Project 4: Sorting Program

Handed out Wednesday, November 27.
Due Monday, December 09, Midnight.

Project Description:

This program will sort grades for our class using an insertion sort. The input to the program is an integer \( n \), where \( 0 < n \leq 100 \) is the number of students in the class, and a list of students’ grades. Each grade is in the range of 0 to 100. Error checking must be done for number of students and grades. The program will be in a loop until user enters an integer 6 to quit the program.

After reading in the grades, your program should respond to each of the following input options:

- 1: display the original input grades.
- 2: display sorted grades from highest to lowest.
- 3: display the highest grade.
- 4: display the lowest grade.
- 5: display the average grade.
- 6: quit the program.

Use C functions to perform the options 1 - 5, initialize your arrays, read input grades, and display the grades. The user should be allowed to select the options in any order. For example, the user can select 1, then 2, and then 1, the program should display the original input grades, then the sorted grades, and then the original input grades. For the sake of efficiency, your program should sort the grades at most once, and only if option 2 is selected. That is, the first time option 2 is selected you sort the grades and save the results. Subsequently, if option 2 is select the saved sorted grades will be printed.

Project Grading:

- All projects are to be done independently. Instances of academic dishonesty will be dealt with harshly, and usually result in a grade of F.
- Late projects are subject to the following late penalties: subtract 20% each day after the due date (Saturday, Sunday and holidays count as days).
- Please write project according to the C Coding Standards and Indentation Style as posted in our class website, http://www.cs.umbc.edu/courses/undergraduate/104/fall02/chen/projs/.
- To submit your project, type “submit cs104-0301 proj4 filename”. See above website for more information. (If you experience problems at the last minute, send email to kevina1@umbc.edu and attach the program as verification that you had the project finished on time.)
Your project will be graded based on the following:

- **Correctness:** 80 points
  - Display the original input grades: 10 points
  - Display sorted grades from highest to lowest: 35 points
  - Display the highest grade: 10 points
  - Display the lowest grade: 10 points
  - Display the average grade: 10 points
  - Quit the program: 5 points
  - Program does not compile: 0 points
  - No error checking: subtract 10 points
  - No function calls: subtract up to 70 points
  - Program efficiency: subtract up to 20 points

- **Good Structure and Documentation:** 20 points

Here is a sample of comment blocks required for this project:

```plaintext
/****************************
 ** Course: CMSC104 Section 0301
 ** Project: proj4.c
 ** Date: 12/09/2002
 ** Author: Li-Chuan Chen
 ** SSN: 123-45-67689
 ** E-mail: lichen@umbc.edu
 **
 ** Description:
 **
 ** Input:
 **
 ** Output:
 **
 ** Pseudocode:
 **
 ****************************/
```

Here is a sample output run:

1. Run the program.
   
   ```
   linux2% a.out
   This program will sort students grades:
   Enter number of students (>= 1):
   0
   number must be >= 1. Enter number of students again:
   4
   ```
Enter grade [0 .. 100]:
-10
Grade must be between [0 .. 100]. Enter grade again:
110
Grade must be between [0 .. 100]. Enter grade again:
60
Enter grade [0 .. 100]:
0
Enter grade [0 .. 100]:
100
Enter grade [0 .. 100]:
40

Enter one of the following menu options:
  1: display unsorted grades
  2: display sorted grades from high to low
  3: display the highest grade
  4: display the lowest grade
  5: display the average grade
  6: quit the program.

1
Display unsorted grades ...
60 0 100 40

Enter one of the following menu options:
  1: display unsorted grades
  2: display sorted grades from high to low
  3: display the highest grade
  4: display the lowest grade
  5: display the average grade
  6: quit the program.

2
Display sorted grades ...
100 60 40 0

Enter one of the following menu options:
  1: display unsorted grades
  2: display sorted grades from high to low
  3: display the highest grade
  4: display the lowest grade
  5: display the average grade
  6: quit the program.

1
Display unsorted grades ...
60 0 100 40
Enter one of the following menu options:
   1: display unsorted grades
   2: display sorted grades from high to low
   3: display the highest grade
   4: display the lowest grade
   5: display the average grade
   6: quit the program.

3

Display highest grade ...
The highest grades is 100.

Enter one of the following menu options:
   1: display unsorted grades
   2: display sorted grades from high to low
   3: display the highest grade
   4: display the lowest grade
   5: display the average grade
   6: quit the program.

4

Display lowest grade ...
The lowest grades is 0.

Enter one of the following menu options:
   1: display unsorted grades
   2: display sorted grades from high to low
   3: display the highest grade
   4: display the lowest grade
   5: display the average grade
   6: quit the program.

5

Display average grade ...
The average grade is 50.000000

Enter one of the following menu options:
   1: display unsorted grades
   2: display sorted grades from high to low
   3: display the highest grade
   4: display the lowest grade
   5: display the average grade
   6: quit the program.

6

quitting the program ...