THE UNIVERSITY OF THE WEST INDIES
Department of Computing
COMP1127–Introduction to Computing II

Lab 4

Access and Complete the following Lab Exercise on Hackerrank.

Opening Date: **Friday, November 12, 2021**

Lab Date (Week 4): **Tuesday, November 16 – Saturday, November 20, 2021**
Due Date: **11:45 pm, Sunday, November 21, 2021 (on Hackerrank)**

A student record contains the information: id, name, list of courses with a corresponding grade. A name consists of a first name and a last name. The following functions have been provided in the hackerrank program:

Type	Name	Description
Constructor	`student()`	Creates a student with an id, first name and last name as a list and the course codes and grades as a list of tuples.
Selector	`get_id()`	Returns the id value from the given student record.
Selector	`get_name()`	Returns student name as a list from the student record
Selector	`get_courses()`	Returns a list of tuples where first part of the tuple is the course and the second part of the tuple is the corresponding grade that the student has received.
Selector	`get_fname()`	Returns student's first name as a string given the student name list.
Selector	`get_lname()`	Returns student's last name as a string given the student name list.
Selector	`get_ccode()`	Returns the course code from a tuple of course code and grade.
Selector	`get_grade()`	Returns the grade from a tuple of course code and grade.

In the hackerrank file, the following are also provided:

`st1` - A student record for John Doe
`credit_list` - A dictionary of course codes as keys and their corresponding credit values
`qp_list` - A dictionary with letter grades as keys and their quality points

`my_map` - A function that performs an operation on each element in a list
`print_students_gpa` - A function that prints a student's details including GPA. For this function to work, it needs function `calc_gpa` to be written

Details of the student record `st1`, the dictionaries and functions

```
st1=student('620000101',"Jane","Doe",["COMP1126",80,"COMP1127",60,"COMP12
10",50,"COMP1161",60,"COCR2003",85,"COMP2140",80])


credit_list={'COMP1126':3,'COMP1127':3,'COMP1161':3,'COMP1210':3,'COMP122
0':3,'COMP2140':3,'COMP2111':3,'COCR2003':1}

qp_list = {"A+":4.3,"A":4.0,"A-":3.7,"B+":3.3,"B":3.0,"B-":2.7,"C+":2.3,\
      "C":2.0,"F1":1.7,"F2":1.3,"F3": 0.0}

def my_map(f,lst):
    if lst == []:
        return []
    else:
        return [f(lst[0])] + my_map(f, lst[1:])

def print_students_gpa(std):
    """Prints the students details and GPA"""
    print ("Student Id:", get_id(std))
    print ("Student name:", get_fname(get_name(std)), get_lname(get_name(std)))
    print ("GPA: %.2f" %(calc_gpa(std)))
```

Examples of the functions with use of the student record `st1`

```
>>> st1  # student record st1 for John Doe
['620000101', ['Jane', 'Doe'], [('COMP1126', 80), ('COMP1127', 60),
('COMP1210', 50), ('COMP1161', 60), ('COCR2003', 85), ('COMP2140', 80)]]

>>> get_id(st1) # returns id of st1
'620000101'
>>> get_name(st1) # returns Name list of st1
['Jane', 'Doe']
>>> get_courses(st1) # returns list of tuples of course codes and grades
[('COMP1126',80),('COMP1127',60),('COMP1210',50),('COMP1161',60),('COCR20
03',85), ('COMP2140',80)]

>>> get_fname(get_name(st1)) # returns first name of st1
'Jane'
>>> get_lname(get_name(st1)) # returns last name of st1
'Doe'

>>> get_ccode(("COMP1127",60)) # returns the course code from a tuple
'COMP1127'
>>> get_grade(("COMP1127",60)) # returns the grade from a tuple
60

>>> my_map (get_grade, get_courses(st1)) # returns all grades for st1
[80, 60, 50, 60, 85, 80]
```

Problem 1

Write a function `compute_letter_grade()` which takes a number grade and returns the corresponding letter grade.

Number Grade	Letter Grade
>89	"A+"
80-89	"A"
75-79	"A-"
70-74	"B+"
65-69	"B"
60-64	"B-"
55-59	"C+"
50-54	"C"
45-49	"F1"
40-44	"F2"
0-39	"F3"

```
>>>compute_letter_grade(80)
'A'
```

Problem 2

Write a function `calc_letter_grade()` which takes a student as input and returns a list of tuples where the first part of the tuple is the course code and second part of the tuple is the letter grade.

From the student structure, first extract the course list which is a list of tuples of course codes and the number grades. Get the number grades from the course list and create a new list in which each number grade is converted to a letter grade. Recreate a new courses list with the list of courses and the list of letter grades.

Hint: Use `my_map` to apply a function to every element of the list. Also remember that zip takes two lists as inputs and creates a list of tuples e.g.

```
>>>list(zip ([1,2,3] ,[4,5,6]))
[(1, 4), (2, 5), (3, 6)]
```

```
>>> calc_letter_grade(st1)
[('COMP1126', 'A'), ('COMP1127', 'B-'), ('COMP1210', 'C'),
('COMP1161', 'B-'), ('COCR2003', 'A'), ('COMP2140', 'A')]
```

Problem 3

To calculate Grade Point Average (GPA) the letter grade for each course and the quality points for each letter grade are required. Each course has a corresponding credit weight associated with it and each letter grade has a corresponding quality point associated with it.

For each course a student has taken, a grade point is calculated by multiplying the quality point associated with the letter grade that the student has gotten by the credit weight for that course. The GPA is calculated by dividing the total grade points of all courses by the total amount of credit hours.

For example if a student has taken two courses COMP1127 and COCR2003 and the grades are "B-" and "A", then the grade point average would be calculated as follows:

Course Code	Credit Weight	Grade	Quality Point	Grade Point
COMP1127	3	B-	2.7	8.1
COCR2003	1	A	4.0	4.0

GPA = (8.1+4.0)/4 = 3.02

a) Write a function `convert_to_wtqp()` which takes a tuple of course code and the letter grade and uses these as keys to get the corresponding values from the dictionaries `credit_list` and `qp_list` and returns the values as a tuple. To access the first part of the tuple use the selector function `get_ccode()` and the second part of the tuple use `get_grade()`

```
>>> convert_to_wtqp(("COMP1127","B-"))
(3, 2.7)
```

b) Write a function `calc_gpa()` which takes a student record and calculates the gpa for the student. First extract the list of tuples of course codes and number grades and create a list of tuples with course codes and letter grade. Then create a list of corresponding wt and qp for each course code and letter grade, this can be created by applying `convert_to_wtqp()` to each element of the course code and letter grade list. Accumulate grade_points and credit_weights as shown in the table above and divide total grade points by total credit weights to calculate the Grade Point Average (GPA).

The function `print_students_gpa()`, which takes a student record as a parameter and uses the function `calc_gpa()`, is used to print the student's GPA.