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MP-1 HOME ASSIGNMENT-4

1. A manufacturer of baby-dolls makes two types of dolls. Doll X and Doll Y. Processing of these two dolls is done on two machines, A and B. Doll X requires two hours on machine A and six hours on machine B. Doll Y requires five hours on machine A and also five hours on machine B. there are 16 hours of time available on machine A and thirty hours on machine B. The profit gained on both the dolls is same, i.e. one rupee per doll. What should be the daily production of each of the two dolls? Formulate but not solve the mathematical programming problem. Suggest the suitable algorithm to solve it.

Solve the following L.P.P by Gomory technique :

$Maximize\ z=3x2$
$Subject\ to\ 3x1+2x2\leq 7$
$x1-x2\leq -2$
$x1,2\geq 0\ are\ integers.$

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Radhakrishna

Max $z = 3x_2$

Subject to $3x_1 + 2x_2 \le 7$

$x_1 - x_2 \le -2$

Here $b_2 = -2 < 0$ so

multiply 2^{nd} constiaint by -1 to make $b_2 > 0$

$-x_1 + x_2 \ge 2$

$x_1, x_2 \ge 0$

After Adding slack, surplus, Artificial variables

Max $z = 0x_1 + 3x_2 + 0S_1 + 0S_2 - MA_1$

Subject To

$3x_1 + 2x_2 + S_1 = 7$

$-x_1 + x_2 - S_2 + A_1 = 2$

$x_1, x_2, S_1, S_2, A_1 \ge 0$

C_{B_i}	c_j	0	3	0	0	$-M$	
	B.V	x_1	x_2	S_1	S_2	A_1	sol
0	S_1	3	2	1	0	0	7
$-M$	A_1	-1	1	0	-1	1	2
	z_j	M	$-M$	0	M	$-M$	
	$c_j - z_j$	$-M$	$3+M$	0	$-M$	0	

Entering = x_2
Departing : A_1
key element = 1

Iteration - 2

C_{B_i}	C_j	0	3	0	0	-M	
	B.V	x_1	x_2	s_1	s_2	A_1	sol
0	s_1	5	0	1	2	-2	3
3	x_2	-1	1	0	-1	1	2
	z_j	-3	3	0	-3	3	
	$C_j - z_j$	3	0	0	3	-M-3	

pivot element is 5

Iteration-3

C_{B_i}	C_j	0	3	0	0	-M	
	B.V	x_1	x_2	s_1	s_2	A_1	sol
0	x_1	1	0	0.2	0.4	-0.4	0.6
3	x_2	0	1	0.2	-0.6	0.6	2.6
	z_j	0	3	0.6	-1.8	1.8	
	$C_j - z_j$	0	0	-0.6	1.8	-M-1.8	

pivot element - 0.4

Entering - s_2
Departing : x_1
key element = 0.4

Iteration - 4

C_{Bi}	C_j	0	3	0	0	-M	
	B.V	x_1	x_2	S_1	S_2	A_1	sol
0	S_2	2.5	0	0.5	1	-1	1.5
3	x_2	1.5	1	0.5	0	0	3.5
	Z_j	4.5	3	1.5	0	0	
	$C_j - Z_j$	-4.5	0	-1.5	0	M	

Since all $C_j - Z_j \le 0$

Hence non-integer optimal solution is arrived with value of variables as

$x_1 = 0, \; x_2 = 3.5$

Max $z = 10.5$

To obtain the integer valued solution, we proceed to construct Gomory's fractional cut with the help of x_2 row as follows.

$3.5 = 1.5x_1 + 1x_2 + 0.5S_1$

$(3 + 0.5) + (1 + 0.5)x_1 + (1 + 0)x_2 + (0 + 0.5)S_1$

The fraction cut will become

$-0.5 = Sg1 - 0.5x_1 - 0.5S_1 \rightarrow$ cut 1

Adding this additional constraint at bottom of optimal simplex table. The new table so obtained is

Iteration 1

C_{B_i}	C_j	0	3	0	0	0	
	B V	x_1	x_2	S_1	S_2	Sg_1	sol
0	S_2	2.5	0	0.5	1	0	1.5
3	x_2	1.5	1	0.5	0	0	3.5
0	Sg_1	-0.5	0	-0.5	0	1	-0.5
	z_j	4.5	3	1.5	0	0	
	$C_j - z_j$	-4.5	0	-1.5	0	0	

Entering = S_1
Leaving = Sg_1
key element = -0.5

Iteration-2

C_{B_i}	C_j	0	3	0	0	0	
	B.V	x_1	x_2	S_1	S_2	Sg_1	sol
0	S_2	2	0	0	1	1	1
3	x_2	1	1	0	0	1	3
0	S_1	1	0	1	0	-2	1
	z_j	3	3	0	0	3	
	$C_j \cdot z_j$	-3	0	0	0	-3	

Since $C_j - z_j \leq 0$

Hence integer optimal solution is arrived with value of variables as.

$x_1 = 0, \ x_2 = 3$

Max $z = 9$

The integer optimal solution found after 1- cuts