6/02/23

OPT

Linear Programming

(Reddy Mikks question)

	Ext.	Int.	Max. daily availability.
M_1	6	4	24
M_2	1	2	6
Profit	5	4	

$x_1 \rightarrow$ tons of ext. paint produced daily

$x_2 \rightarrow$ " " int. paint " "

Objective f^n: Max $z = 5x_1 + 4x_2$

$6x_1 + 4x_2 \leq 24$ — (1.)

$x_1 + 2x_2 \leq 6$ — (2.)

$x_2 - x_1 \leq 1$ — (3.)

$x_2 \leq 2$ — (4.)

$x_1 \geq 0 \;,\; x_2 \geq 0$

Problem set 2.1A

(1) (a) $x_2 - x_1 \geq 1$

(b) $3 \leq 1x_1 + 2x_2 \leq 6$

(c) $x_2 \geq x_1$ or $x_2 - x_1 \geq 0$

(d) $x_1 + x_2 \geq 3$

(e) $\frac{x_2}{x_1 + x_2} \leq 0.5$

(2)

(a) $x_1 = 1, \; x_2 = 4$

(1) → $6(1) + 4(4) \leq 24$ ✓

(2) → $1 + 2(4) \leq 6$ X

Infeasible

(b) $x_1 = 2, \; x_2 = 2$

(1) ✓

(2) ✓

(3) ✓

(4) ✓

∴ satisfied and feasible

∴ $z = 18$ $ (in 1000's of $)

(c.) $x_1 = 3, x_2 = 1.5$

(1.) → ✓ (2.) → ✓ (3.) → ✓

(4.) → ✓

∴ feasible

$z = 21\$$ (in 1000's of \$'s)

(d.) $x_1 = 2, x_2 = 1$

(1.) → ✓ (2.) → ✓ (3.) → ✓

(4.) → ✓ ∴ feasible

$z = 14\$$ (in 1000's of \$)

(e.) $x_1 = 2, x_2 = -1$

$x_2 \neq 0$ ∴ infeasible

(c.) is most feasible.

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JACK Q^n

(Q1.) x_1 => play (no. of hrs)

x_2 => work (no. of hrs)

