Exercises sheet A2
School of Mathematics
The University of Edinburgh
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Producti-Co is a company that can produce a total of seven products. The sale cost and production time, in hours, for each of the seven products can be found in the table below.

Product	Sale price (£)	Production time (hours)
1	100	1.0
2	420	2.0
3	350	2.7
4	490	2.4
5	550	4.5
6	100	0.7
7	1115	9.5

Suppose that Producti-Co can employ either part-time or full time employees to produce the products. A full-time employee works for 8 hours a day at a rate of £80 per hour and if a full-time employee is hired then they must work for 5 constitutive days followed by two rest days. A part-time employee works for 6 hours a day at a rate of £35 per hour and if a part-time employee is hired then they must work for 5 constitutive days followed by two rest days. Union requirements limit part-time labour to 25% of the total labour force hours. Assume that there can be at most 500 workers on duty on any given day. You can assume that the system is in steady state. That means that if an employee is scheduled to start on Sunday, they will be available to work on Sunday, Monday, Tuesday, Wednesday, Thursday but will be off on Friday and Saturday. Suppose that the following production requirements must also be satisfied:

- If any units of product 7 are produced on a given day then an additional fixed cost of £2000 is required
- Each unit of product 2 that is produced over 100 units requires a production time of 3.0 man-hours instead of 2.0 man-hours (e.g. producing 101 units of product 2 requires 100(2.0) + 1(3.0) man-hours)
- If both product 3 and product 4 are produced together on any given day then 75 additional labour hours are required for production line set-up.
- If I can purchase a new machine to produce product 7 in 5.5 hours, what is the most that I should be willing to pay for this new machine?

Exercise 1 *Written* ***(10 marks)***

Write a linear optimization model to find Producti-Co's weekly production plan with maximum profit. Present your model and findings in a well organised consultancy report.

Exercise 2 *Computer* ***(10 marks)***

Write a Mosel file for this model and solve the problem with Xpress. Print your results in a suitable format.