A Level · Edexcel · Further Maths

🕐 19 mins   ❓ 2 questions

Linear Programming (LP) problems

Formulating a Linear Programming Problem

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Total Marks /19

1 (a) Ben is a wedding planner. He needs to order flowers for the weddings that are taking place next month. The three types of flower he needs to order are roses, hydrangeas and peonies.

Based on his experience, Ben forms the following constraints on the number of each type of
flower he will need to order.

- At least three-fifths of all the flowers must be roses.
- For every 2 hydrangeas there must be at most 3 peonies.
- The total number of flowers must be exactly 1000

The cost of each rose is £1, the cost of each hydrangea is £5 and the cost of each peony is £4

Ben wants to minimise the cost of the flowers.

Let x represent the number of roses, let y represent the number of hydrangeas and let z represent the number of peonies that he will order.
Formulate this as a linear programming problem in x and y only, stating the objective function and listing the constraints as simplified inequalities with integer coefficients.

(7 marks)

(b) Ben decides to order the minimum number of roses that satisfy his constraints.

  (i)   Calculate the number of each type of flower that he will order to minimise the cost of the flowers.

  (ii)   Calculate the corresponding total cost of this order.

(3 marks)

2 Donald plans to bake and sell cakes. The three types of cake that he can bake are brownies, flapjacks and muffins.

Donald decides to bake 48 brownies and muffins in total.

Donald decides to bake at least 5 brownies for every 3 flapjacks.

At most 40% of the cakes will be muffins.

Donald has enough ingredients to bake 60 brownies or 45 flapjacks or 35 muffins.

Donald plans to sell each brownie for £1.50, each flapjack for £1 and each muffin for £1.25 He wants to maximise the total income from selling the cakes.

Let x represent the number of brownies, let y represent the number of flapjacks and let z represent the number of muffins that Donald will bake.

Formulate this as a linear programming problem in x and y only, stating the objective function and listing the constraints as simplified inequalities with integer coefficients.

You should **not** attempt to solve the problem.

(9 marks)