MIDDLE EAST TECHNICAL UNIVERSITY, NORTHERN CYPRUS CAMPUS
CNG140 C Programming – Programming Assignment 4

Date handed out: **30 May, 2022, Monday**
Date submission due: **13 June, 2021, Monday, 23:55 (Cyprus Time)**

Programming Assignment 4: CNG140 Grade Calculator

Purpose:

The main purpose of this programming assignment is to revise the topics that we have covered in CNG140 including fundamentals of C programming, conditional statements, repetitive statements, functions, arrays, pointers, dynamic memory allocation, files, strings, etc. This is a comprehensive assignment that covers all the topics you have seen in CNG140.

Description:

You will write a program that takes a list of exam/assignment grades from a number of CNG140 students and calculate their total overall grade of the course.

In this programming assignment, you will write a program that reads student records from a file and allows the user to process these records.

As usual don't try to compile your entire program in one "big bang". Compile it piece by piece. Test each piece that you have compiled to make sure it works correctly before you add the next piece.

Programming Requirements

You will read student records from a file which includes a table of records as follows:

Table 1: Student records

Name Surname	Lab	Assignment	Midterm	Final
Elisa Blaese	10.00	24.78	69.78	94.55
Samiya Davidson	10.00	23.95	68.95	92.90
Ariah Brandt	10.00	24.20	66.70	90.90
Brittney Bennett	10.00	24.90	69.90	94.80
Lorelei Munoz	10.00	23.73	66.73	90.45
Carlton Randall	8.00	24.20	66.70	90.90
Elina Cantu	10.00	24.03	60.03	84.05
Efa Murillo	10.00	22.65	65.15	87.80
Cruz Laing	9.00	23.58	58.58	82.15
Eisa Ferrell	8.50	21.90	65.90	87.80

CNG140 syllabus proposes the following weights for each of these assessments:

Practical Assignments:	25%
Weekly Lab Assignment Submissions:	10%
Midterm Exam:	30%
Final Exam:	35%

Therefore, the following formula can be used to calculate the total grade for a student:

```
Total = lab + assignment + 0.3*midterm + 0.35*final
```

Please note that, in the given table above, lab is already out of 10 and assignment is already out of 25, therefore their weight is one in the formula.

Define a **structure** type to represent one row of this student record table. The structure will include string to represent the name and surname of the student, a real number to represent lab, assignment, midterm, final and the overall total.

Write a program to implement the following steps to process such student records as follows. Before you start, copy the data in Table 1 into a file called "cng140.txt".

a. Read the name of this data file from the command line which is called "cng140.txt". Then check the file, if the file does not exist, your program needs to ask user for entering a correct file name.

b. Load "cng140.txt" into an array of structures called StudentTable. Here, you also need to compute the Total score (see above given formula) and included that into an array of structures called StudentTable.

c. Define and call the following functions.

Load_StudentTable – Takes as parameters the name of the input file. Function creates an array of StudentTable, opens the given file, fills the StudentTable array, closes the file, and returns the StudentTable array. Please note that this function needs to return both the actual array as the function result and also the total number of students read from the file. Please note that here you cannot return both the table structure and also the size of the array therefore you need to return the actual table and use pass by reference to update the total number of students in the main. Please note that you cannot make an assumption about the number of rows in the given table. When you load the data from the file, you also need to compute and add the Total grade to the StudentTable array.

Display_StudentTable – Takes as parameters the the StudentTable array and its actual size. Then, displays the table on the screen. If the table has not been loaded then appropriate error message should be displayed to the user.

Search – Takes as parameters the StudentTable array, its actual size, and a string representing the name and surname of the student. If the entered name and surname is found then this function returns the position of this record in the array otherwise it returns -1 if that student is not found (Details of the searched student will be displayed in the main function according to the returned value from this search function). Please note that when you search if the given name/surname is part of a name and surname in the array then it will be accepted as found. For example, if the array has "Ahmet Mehmet Var" then when you search "Ahmet Mehmet", then this function will return found. Similarly, when you search, "Ahmet", it will also return true. However, when you search for "met", it should return false. If the list has more than one name then it will return the position of the first student with the given name.

Sort – Takes as parameters the StudentTable array and its actual size. It then asks user to enter a sorting option and depending on the input from the user reorders the records of the students. The user can sort the data based on the total grade and final grade. **Hint**: You learnt how to use Bubble Sort (Worksheet 14), you can use that algorithm or another sorting algorithm. However, clearly comment out in your code which algorithm you use and how you do the sorting.

