem 1**																							
2																								
3	*Priority 3*																							
4	Minimize	d3^-																						
5																								
6																								
7	Objective function	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0				
8	Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used		Constraint	Value		
9	Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=		6000		
10	Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=		80000		
11	Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=		105000		
12	available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=		1000		
13	Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=		200		
14	Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=		500		
15	Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=		300		
16	Priority 1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	=		0		
17	Priority 2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	=		0		
18																								
19																								
20	x1	2																						
21	x2	665																						
22	x3	0																						
23	d1^-	0																						
24	d1^+	664																						
25	d2^-	0																						
26	d2^+	0																						
27	d3^-	78340																						
28	d3^+	0																						
29	d4^-	333																						
30	d4^+	0																						
31	d5^-	198																						
32	d5^+	0																						
33	d6^-	0																						
34	d6^+	165																						
35	d7^-	300																						
36	d7^+	0																						
37		78340																						

Figure 4: Excel in Question 1, Priority 3

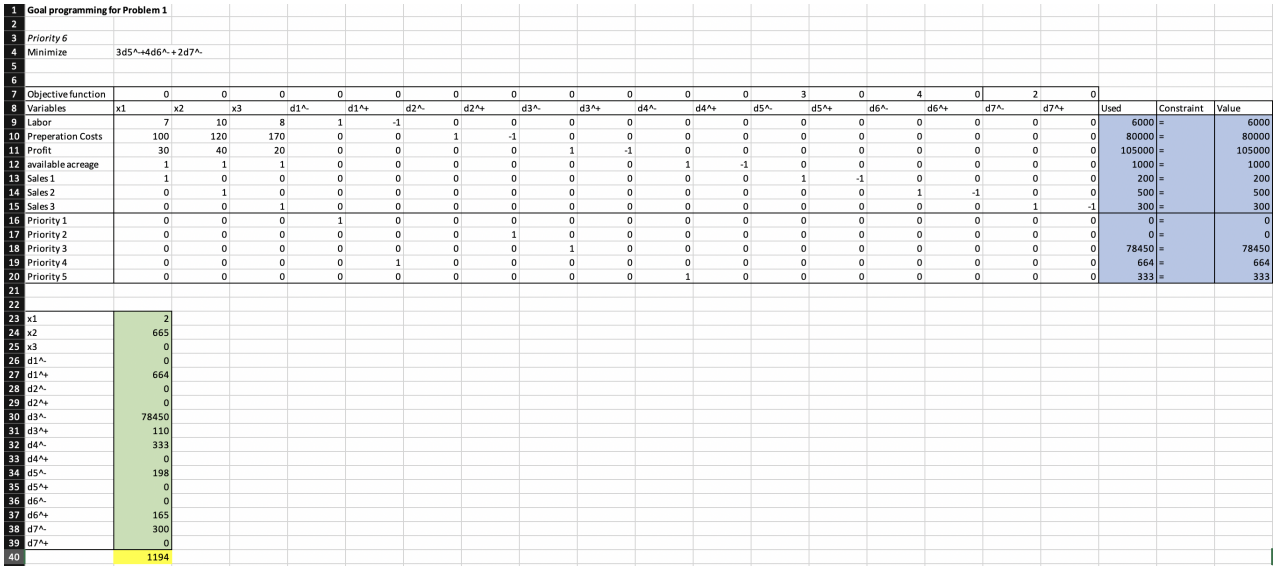
1	**Goal programming for Problem 1**																							
2																								
3	*Priority 4*																							
4	Minimize	d1^+																						
5																								
6																								
7	Objective function	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8	Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used		Constraint	Value		
9	Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=		6000		
10	Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=		80000		
11	Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=		105000		
12	available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=		1000		
13	Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=		200		
14	Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=		500		
15	Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=		300		
16	Priority 1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	=		0		
17	Priority 2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	=		0		
18	Priority 3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	78340	=		78340		
19																								
20																								
21	x1	2																						
22	x2	665																						
23	x3	0																						
24	d1^-	0																						
25	d1^+	664																						
26	d2^-	0																						
27	d2^+	0																						
28	d3^-	78340																						
29	d3^+	0																						
30	d4^-	333																						
31	d4^+	0																						
32	d5^-	198																						
33	d5^+	0																						
34	d6^-	0																						
35	d6^+	165																						
36	d7^-	300																						
37	d7^+	0																						
38		664																						

