Winston p.503, #14 (prereduce)

					Column						
Row	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
0	3	5	1	2	1	4	3	1	2	2	
1	1	1	0	1	1	0	0	1	1	0	>=1
2	1	0	1	0	0	0	0	0	0	0	>=1
3	0	1	0	0	1	0	1	0	0	1	>=1
4	0	0	1	0	0	1	0	1	0	0	>=1
5	1	1	0	1	0	1	1	0	1	1	>=1
		col 4 + col 5 >= col 2; c2 > c4+c5; delete column 2									

Row	**1**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
0	3	1	2	1	4	3	1	2	2	
1	1	0	1	1	0	0	1	1	0	>=1
2	1	1	0	0	0	0	0	0	0	>=1
3	0	0	0	1	0	1	0	0	1	>=1
4	0	1	0	0	1	0	1	0	0	>=1
5	1	0	1	0	1	1	0	1	1	>=1
		col 4 + col 3 >= col 1; c1 >= c3+c4; delete column 1								

Winston p.503, #14 (cont'd)

Row	3	4	5	6	7	8	9	10	
0	1	2	1	4	3	1	2	2	
1	0	1	1	0	0	1	1	0	>=1
2	1	0	0	0	0	0	0	0	>=1
3	0	0	1	0	1	0	0	1	>=1
4	1	0	0	1	0	1	0	0	>=1
5	0	1	0	1	1	0	1	1	>=1
		col 7 + col 8 >= col 6; c6 >= c7+c8; delete column 6							

Row	3	4	5	7	8	9	10		
0	1	2	1	3	1	2	2		
1	0	1	1	0	1	1	0	>=1	
2	1	0	0	0	0	0	0	>=1	
3	0	0	1	1	0	0	1	>=1	
4	1	0	0	0	1	0	0	>=1	
5	0	1	0	1	0	1	1	>=1	
		col 4 + col 5 >= col 7; c7 >= c4+c5; delete column 7							

Winston p.503, #14 (cont'd)

Row	3	4	5	8	9	10	
0	1	2	1	1	2	2	
1	0	1	1	1	1	0	>=1
2	1	0	0	0	0	0	>=1
3	0	0	1	0	0	1	>=1
4	1	0	0	1	0	0	>=1
5	0	1	0	0	1	1	>=1
		row 2 fixes x3 at 1; delete rows 2,4, col 3					

Row	4	5	8	9	10						
0	2	1	1	2	2						
1	1	1	1	1	0	>=1					
3	0	1	0	0	1	>=1					
5	1	0	0	1	1	>=1					
		multiple optima; best solution is z=4; x3=1, x5=1, x10=1 is one soln									

Problem #2 (Gomory Cuts)

- **Cut from first constraint:**

$$x_1 + \frac{1}{3}s_1 - \frac{1}{12}s_2 = \frac{5}{4}$$

$$x_1 + 0s_1 + \frac{1}{3}s_1 - s_2 + \frac{11}{12}s_2 = 1 + \frac{1}{4}$$

$$x_1 - s_2 - 1 = \frac{1}{4} - \frac{1}{3}s_1 - \frac{11}{12}s_2$$

$$\frac{1}{4} - \frac{1}{3}s_1 - \frac{11}{12}s_2 \le 0, \text{ or}$$

$$\frac{1}{4} - \frac{1}{3}s_1 - \frac{11}{12}s_2 + s_3 = 0$$

- **Cut from second constraint:**

$$x_2 + \frac{1}{3}s_1 + \frac{1}{6}s_2 = \frac{5}{2}$$

$$x_1 + 0s_1 + \frac{1}{3}s_1 + 0s_2 + \frac{1}{6}s_2 = 2 + \frac{1}{2}$$

$$x_1 - 2 = \frac{1}{2} - \frac{1}{3}s_1 - \frac{1}{6}s_2$$

$$\frac{1}{2} - \frac{1}{3}s_1 - \frac{1}{6}s_2 \le 0, \text{ or}$$

$$\frac{1}{2} - \frac{1}{3}s_1 - \frac{1}{6}s_2 + s_4 = 0$$