

Optimization Assignment-1

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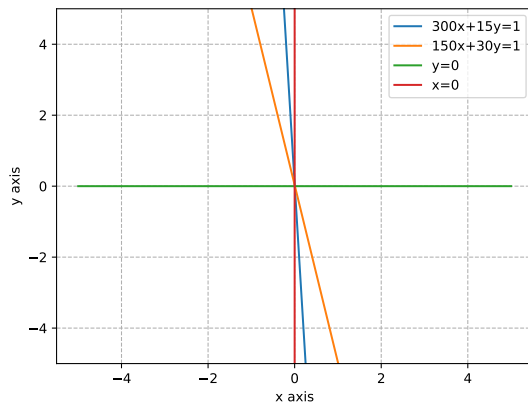
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Solution

Problem: One kind of cake requires 300gm of flour and 15gm of fat and another kind of cake requires 150gm of flour and 30gm of fat. Find the maximum number of cake that can be made from 7.5kg of flour and 600gm of fat . Form a linear programming problem and solve it graphically.

Food	Cake A	Cake B
X	300	150
Y	15	30

Given that first kind of cake requires 15g of fat while second kind of cake required 30g of fat.



Let mixture contains x units of food X,y units of food Y.

According to given problem, problem can be formulated as,

$$P = \max(7500x + 600y) \quad (1)$$

where P is maximum cost of Cake A

$$300x + 15y \geq 1 \quad (2)$$

for Cake B

$$150x + 30y \geq 1 \quad (3)$$

mixture contains both X,Y so,

$$x \geq 0, y \geq 0 \quad (4)$$

eq 1 and 2 to 4 can be expressed in vector form as

$$\mathbf{P} = \max \begin{pmatrix} 7500 & 600 \end{pmatrix} \mathbf{x}$$
$$\begin{pmatrix} 300 & 15 \\ 150 & 30 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} \mathbf{x} \geq \begin{pmatrix} 1 \\ 1 \\ 0 \\ 0 \end{pmatrix}$$

Solving above equations using cvxpy, we get

$$P_{\max} = 30$$

$$\mathbf{x} = \begin{pmatrix} 0.0022 \\ 0.0222 \end{pmatrix}$$