

## Practical Exam

*Do not open this exam paper until instructed to do so.*

Time allowed: **90** minutes

There are **2** questions on this exam

You may access any material during the exam including material on paper, in your electronic files or online. However you may not communicate with other people during the exam.

Submit your Python files for each question through Blackboard before the end of the exam.

Please fill in your details below.

Student number: .....

Name: .....

Signature: .....

### Question 1 (5 marks)

The marketing group of AJPCo is considering the options available for its next advertising campaign. After a great deal of work, the group has identified a number of options with the characteristics shown in the accompanying table.

	TV	Social Media	Print	Radio	Cinema	In-store Marketing	Total available
Customers Reached	1,000,000	200,000	300,000	400,000	450,000	450,000	NA
Cost(\$)	500,000	150,000	300,000	250,000	250,000	100,000	1,400,000
Designer hours	700	250	200	200	300	400	1,500
Salesman hours	200	100	100	100	100	1,000	1,200

The objective of the advertising program is to maximize the number of customers reached, subject to the limitation of resources (money, designers, and salesman) given in the table above. In addition, the following constraints have to be met:

1. If the In-store Marketing campaign is undertaken, it needs at least one of a Radio or a Cinema campaign effort to support it.
2. The firm will only use at most one of the Social Media or Cinema campaigns.

Formulate an IP model that will assist the company to select an appropriate advertising campaign strategy. Write your formulation in the space below or on the back of this page (if needed).

Implement your formulation in Python and solve the problem. The code should clearly correspond to your formulation.

The Python stub *Marketing.py* contains the data above, to save you retyping it. You do not need to use lists of the same name as in the stub if you choose not to.

## Question 2 (5 marks)

In a carnival contest, Michael will shoot a total of ten shots at four different targets. The contest has been designed so that Michael will not know whether or not he hits any target until after he has made all ten shots.

He obtains 6 points if any shot hits target 1, 4 points if any shot hits target 2, 10 points if any shot hits target 3, and 7 points if any shot hits target 4, so that the maximum possible points is 27.

At each shot there is an 80% chance that he will miss target 1, a 60% chance of missing target 2, a 90% chance of missing target 3, and a 50% chance of missing target 4, given that he aims at the appropriate target.

If Michael wants to maximize his expected number of points, how many shots should he aim at each target? Implement a DP formulation in Python, including comments in your code that describe the stages, state variable and return function for your solution. Write the optimal solution in the space below.