

# DEPARTMENT OF PHYSICS & ASTRONOMY

## 3C59 EXAM-1

### PROGRAMMING EXERCISE

Please read the exam guidelines, rules, instructions and marking criteria at:  
<http://www.hep.ucl.ac.uk/undergrad/3459/exam/midterm.html>

For this programming exercise you have 3 hours and it is worth 17.5 % of your final mark.

You will process information from three URLs in order to calibrate a number of radiation counters and determine the activity of some samples.

Each line of <http://www.hep.ucl.ac.uk/undergrad/3459/exam/calibration-samples.txt> contains the name of a calibration sample and its radioactivity level in Bequerels (decays per second) as measured using a highly accurate test apparatus.

Each line of <http://www.hep.ucl.ac.uk/undergrad/3459/exam/calibration-data.txt> contains the name of a radiation counter, the name of one of the calibration samples (from [calibration-samples.txt](http://www.hep.ucl.ac.uk/undergrad/3459/exam/calibration-samples.txt)) and the radioactivity level of the sample as measured using the given counter. A given radiation counter can occur more than once since it can have radioactivity level measurements taken using several calibration samples.

- For each radiation counter, determine its efficiency by comparing its measured radioactivity level with the level determined from the calibration sample using the data in [calibration-samples.txt](http://www.hep.ucl.ac.uk/undergrad/3459/exam/calibration-samples.txt) and [calibration-data.txt](http://www.hep.ucl.ac.uk/undergrad/3459/exam/calibration-data.txt). Where there are multiple lines referring to the same radiation counter, take the mean efficiency from all relevant lines.

Each line of <http://www.hep.ucl.ac.uk/undergrad/3459/exam/test-data.txt> contains the name of a test sample and then data for an arbitrary number of radiation counters on the same line. The associated radiation counter data has the name of the radiation counter, the time in seconds for which the sample was observed, and the number of radioactive decays observed in that time. These three data items (name of counter,time,counts) are repeated for each radiation counter used to measure the given test sample.

- For each test sample listed in [test-data.txt](http://www.hep.ucl.ac.uk/undergrad/3459/exam/test-data.txt), find the average count rate, allowing for the efficiency of each counter used and determine which sample has the highest count rate.

## END OF PAPER