

Project 1 -- Patient Scheduling & Profit Management¹

Consider a Health Management Organization (HMO) which contracts for doctor services in a clinic. For simplicity, we'll assume that a doctor's contract with the HMO calls for him to see no more than ____ patients in one day and that the doctor's patients may be divided between the clinic and a private practice. A total of eight doctors will staff the HMO clinic. A doctor's total profits are determined by his share of the clinic's profit and any profit from a private practice. The profit to the clinic is determined by the number of patients seen in the clinic such that:

$$\text{clinic profit} = \text{____} (\text{total \# of patients seen in the clinic}) - 0.25(\text{total \# of patients seen in the clinic})^2$$

The doctors share the profit earned in the clinic such that each doctor gets a percentage of the total clinic profit equal to his share of the clinic's patient load. Each doctor also has a private office. The profit to the doctor for each patient seen in his private office is \$ ____ per patient. How should the doctor divide his patient load between the clinic and his private practice?

You have been hired as an advisor to a doctor who has recently entered into this service contract with the HMO. You are to advise the doctor on how to schedule his ____ patients so that he can maximize his total profit. To do this, your task is to develop a chart which will assist the doctor in scheduling the number of patients to be seen in his clinic and in his private office and to determine the amount of his total profits. Furthermore, he has also asked you to be prepared to advise him on several other matters concerning this contract, to include the number of patients he should schedule to be seen in the clinic if he and the other seven doctors agree to act in similar manners so as to maximize joint profits. Let α be the number of patients seen in the clinic by the other seven doctors.

Here are some questions to guide your analysis and to answer possibly all of the doctor's questions:

In your investigation of maximizing the doctor's individual total profit, you should :

- State an expression for the doctor's share of clinic profit.
- State an expression for the doctor's profit from private practice.
- State an expression for the doctor's total profits.
- Express the optimal in-clinic patient schedule chart as a piecewise continuous function.

In your investigation of maximizing the doctor's joint profits, you should :

- State an expression for the doctor's share of clinic profit.
- State an expression for the doctor's profit from private practice.
- State an expression for the doctor's total profits.
- What is the domain of your independent variable in your total profits expression?
- What is the range of your dependent variable in your total profits expression?
- What is the clinic's patient load if all 8 doctors act in a similar manner to maximize joint profits?
- What is the rate of change in the doctor's total profits if the doctor's clinic patient load decreases at the rate of 1 patient per day when his current clinic patient load is ____ (*optimal* + 1) patients?
- What is the rate of change in the doctor's total profits if the doctor's clinic patient load increases at the rate of 1 patient per day when his current clinic patient load is ____ (*optimal* - 1) patients?
- Assume that, at the end of each day, the doctor deposits his total profits into an ordinary savings account which pays 3% annual interest compounded daily. Develop a Discrete Dynamical System which models this problem and find an expression which determines how much money the doctor has accumulated in the account after k days.

Your report for this project is not just a list of answers to these questions -- you must *explain* your analysis and support your advice and findings. The format for this report submission is described in your Course Guide at enclosure 3 to the Instructional Memorandum dated 24 January 1995.

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