Figure 5: Excel in Question 1, Priority 4



Goal programming for Problem 1																									
Priority 5																									
Minimize	d4^-																								
Objective function	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0						
Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used	Constraint	Value					
Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=	6000					
Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=	80000					
Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=	105000					
available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=	1000					
Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=	200					
Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=	500					
Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=	300					
Priority 1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	=	0					
Priority 2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	=	0					
Priority 3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	78450	=	78450					
Priority 4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	664	=	664					
x1	2																								
x2	665																								
x3	0																								
d1^-	0																								
d1^+	664																								
d2^-	0																								
d2^+	0																								
d3^-	78450																								
d3^+	110																								
d4^-	333																								
d4^+	0																								
d5^-	198																								
d5^+	0																								
d6^-	0																								
d6^+	165																								
d7^-	300																								
d7^+	0																								
	333																								

Figure 6: Excel in Question 1, Priority 5



Goal programming for Problem 1																									
Priority 6																									
Minimize	3d5^-+4d6^-+2d7^-																								
Objective function	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	4	0	2	0						
Variables	x1	x2	x3	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	Used	Constraint	Value					
Labor	7	10	8	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	6000	=	6000					
Preperation Costs	100	120	170	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	80000	=	80000					
Profit	30	40	20	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	105000	=	105000					
available acreage	1	1	1	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	1000	=	1000					
Sales 1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	200	=	200					
Sales 2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	500	=	500					
Sales 3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	300	=	300					
Priority 1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	=	0					
Priority 2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	=	0					
Priority 3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	78450	=	78450					
Priority 4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	664	=	664					
Priority 5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	333	=	333					
x1	2																								
x2	665																								
x3	0																								
d1^-	0																								
d1^+	664																								
d2^-	0																								
d2^+	0																								
d3^-	78450																								
d3^+	110																								
d4^-	333																								
d4^+	0																								
d5^-	198																								
d5^+	0																								
d6^-	0																								
d6^+	165																								
d7^-	300																								
d7^+	0																								
	1194																								

Figure 7: Excel in Question 1, Priority 6

2

(a) Let x_i be the number of workers begin their 5-day workweek on day i, $i = 1, ..., 7$. The model is as follows:

$$\min z = P_1 d_1^+, P_2(d_2^- + d_3^-), P_3 d_4^-, P_4(d_5^- + d_6^- + d_7^- + d_8^-)$$
$$s.t.$$
$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + d_1^- - d_1^+ = 60$$
$$x_2 + x_3 + x_4 + x_5 + x_6 + d_2^- - d_2^+ = 53$$
$$x_3 + x_4 + x_5 + x_6 + x_7 + d_3^- - d_3^+ = 47$$
$$x_1 + x_2 + x_3 + x_4 + x_5 + d_4^- - d_4^+ = 43$$
$$x_1 + x_4 + x_5 + x_6 + x_7 + d_5^- - d_5^+ = 22$$
$$x_1 + x_2 + x_5 + x_6 + x_7 + d_6^- - d_6^+ = 28$$
$$x_1 + x_2 + x_3 + x_6 + x_7 + d_7^- - d_7^+ = 35$$
$$x_1 + x_2 + x_3 + x_4 + x_7 + d_8^- - d_8^+ = 34$$
$$x_i, integer, i = 1, ..., 7. d_j^-, d_j^+ \geq 0, j = 1, ..., 8$$

(b) We can solve the model using excel, shown in Fig 9. When solve for Priority 1, all of the other deviation variables needed to minimize are all minimized to zero. From the result, we can see that

$$x_1 = 0, \quad x_2 = 7, \quad x_3 = 25 \quad x_4 = 1$$
$$x_5 = 10, \quad x_6 = 10, \quad x_7 = 1$$

