26/07/21

Step 7: Transition from second table to third table.

	Qty	x_1	x_2	S_1	S_2
		7	5	0	0
S_1	$\frac{40}{1}$	$\frac{0}{1}$	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{-2}{1}$
x_1	50	1	$1/2$	0	$1/2$

i) In order to replace old variable with new variable, we have to divide key element row with key element.

ii) Multiply first row with 1/2 and subtract from second row.

		7	5	0	0
		x_1	x_2	S_1	S_2
S_1	40	0	1	1	-2
	$50 - 1/2 \times 40$	$1 - 1/2 \times 0$	$1/2 - 1/2 \times 1$	$0 - 1/2 \times 1$	$1/2 - (1/2 \times -2)$
x_1	30	1	0	$-1/2$	$3/2$

Third table :

$C_j \rightarrow$	Solution Mix	Qty	7 x_1	5 x_2	0 S_1	0 S_2
0	x_2	40	0	1	1	-2
7	x_1	30	1	0	$-1/2$	$3/2$
Z_j	-	410	7	5	$3/2$	$-10+21/2 = \frac{1}{2}$
$C_j - Z_j$	-	-	0	0	$-3/2$	$-1/2$

Rule for optimality :-

In maximization problem, optimum solution will be received when all the values in $C_j - Z_j$ row are either zero or negative.

$\therefore$ 40 chairs and 30 tables will be manufactured and profit will be maximum of ₹ 410.

→ Minimisation case: [Solving by M method]

$$\text{Min } (C) = 5x_1 + 6x_2$$

$$x_1 + x_2 = 1000$$
$$x_1 \leq 300$$
$$x_2 \geq 150$$

Step 1:

$$x_1 + x_2 = 1000$$
$$x_1 + S_1 = 300$$
$$x_2 - S_2 = 150$$

- In case of greater than or equal to inequality, surplus variable will be subtracted.

- In case of equality and greater than or equal to inequality, then an artificial variable will be added.

$$x_1 + x_2 + A_1 = 1000$$

$$x_1 + S_1 = 300$$

$$x_2 - S_2 + A_2 = 150$$

Step 2:

$$C = 5x_1 + 6x_2 + 0S_1 + 0S_2 + MA_1 + MA_2$$

(where M is a very large value)

Homogenisation

$$1x_1 + 1x_2 + 0S_1 + 0S_2 + 1A_1 + 0A_2 = 1000$$

$$1x_1 + 0x_2 + 1S_1 + 0S_2 + 0A_1 + 0A_2 = 300$$

$$0x_1 + 1x_2 + 0S_1 - 1S_2 + 0A_1 + 1A_2 = 150$$

Step 3:

Putting $x_1, x_2 = 0$; and $S_2 = 0$;

$$A_1 = 1000$$

$$S_1 = 300$$

$$A_2 = 150$$

[Whenever there is a surplus variable, they'll also be putted equal to 0.]