5. A manufacturer makes three flavours of ice cream, vanilla, strawberry and chocolate. All flavours are supplied in the same size tubs.

The profit from selling each tub of vanilla ice cream is £1.50, each tub of strawberry ice cream is £2.00 and each tub of chocolate ice cream is £1.80

The manufacturer wishes to maximise their profit.

This needs to be formulated as a linear programming problem.

Let x be the number of tubs of vanilla ice cream made.
Let y be the number of tubs of strawberry ice cream made.
Let z be the number of tubs of chocolate ice cream made.

(a) State the objective, giving the objective function in terms of x, y and z

(2)

There are sufficient ingredients to make 400 tubs of vanilla ice cream **or** 240 tubs of strawberry ice cream **or** 300 tubs of chocolate ice cream.

(b) Show that this constraint can be written as

$$3x + 5y + 4z \leqslant 1200$$

(2)

The manufacturer must also meet the following three conditions

- at least 40% of the total ice cream made must be vanilla
- at most 25% of the total ice cream made must be strawberry
- for every 2 tubs of strawberry ice cream made, the manufacturer must make at least 3 tubs of chocolate ice cream

(c) Use this information to form three further constraints, giving these as simplified inequalities with integer coefficients.

(3)

(Total for Question 5 is 7 marks)