8. A bakery makes three types of doughnut. These are ring, jam and custard. The bakery has the following constraints on the number of doughnuts it must make each day.

- The total number of doughnuts made must be at least 200
- They must make at least three times as many ring doughnuts as jam doughnuts
- At most 70% of the doughnuts the bakery makes must be ring doughnuts
- At least a fifth of the doughnuts the bakery makes must be jam doughnuts

It costs 8 pence to make each ring doughnut, 10 pence to make each jam doughnut and 14 pence to make each custard doughnut. The bakery wants to minimise the total daily costs of making the required doughnuts.

Let x represent the number of ring doughnuts, let y represent the number of jam doughnuts and let z represent the number of custard doughnuts the bakery makes each day.

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

(6)

On a given day, instead of making **at least** 200 doughnuts, the bakery requires that **exactly** 200 doughnuts are made. Furthermore, the bakery decides to make the minimum number of jam doughnuts which satisfy all the remaining constraints.

Given that the bakery still wants to minimise the total cost of making the required doughnuts, use algebra to

(b) (i) calculate the number of each type of doughnut the bakery will make on that day,

(ii) calculate the corresponding total cost of making all the doughnuts.

(5)

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