Optimization Assignment

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1 Problem

A merchant plans to sell two types of personal computers a desktop model and a portable model that will cost Rs 25000 and Rs 40000 respectively. He estimates that the total monthly demand of computers will not exceed 250 units. Determine the number of units of each type of computers which the merchant should stock to get maximum profit if he does not want to invest more than Rs 70 lakhs and if his profit on the desktop model is Rs 4500 and on portable model is Rs 5000.

2 Solution

Let's assume that

Number of Desktops be x
Number of Portable computers be y

Item	Number	Cost	Profit
Desktop	x	25000	4500
Portable Computers	y	40000	5000
Max Investment		7000000	

According to question:
Monthly demand of both items=Maximum 250 units

$$\begin{pmatrix}1 & 1\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \leq 250 \tag{1}$$

Also,

cost of Desktop=$Rs.2500$
cost of computers=$Rs.40000$
Maximum investment=$Rs.7000000$

Hence,

$$\begin{pmatrix}25000 & 40000\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \leq 7000000 \tag{2}$$

$$=> \begin{pmatrix}5 & 8\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \leq 1400 \tag{3}$$

As we need to maximize profit,
Hence,function used here will be maximize Z
profit on Desktop=$Rs.4500$
profit on computers=$Rs.5000$

$$\therefore \text{maximize Z}=\begin{pmatrix}4500 & 5000\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}$$

combining all constraints

$$\text{Maximize Z}=\begin{pmatrix}4500 & 5000\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}$$

subject to constraints

$$\begin{pmatrix}1 & 1\\5 & 8\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \leq \begin{pmatrix}250\\1400\end{pmatrix} \tag{4}$$

$$x \geq 0, y \geq 0 \tag{5}$$

$$\begin{pmatrix}1 & 1\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \leq 250 \tag{6}$$

x	0	250
y	250	0

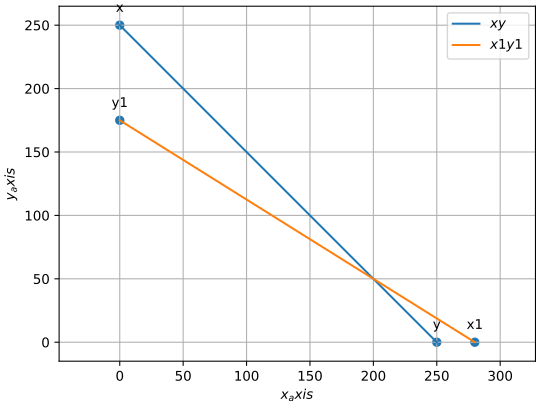
$$\begin{pmatrix}5 & 8\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} \leq 1400 \tag{7}$$

x	280	0
y	0	175

Corner points	Value of Z
(250,0)	112500
(200,50)	1150000
(0,175)	875000

Hence,the profit will be maximum if company produces
Number of Desktops is 200
Number of Portable computers is 50
Maximum profit is 1150000

3 Construction



4 Execution

Verify the above proofs in the following code.

https://github.com/soundaryanaru/FWC-assignments/