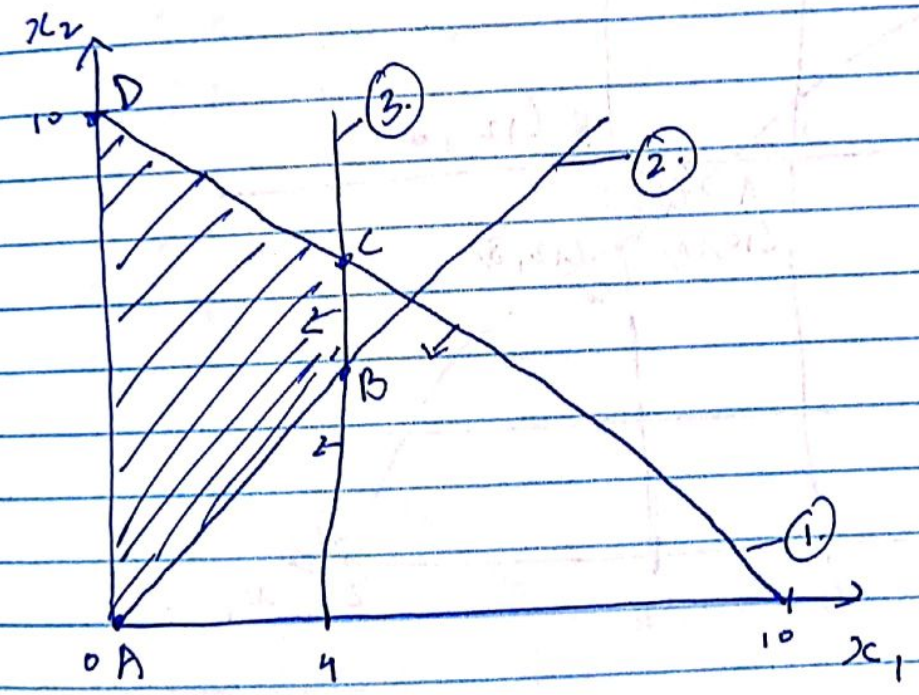
$$\text{Max } z = 2x_1 + x_2$$

$$x_1 + x_2 \leq 10 \quad — (1.)$$

$$x_1 \leq x_2 \text{ or } x_1 - x_2 \leq 0 \quad — (2.)$$

$$x_1 \leq 4 \quad — (3.)$$

$$x_1, x_2 \geq 0$$



A (0,0) → z = 0

B (4,4) → z = 12

C (4, 6) → z = 14 → Max

D (0,10) → z = 10

John Q^n

(Q2.) $x_1 \rightarrow$ no. of hrs in store 1 / week

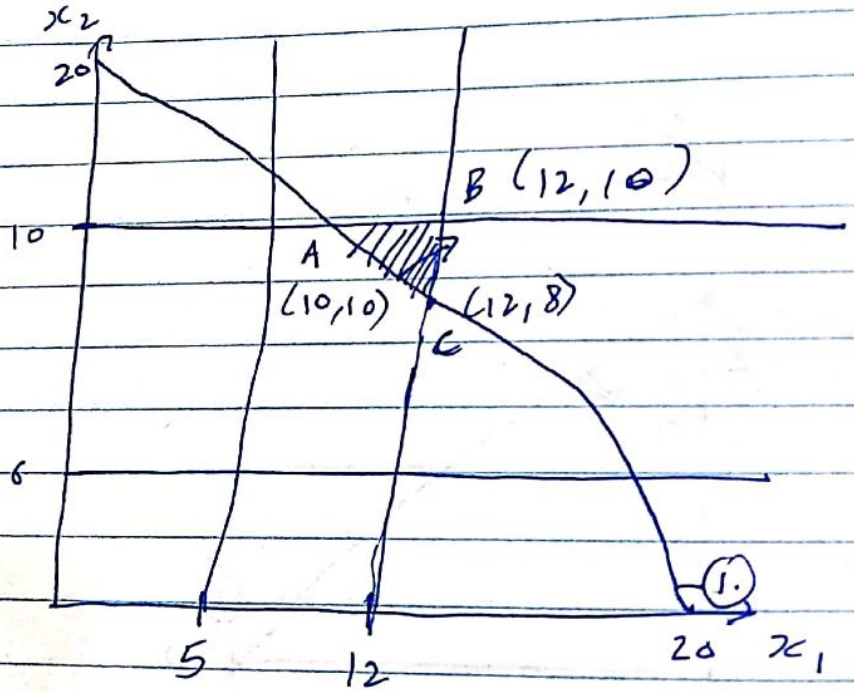
$x_2 \rightarrow$ no. of hrs in store 2 / week

~~Max z~~ Min $z = 8x_1 + 6x_2$

$x_1 + x_2 \geq 20$ — (1.)

$5 \leq x_1 \leq 12$ — (2.)

$6 \leq x_2 \leq 10$ — (3.) $\quad x_1, x_2 \geq 0$



A (10,10) $\rightarrow$ $\boxed{z = 140}$ ✓

B (12,10) $\rightarrow$ $z = 144$

C (12,8) $\rightarrow$ $z = 156$

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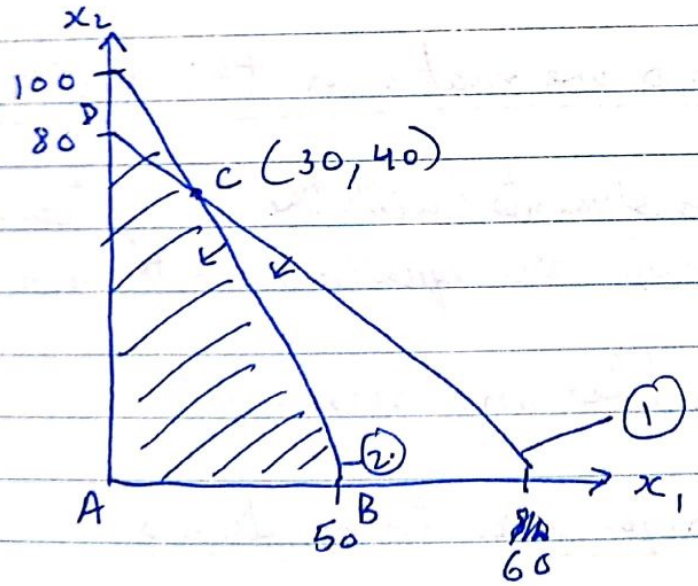
(Q.) Flair Furniture

$x_1 \rightarrow$ no. of tables produced / production period
$x_2 \rightarrow$ " " chairs " " " " "

Dept.	Tables	Chairs	Avail. hrs in production
Carpentry	4	3	240
P & V	2	1	100
Profit	70 $	50 $	

$$\text{Max } z = 70x_1 + 50x_2$$

$$4x_1 + 3x_2 \leq 240 \quad \text{—— (1)}$$
$$2x_1 + x_2 \leq 100 \quad \text{—— (2)}$$
$$x_1, x_2 \geq 0$$



B (50, 0) , $z = \$ 3500$
C (30, 40) , $z = \boxed{\$ 4100}$ → Max ✓
D (0, 80) , $z = \$ 4000$