1	**Goal programming for Problem 2**																													
2																														
3	*Priority 1*																													
4	Minimize	d1^+																												
5																														
6																														
7	Objective function		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8	Variables	x1	x2	x3	x4	x5	x6	x7	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	d8^-	d8^+	Used	Constraint	Value			
9	Labor	1	1	1	1	1	1	1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	=	60			
10	Preperation Costs	0	1	1	1	1	1	0	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	53	=	53			
11	Profit	0	0	1	1	1	1	1	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	47	=	47			
12	available acreage	1	1	1	1	1	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	43	=	43			
13	Sales 1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	22	=	22			
14	Sales 2	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	28	=	28			
15		1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	35	=	35			
16	Sales 3	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	34	=	34			
17																														
18																														
19	x1	0																												
20	x2	7																												
21	x3	25																												
22	x4	1																												
23	x5	10																												
24	x6	10																												
25	x7	1																												
26	d1^-	6																												
27	d1^+	0																												
28	d2^-	0																												
29	d2^+	0																												
30	d3^-	0																												
31	d3^+	0																												
32	d4^-	0																												
33	d4^+	0																												
34	d5^-	0																												
35	d5^+	0																												
36	d6^-	0																												
37	d6^+	0																												
38	d7^-	0																												
39	d7^+	8																												
40	d8^-	0																												
41	d8^+	0																												
42		0																												

Figure 8: Excel in Question 2, Priority 1

3

(a) Let x_1 be the number of yards of denim (in 10,000).
x_2 be the number of yards of brush-cotton.
The model is as follows:

$$\min z = P_1 d_1^-, P_2 d_2^+, P_3(3d3^- + 2d4^-), P_4 d_1^+$$
$$s.t.$$
$$x_1 + x_2 + d_1^- - d_1^+ = 80$$
$$d_1^+ - d_1^- + d_2^- - d_2^+ = 10$$
$$x_1 + + d_3^- - d_3^+ = 60$$
$$x_2 + d_4^- - d_4^+ = 35$$
$$x_i, integer, i = 1, 2. d_j^-, d_j^+ \geq 0, j = 1, ..., 4$$

(b) We can solve the model using excel, shown in Fig 10, 11, 12. From the result, we can see that

$$x_1 = 60, \quad x_2 = 30$$

1	**Goal programming for Problem 2**																													
2																														
3	*Priority 1*																													
4	Minimize	d1^+																												
5																														
6																														
7	Objective function	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8	Variables	x1	x2	x3	x4	x5	x6	x7	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	d5^-	d5^+	d6^-	d6^+	d7^-	d7^+	d8^-	d8^+	Used	Constraint	Value			
9	Labor	1	1	1	1	1	1	1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	=	60			
10	Preperation Costs	0	1	1	1	1	1	0	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	53	=	53			
11	Profit	0	0	1	1	1	1	1	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	0	0	47	=	47			
12	available acreage	1	1	1	1	1	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	43	=	43			
13	Sales 1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	22	=	22			
14	Sales 2	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	28	=	28			
15		1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	35	=	35			
16	Sales 3	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	34	=	34			
17																														
18																														
19	x1	0																												
20	x2	7																												
21	x3	25																												
22	x4	1																												
23	x5	10																												
24	x6	10																												
25	x7	1																												
26	d1^-	6																												
27	d1^+	0																												
28	d2^-	0																												
29	d2^+	0																												
30	d3^-	0																												
31	d3^+	0																												
32	d4^-	0																												
33	d4^+	0																												
34	d5^-	0																												
35	d5^+	0																												
36	d6^-	0																												
37	d6^+	0																												
38	d7^-	0																												
39	d7^+	8																												
40	d8^-	0																												
41	d8^+	0																												
42		0																												

Figure 9: Excel in Question 2, Priority 1

1	**Goal programming for Problem 3**														
2															
3	*Priority 1*														
4	Minimize	d1^-													
5															
6															
7	Objective function	0	0	1	0	0	0	0	0	0	0				
8	Variables	x1	x2	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	Used	Constraint	Value	
9	Labor	1	1	1	-1	0	0	0	0	0	0	80	=	80	
10	Preperation Costs	0	0	-1	1	1	-1	0	0	0	0	10	=	10	
11	Profit	1	0	0	0	0	0	1	-1	0	0	60	=	60	
12	available acreage	0	1	0	0	0	0	0	0	1	-1	35	=	35	
13															
14															
15	x1	60													
16	x2	30													
17	d1^-	0													
18	d1^+	10													
19	d2^-	0													
20	d2^+	0													
21	d3^-	0													
22	d3^+	0													
23	d4^-	5													
24	d4^+	0													
25		0													

