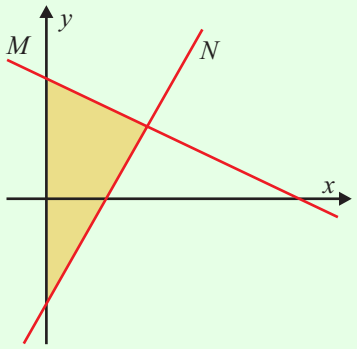
Linear Programming (Q 11, Paper 2)

2002

11 (a) The equation of the line M is $2x + y = 10$.
The equation of the line N is $4x - y = 8$.

Write down the three inequalities that define the shaded region in the diagram.



(b) A new ship is being designed. It can have two types of cabin accommodation for passengers — type A cabins and type B cabins.

Each type A cabin accommodates 6 passsengers and each type B cabin accommodates 3 passengers. The maximum number of passengers that the ship can accommodate is 330.

Each type A cabin occupies 50 m^3 of floor space. Each type B cabin occupies 10 m^3 of floor space. The total amount of floor space occupied by cabins cannot exceed 2300 m^3.

(i) Taking x to represent the number of type A cabins and y to represent the number of type B cabins, write down two inequalities in x and y and illustrate these on graph paper.

(ii) The income on each voyage from renting the cabins to passengers is €600 for each type A cabin and €180 for each type B cabin. How many of each type of cabin should the ship have so as to maximise income, assuming that all cabins are rented?

(iii) What is the maximum possible income on each voyage from renting the cabins?

Answers

11 (a) $2x + y \le 10,\ 4x - y \le 8,\ x \ge 0$

(b) (i) $2x + y \le 110,\ 5x + y \le 230$

(ii) $x = 40,\ y = 30$

(iii) €29,400