6. A clock manufacturer makes two sizes of clock, small and large. The profit on a small clock is £8 and the profit on a large clock is £18. The manufacturer wants to maximise the total profit on the clocks and formulates this as a linear programming problem, including two constraints which are already known.

Let x represent the number of small clocks.

Let y represent the number of large clocks.

$$\text{Maximise} \quad P = 8x + 18y$$

$$\text{subject to} \quad 3y \geqslant x$$
$$y \leqslant 4x$$

The manufacturer also knows that

- the total number of clocks made must be at most 34
- small clocks take 12 minutes to assemble
- large clocks take 30 minutes to assemble
- there is a maximum of 12 hours available to assemble the clocks

(a) Formulate this information as additional constraints written as inequalities, with fully simplified integer coefficients.

(3)

(b) Represent these additional constraints on the graph in the answer book. Hence determine, and label, the feasible region, R

(2)

(c) Use the objective line method to determine the optimal number of each type of clock to be made.

(3)

(d) Hence determine how much available assembly time is not used.

(1)

(Total for Question 6 is 9 marks)