OR - Case Study

\# A company deals with three products A, B & C. they are to be processed in three departments. x, y & z. products A require 2 hours of department x, 3 hours of department Y and product B requires 3 hours, 2 hours & 4 hours of department x, y & z respectively. product C requires 2 hours in department Y and 5 hours in department z respectively. the profit contribution of A, B & C are Rs. 3/-, Rs. 5/- and Rs. 4/- respectively. Find the optimal product mix for maximising the profit. In the coming planning period, 8 hours of department x, 15 hours of department Y & 10 hours of department z are available for production.

the Data Departments	Product Hours required per unit			Available capacity in hours
	A	B	C	
x	2	3	0	8
y	3	2	4	15
z	0	2	5	10
Profit per unit in Rs	3	5	4	

→ maximise $z = 3a + 5b + 4c$

$2a + 3b + 0c \leq 8$

$3a + 2b + 4c \leq 15$

$0a + 2b + 5c \leq 10$

a, b & c all ≥ 0

Equations, maximise $z = 3a + 5b + 4c + 0s_1 + 0s_2 + 0s_3$

$2a + 3b + 0c + 1s_1 + 0s_2 + 0s_3 = 8$

$3a + 2b + 4c + 0s_1 + 1s_2 + 0s_3 = 15$

$0a + 2b + 5c + 0s_1 + 0s_2 + 1s_3 = 10$

a, b, c, s_1, s_2, s_3 all ≥ 0

$$\begin{bmatrix} 2 & 3 & 0 & 1 & 0 & 0 \\ 3 & 2 & 4 & 0 & 1 & 0 \\ 0 & 2 & 5 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \\ s_1 \\ s_2 \\ s_3 \end{bmatrix} = \begin{bmatrix} 8 \\ 15 \\ 10 \end{bmatrix}$$

		Cj	3	5	4	0	0	0	
BV	C_B	X_B	a	b	c	S_1	S_2	S_3	MR
S_1	0	8	2	3	0	1	0	0	2.6
S_2	0	15	3	2	4	0	1	0	7.5
S_3	0	10	0	2	5	0	0	1	5
		Δj	-3	-5	-4	0	0	0	

$R_1 \rightarrow R_1/3$

$R_2 \rightarrow R_2 - 2R_1$

$R_3 \rightarrow R_3 - 2R_1$

		Cj	3	5	4	0	0	0	
BV	C_B	X_B	a	b	c	S_1	S_2	S_3	MR
b	5	2.6	0.66	1	0	0.33	0	0	-
S_2	0	9.8	1.68	0	4	-0.66	1	0	2.45
S_3	0	4.8	-1.32	0	5	-0.66	0	1	0.96
		Δj	0.3	0	-4	1.65	0	0	

$R_3 \rightarrow R_3/5$

$R_2 \rightarrow 1R_2 - 4(R_3)$

		C_j	3	5	4	0	0	0	
B_v	C_B	X_B	a	b	c	S_1	S_2	S_3	MR
B	5	2.6	0.66	1	0	0.33	0	0	–
S_2	0	5.94	2.74	0	0	1.98	1	-4	–
C	4	0.96	-0.264	0	1	-0.132	0	0.2	
		Δ_j	0.3	0	.4	1.65	0	0	

$a = 0$

$b = 2.6$

$c = 0.96$

max. $Z = 3a + 5b + 4c$

$Z = 3 \times 0 + 5 \times 2.6 + 4 \times 0.96$

max. $Z = 16.84$