A sample run will be as follows:

```
>Grading cn14.txt
This file does not exist, please enter again: cn14.txt
This file does not exist, please enter again: cng14.txt
This file does not exist, please enter again: cng140.txt
Student records file (cng140.txt) has been successfully loaded!
Following records have been loaded:
```

Name Surname	Lab	Assignment	Midterm	Final	Total
Elisa Blaese	10.00	24.73	69.78	94.55	88.76
Samiya Davidson	10.00	23.95	68.95	92.90	87.15
Ariah Brandt	10.00	24.20	66.70	90.90	86.03
Brittney Bennett	10.00	24.90	69.90	94.80	89.05
Lorelei Munoz	10.00	23.73	66.73	90.45	85.41
Carlton Randall	8.00	24.20	66.70	90.90	84.03
Elina Cantu	10.00	24.03	60.03	84.05	81.46
Efa Murillo	10.00	22.65	65.15	87.80	82.93
Cruz Laing	9.00	23.58	58.58	82.15	78.91
Eisa Ferrell	8.50	21.90	65.90	87.80	80.90

```
Press 1 for search, 2 for sort and 3 for exit: 1

Enter the name of the student: Ahmet Mehmet
That student is unknown! Please try again!
Enter the name of the student: Eisa Ferrell

Eisa Ferrell has 8.50 from Lab, 21.90 from Assignments, 65.90 from Midterm
and 87.80 from Final, with the total of 80.90.

Press 1 for search, 2 for sort and 3 for exit: 2
Sort by (F: Final, T: Total): T
```

Name Surname	Lab	Assignment	Midterm	Final	Total
Brittney Bennett	10.00	24.90	69.90	94.80	89.05
Elisa Blaese	10.00	24.73	69.78	94.55	88.76
Samiya Davidson	10.00	23.95	68.95	92.90	87.15
Ariah Brandt	10.00	24.20	66.70	90.90	86.03
Lorelei Munoz	10.00	23.73	66.73	90.45	85.41
Carlton Randall	8.00	24.20	66.70	90.90	84.03
Efa Murillo	10.00	22.65	65.15	87.80	82.93
Elina Cantu	10.00	24.03	60.03	84.05	81.46
Eisa Ferrell	8.50	21.90	65.90	87.80	80.90
Cruz Laing	9.00	23.58	58.58	82.15	78.91

```
Press 1 for search, 2 for sort and 3 for exit: 2
Sort by (F: Final, T: Total): F
```

Name Surname	Lab	Assignment	Midterm	Final	Total
Brittney Bennett	10.00	24.90	69.90	94.80	89.05
Elisa Blaese	10.00	24.73	69.78	94.55	88.76
Samiya Davidson	10.00	23.95	68.95	92.90	87.15
Ariah Brandt	10.00	24.20	66.70	90.90	86.03
Carlton Randall	8.00	24.20	66.70	90.90	84.03
Lorelei Munoz	10.00	23.73	66.73	90.45	85.41
Efa Murillo	10.00	22.65	65.15	87.80	82.93
Eisa Ferrell	8.50	21.90	65.90	87.80	80.90
Elina Cantu	10.00	24.03	60.03	84.05	81.46

```
 Cruz Laing          9.00     23.58           58.58        82.15      78.91


Press 1 for search, 2 for sort and 3 for exit: 3

Bye!
```

Grading:
If your code does not compile, you will automatically get zero. If your code compiles, you will then be graded based the following scheme:

Grading Point	**Mark (100)**
Load_StudentTable function that reads the file and dynamically populates the data from the file and the computed Total grade to the array. You should not make any assumption about the size of the data.	40 points
Display_ StudentTable function that displays the array to the user with appropriate messages.	10 points
Search function that searches and looks up for a specific string in the array and display appropriate messages.	20 points
Sort function that sorts the data in the array by the value given by the user.	20 point
Main function that coordinates these functions and extra functions needed.	10 point

Please note that the functions prototype descriptions are provided in Programming Requirements part

Rules:

Please make sure that you follow the restrictions for the assignment as follows:

- Strictly obey the input output format. Do not print extra things.
- **You are not allowed to use global variables.**
- Add your name/surname and ID at the top of your code as comments and name your source file "Name-Surname-StudentID.c"
- Submit your solution as C and PDF to odtuclass. Do not compress it (zip, rar, …).

If you fail to obey any of the above rules, you will automatically get zero.