

Linear Programming

Paper II – Q11 – OPTION

The topic of Linear Programming is an interesting and practical one. It relies heavily on concepts from co-ordinate geometry of the line. In particular we must be able to plot lines and find their point of intersection. This may be daunting at first, but with a little practice, we see how similar all these questions are.

Half-Planes – Part (a)

TYPE 1

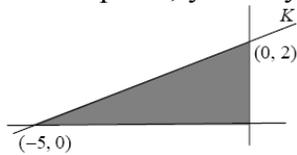
You need to be able to graph a half plane

(e.g. $2x + y \leq 8$)

- You need to draw the line $2x + y = 8$ by finding where it cuts the x and y axes.
- Then test a point to see which side of the line it lies (a good point to test is $(0, 0)$)
- If it proves to be true then use this inequality.
- If it is false change the direction of the inequality.
- See 2001 Q11 (a)

TYPE 2

You are given the graph of the half plane; you may need to find the equation using the formulae below or you may be given the equation. Again here you test a point to see which inequality symbol to use.



Slope formula : $m = \frac{y_2 - y_1}{x_2 - x_1}$

Equation of the Line :

$y - y_1 = m(x - x_1)$

Practical Problems

In this question (usually part b) you are given the constraints in the question, you must write out the inequalities from the constraints.

Example: if machine type A costs €1600 and machine B costs €800 and there is a maximum of €272000 to be spent on x machines of type A and y machines of type B, then the inequality is:

$$1600x + 800y \leq 272000$$

Or $2x + y \leq 34$

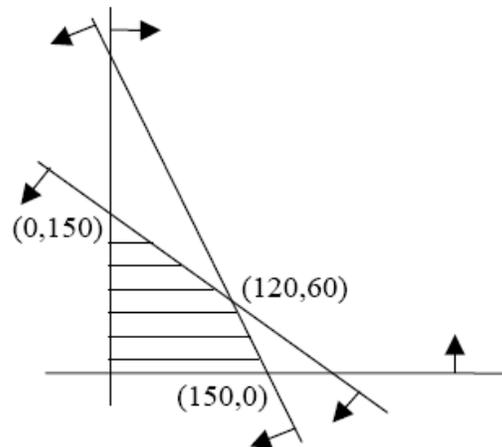
You must graph the two half planes on the one diagram.

You must determine the coordinates of the vertices (corner points of the enclosed region)

You then write down in terms of x and y the expression to be a maximum or minimum.

You must evaluate this expression at the corner points and choose the maximum or minimum, as requested.

Example graph and max. / min table:



Vertices	$11x + 10y$	Income
(0,150)	$0 + 1500$	1500
(120,60)	$1320 + 600$	1920
(150,0)	$1650 + 0$	1650