Figure 10: Excel in Question 3, Priority 1

Goal programming for Problem 3														
Priority 3														
Minimize	3d3^- + 2d4^-													
Objective function	0	0	0	0	0	0	3	0	2	0				
Variables	x1	x2	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	Used		Constraint	Value
Labor	1	1	1	-1	0	0	0	0	0	0	80	=		80
Preperation Costs	0	0	-1	1	1	-1	0	0	0	0	10	=		10
Profit	1	0	0	0	0	0	1	-1	0	0	60	=		60
available acreage	0	1	0	0	0	0	0	0	1	-1	35	=		35
Priority 1	0	0	1	0	0	0	0	0	0	0	0	=		0
Priority 2	0	0	0	0	0	1	0	0	0	0	0	=		0
x1	60													
x2	30													
d1^-	0													
d1^+	10													
d2^-	0													
d2^+	0													
d3^-	0													
d3^+	0													
d4^-	5													
d4^+	0													
	10													

Figure 11: Excel in Question 3, Priority 3

Goal programming for Problem 3														
Priority 4														
Minimize	d1^+													
Objective function	0	0	0	1	0	0	0	0	0	0				
Variables	x1	x2	d1^-	d1^+	d2^-	d2^+	d3^-	d3^+	d4^-	d4^+	Used		Constraint	Value
Labor	1	1	1	-1	0	0	0	0	0	0	80	=		80
Preperation Costs	0	0	-1	1	1	-1	0	0	0	0	10	=		10
Profit	1	0	0	0	0	0	1	-1	0	0	60	=		60
available acreage	0	1	0	0	0	0	0	0	1	-1	35	=		35
Priority 1	0	0	1	0	0	0	0	0	0	0	0	=		0
Piority 2	0	0	0	0	0	1	0	0	0	0	0	=		0
Priority 3	0	0	0	0	0	0	3	0	2	0	10	=		10
x1	60													
x2	30													
d1^-	0													
d1^+	10													
d2^-	0													
d2^+	0													
d3^-	5.3291E-15													
d3^+	0													
d4^-	5													
d4^+	0													
	10													

Figure 12: Excel in Question 3, Priority 4

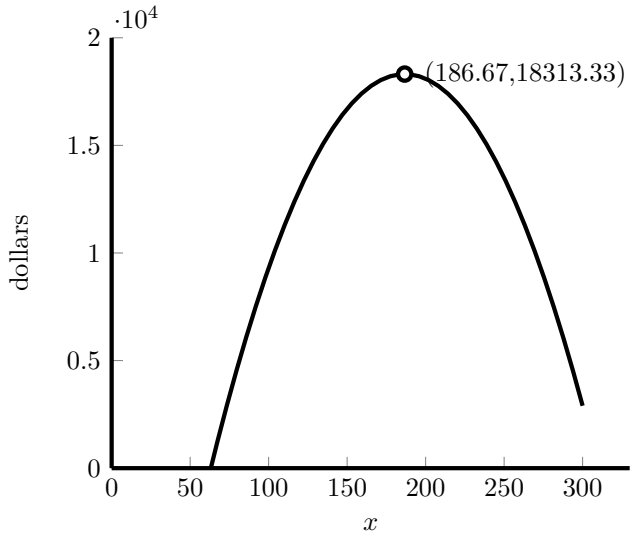
4

The objective function $z = vp - 7500 - 40v = (400 - 1.2p)(p - 40) - 7500 = -1.2p^2 + 448p - 23500$, then we can take the derivative of z over p and set it to zero, namely,

$$\frac{\partial z}{\partial p} = -2.4p + 448 = 0$$

Then we have $p^* = 186.67$ and the optimal profit $z^* = 18313.33$.

5


$\cdot 10^4$
2
1.5
1
0.5
0
dollars
(186.67,18313.33)
0
50
100
150
200
250
300
x