Year 1 D1 – Linear Programming – Forming Problems Exam Questions (Edexcel)

Q1.

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.

(a) 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)

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

(b) (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)

(Total for question = 10 marks)

(Q05 8FM0/27, June 2019)

Q2.

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.

(Total for question = 9 marks)

(Q03 8FM0/27, Oct 2021)

Q3.

Jonathan makes two types of information pack for an event, *Standard* and *Value*.

Each *Standard* pack contains 25 posters and 500 flyers.

Each *Value* pack contains 15 posters and 800 flyers.

He must use at least 150 000 flyers.

Between 35% and 65% of the packs must be *Standard* packs.

Posters cost 20p each and flyers cost 4p each.

Jonathan wishes to minimise his costs.

Let x and y represent the number of *Standard* packs and *Value* packs produced respectively.

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

You should not attempt to solve the problem.

(Total for question = 5 marks)

(Q05 8FM0/2K/sA, Specimen papers)

Q4.

A caterer can make three different sizes of salad; small, medium and large.

The caterer will make a total of at least 280 salads.

The caterer wants at least 35% of the salads to be small and no more than 20% of the salads to be large.

The caterer has enough ingredients to make 400 small salads or 300 medium salads or 200 large salads.

The profit on each small, medium and large salad is 40p, 60p and 85p respectively. The caterer wants to maximise his total profit.

Let x represent the number of small salads, y represent the number of medium salads and z represent the number of large salads.

Formulate this information as a linear programming problem, stating the objective and listing the constraints as simplified inequalities with integer coefficients.

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

(Total for question = 8 marks)

(Q06 6689/01, June 2017)

Q5.
A manufacturer of frozen yoghurt is going to exhibit at a trade fair. He will take two types of frozen yoghurt, Banana Blast and Strawberry Scream.

He will take a total of at least 1000 litres of yoghurt.

He wants at least 25% of the yoghurt to be Banana Blast. He also wants there to be at most half as much Banana Blast as Strawberry Scream.

Each litre of Banana Blast costs £3 to produce and each litre of Strawberry Scream costs £2 to produce. The manufacturer wants to minimise his costs.

Let x represent the number of litres of Banana Blast and y represent the number of litres of Strawberry Scream.

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

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

(Total 6 marks)

(Q06 6689/01/R, June 2014)

Q6.
A firm is planning to produce two types of radio, type A and type B.

Market research suggests that, each week:

- At least 50 type A radios should be produced.
- The number of type A radios should be between 20% and 40% of the total number of radios produced.

Each type A radio requires 3 switches and each type B radio requires 2 switches. The firm can only buy 200 switches each week.

The profit on each type A radio is £15. The profit on each type B radio is £12.

The firm wishes to maximise its weekly profit.

Formulate this situation as a linear programming problem, defining your variables.

(Total 7 marks)
(Q06 6689/01, June 2011)

Q7.
Class 8B has decided to sell apples and bananas at morning break this week to raise money for charity. The profit on each apple is 20p, the profit on each banana is 15p. They have done some market research and formed the following constraints.

- They will sell at most 800 items of fruit during the week.
- They will sell at least twice as many apples as bananas.
- They will sell between 50 and 100 bananas.Assuming they will sell all their fruit, formulate the above information as a linear programming problem, letting a represent the number of apples they sell and b represent the number of bananas they sell.

Write your constraints as inequalities.

(7)

(Total 7 marks)

(Q05 6689/01, June 2008)