BIL105E - Introduction to Scientific and Engineering Computing

Homework-3

Assignment Date : 01.04.2010
Due Date : 22.04.2010 at 22:00

- Submit two files to Ninova. File names must be your İTÜ student number.
  1) Your C source file (Example: 040090123.c)
  2) Your MS Word report file (Example: 040090123.doc)
- You should use the standard report format (Yazılım Ödevleri Klavuzu) which is available at Ninova. *Flowchart is not required for this homework, but an outline of algorithm (pseudocode) is required in the report.*
- Make sure gcc compiles your code successfully on Unix/Linux.
- Cheating is unacceptable and subject to disciplinary actions. All submitted programs will be cross-checked by using an automatic detection system.
- Late submissions through email are not accepted.

IMPORTANT

The following information must be added at the beginning of your C source code, otherwise 10 points will be deducted as penalty from your homework grade.

```
/***************************
Course         : Bil105e
Term           : 2010 Spring
Homework       : #3
Student Name   : Aaa Bbb
Student Number : 123456789
***************************/
```

HOMEWORK DEFINITION

Write a **C program** that reads the followings for each student from standard input (KEYBOARD). Number of student records is arbitrary, so in order to signal the end of input, the value (-1) for Student Number will be used as a sentinel data.

The following inputs for students will be entered to the program. Each value will be separated by a blank space.

- Student number
- First name
- Last name
- Midterm exam result
- Final exam result
- Homework1 result
- Homework2 result

Grade of a student should be calculated as the sum of followings:

- Final (%40)
- Midterm (%25)
- HW1 (%15)
- HW2 (%20)

The corresponding grade Letter for a student should be determined according to the following table, so that a normal bell-curve distribution is accomplished.

CONDITION	LETTER
Grade $\geq$ m + 1.5σ	AA
m + 1.0σ $\leq$ Grade < m + 1.5σ	BA
m + 0.5σ $\leq$ Grade < m + 1.0σ	BB
m $\leq$ Grade < m + 0.5σ	CB
m - 0.5σ $\leq$ Grade < m	CC
m - 1.0σ $\leq$ Grade < m - 0.5σ	DC
m – 1.5σ $\leq$ Grade < m - 1.0σ	DD
Grade < m – 1.5σ	FF
Midterm=Final=HW1=HW2=0	VF

Use the following equations:

$$m = \frac{\sum_{i=1}^{N} X_i}{N} \qquad \sigma = \sqrt{\frac{\sum_{i=1}^{N} (X_i - m)^2}{N}}$$

- N denotes the count of students
- X_i denotes the Grade of i^{th} student
- m denotes the mean (average) of grades
- σ denotes the standard deviation

Exception Case: When a student's Midterm, Final, HW1, and HW2 are all zero, then that student should be excluded from the N count.

INPUT

Your program should read all data values from the standard input (KEYBOARD).

In order to make testing easy, you can use the command-line window to run your program, by applying the following input redirection method.

Myprog.exe < students.txt

With this method, your program will read the input values from the file, instead of the actual keyboard. (Both the executable program and the data file must be in the same directory.)

OUTPUT

Your program should print all outputs to the standard output (SCREEN).

If you also want to save the outputs to a file, instead of displaying on screen, then run the program with the following input/output redirection method.

Myprog.exe < students.txt >sonuclar.txt

The output screen must contain the following three parts.

PART 1: THE LIST OF RESULTS

Display the results list which is sorted by Grades in descending order.

```
PART 1:

RESULTS SORTED BY GRADE IN DESCENDING ORDER

Student Number   Student Name        Grade  Letter
==============   ==================  =====  ======
040040245        Alper Kilic            89    AA
040040260        Bora Izgordu           84    AA
040040219        Mehmet Gunes           84    AA
040050201        Atakan Aral            81    AA
040040927        Iliyaz Iliyaz          79    BA
040040214        Yasin Oge              78    BA
...              ...  ...               ...   ...
...              ...  ...               ...   ...
990082003        Marco Martino          25    FF
040950638        Mustafa Akkoca          0    VF
```

PART 2: CLASS AVERAGES

Display the averages of Midterm, Final, Homework1, and Homework2.

Also display the Mean (Grade Average), and the Standard deviation.

```
PART 2:

CLASS AVERAGES

Number of student records =  83
N =  82

Midterm Average =  49.22
Final Average   =  58.04
HW1 Average     =  87.65
HW2 Average     =  59.45

Mean (Grade Average)  =  60.06
Standard deviation    =  13.44
```

PART 3: LETTER COUNTS AND THE HISTOGRAM

Display the frequency counts of each letter, and a horizontal histogram next to the count.

```
PART 3:

LETTER COUNTS AND HISTOGRAM


AA Count =  4 ****
BA Count =  6 ******
BB Count = 10 **********
CB Count = 22 **********************
CC Count = 21 *********************
DC Count = 11 ***********
DD Count =  4 ****
FF Count =  4 ****
VF Count =  1 *
```

NOTICE:

You can assume that the maximum number of student records can be 100.