

Issue date: Tuesday 11th November 2008

Hand-in date: Friday 21st November 2008 (***) 12 noon (***)

Part 1. Monte-Carlo Simulation (10 marks)

Write a program to do the following:

- Input a positive integer N
- Generate N pairs of random numbers (x, y) where x and y are each uniformly distributed on $[0,1]$.
- Calculate the fraction F of times that $x^2 + y^2 < 1$.
- Output the value $4F$.

The random-number generation can be done by

```
CALL RANDOM_NUMBER( X )
```

(The argument X can be either a scalar or an array, to generate one or many random numbers at a time). Although this generates a sequence of random numbers they will always be the same random numbers (!) unless you

```
CALL RANDOM_SEED
```

(once) before any calls to it.

Include in your report a full program listing and two successive outputs of the program when run with $N = 10\,000\,000$ (ten million).

Part 2. Conversion of Case (10 marks)

Write a program to read a passage of text from a file and write it back to a different file entirely in upper case.

Include in your report a full program listing and the output of the program when applied to file `part2.dat` on this unit's website.

[Continued overleaf]

Part 3. End-of-Semester Marks (20 marks)

At an entirely fictitious British university students take a selection of units with different credit weightings. They receive a percentage mark for each unit, but it is necessary to calculate a credit-weighted average for all units.

A typical marks file is shown below.

4						
6						
	MACE20001	MACE20011	MACE20041	MACE20221	MACE20351	MACE20152
	20.0	10.0	10.0	5.0	5.0	20.0
7032601	52.8	57.9	45.8	41.2	46.2	76.7
7136166	45.8	57.3	41.2	43.7	47.5	55.6
7149886	3.6	35.0	20.6	28.5	14.8	73.8
7167132	29.3	57.8	32.6	13.3	57.5	61.2

The 1st line is the number of students (here, 4).

The 2nd line is the number of course units taken (here, 6).

The 3rd line is the set of course units, indicated by a 9-character code (e.g. MACE42001).

The 4th line is the corresponding set of credit weightings.

The subsequent lines contain 7-character student registration codes (e.g. 7032601), followed by their percentages for each unit.

Write a program to read such a marks grid from an input file and write back to an output file a table of students' registration numbers and their credit-weighted marks only.

Your program should be able to deal with an arbitrary number of students, with the class taking an arbitrary number of units.

In your report include a full program listing and the output file when applied to the marks grid to be found in `part3.dat` on this unit's website.