Optimization-Linear

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Get Python code for the figure from

https://github.com/SurabhiSeetha/Fwciith2022/tree/main/Assignment%201/codes/src

Get LaTex code from

https://github.com/SurabhiSeetha/Fwciith2022/tree/main/avr%20gcc

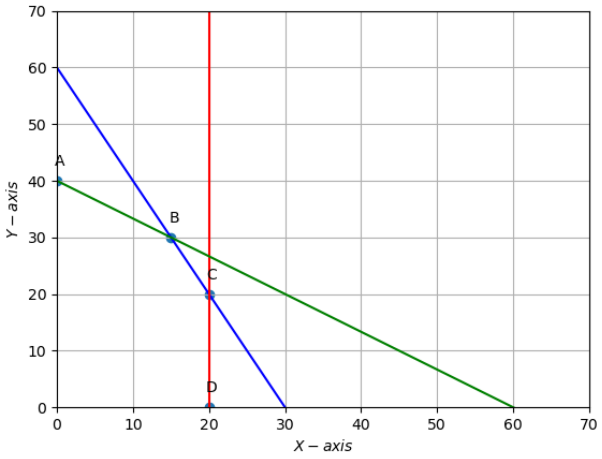
1 Question-Class 12, Miscellaneous, Q(4)

A manufacturer makes two types of toys A and B.Three machines are needed for this purpose and the time(in minutes)required for each toy on the machines is given below:

Types of Toys	I	II	III
A	12	18	6
B	6	0	9

Each machine is available for a maximum 6 hours per day. If the profit on each toy of type A is Rs.7.50 and that on eahc toy of type B is Rs.5, show that 15 toys of type A and 30 type B should be manufactured in a day to get maximum profit

2 Solution



From the figure we get, four points A(0,40), B(15,30),C(20,20),D(20,0)

We get these four points through the equations derived and by converting the minutes time into hours from the table above as,

$$12x + 6y \le 360$$
$$18x \le 360$$
$$6x + 9y \le 360$$

simplified as,

$$2x + y \le 1$$
$$3x \le 1$$
$$2x + 3y \le 2$$

x and y are the profits of A and B
Now,

$$Z_{max} = 7.50x + 5y$$

The above equations can be expressed in vector form as,

$$Z = \max_{x,y} \begin{pmatrix} 7.50 & 5 \end{pmatrix} \mathbf{x}$$

$$\begin{pmatrix} 2 & 1 \\ 3 & 0 \\ 2 & 3 \end{pmatrix} x \le \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$$

$$\mathbf{x} \ge 0$$

Solving the above equations using cvxpy, we get

$$Z_{max} = Rs.262.50$$

$$\mathbf{x} = \begin{pmatrix} 15 \\ 30 \end{pmatrix}$$