Northeastern University
College of Engineering
Department of Electrical & Computer Engineering

EECE7205: Fundamentals of Computer Engineering

Spring 2022 - Homework 1

Instructions

- For programming problems:
  1. Your code must be well commented by explaining what the lines of your program do. Have at least one comment for every 4 lines of code.
  2. You are **not** allowed to use any advanced C++ library unless it is clearly allowed by the problem. For example, you cannot use a library function to sort a list of data if the problem is asking you to implement an algorithm to sort the list.
  3. At the beginning of your source code files write your full name, students ID, and any special compiling/running instruction (if any).
  4. Your code must compile and tested with a standard GCC compiler (available in the CoE Linux server). before submitting the source code file(s) (do not submit any compiled/executable files):
     a. If your program does not compile with a GCC compiler due to incompatible text encoding format, then make sure the program is saved with Encoding Unicode (UTF-8). In visual studio, Save As -> Click on the arrow next to Save -> Save with Encoding -> Yes -> Unicode (UTF-8) -> Ok
     b. Compile using g++ -std=c++11 <filename>

- Submit the following to the homework assignment page on Canvas:
  1. Your homework report developed by a word processor and submitted as one PDF file. For answers that require drawing and if it is difficult on you to use a drawing application, which is preferred, you can neatly hand draw the answer, scan it, and include it into your report. The report includes the following (depending on the assignment contents):
     a. Answers to the non-programming problems that show all the details of the steps you follow to reach these answers.
     b. A summary of your approach to solve the programming problems.
     c. The screen shots of the sample run(s) of your program(s)
  2. Your well-commented programs source code files (i.e., the .cc or .cpp files).

  Do NOT submit any files (e.g., the PDF report file and the source code files) as a compressed (zipped) package. Rather, upload each file individually.

Note: You can submit multiple attempts for this homework, however, only what you submit in the last attempt will be graded. This means all required files must be included in this last submission attempt.

Problem 1 (30 Points)

Write a C++ program to implement and test two functions: SwapP and SwapR.

1. SwapP swaps the values of two integer variables using pass-by-pointer.
2. SwapR swaps the values of two integer variables using pass-by-reference.

Write a main function in your program to test these two functions.

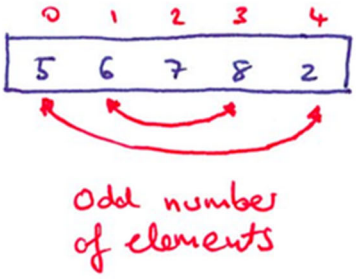
Problem 2 (30 Points)

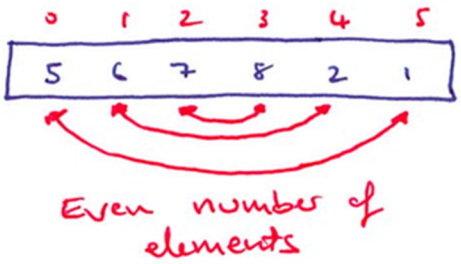
The following *main* function of a C++ program calls the function `mirror` that mirrors the content of a pre-initialized array *v* of integers and then display the contents of the mirrored array.

```
int main()
{
   // Declare array
 int v[] = {5, 6, 7, 8, 2, 1};
 // Mirror it
  mirror(v, 6);
 // Print array
  for (int i = 0; i < 6; i++)
    cout << v[i] << '\n';
 return 0;
}
```

不定义别的数组

Implement the function `mirror` in C++. The function must mirror the array in place (i.e., without defining any other temporary arrays). Also, the function must work with any array of integers where the array size is either odd or even. Do not use the swap function provided by the language library. Examples of arrays mirror for both odd and even number of elements are shown below:





Problem 3 (40 Points)

Write a C++ program that takes as inputs from a teacher, the names of her/his students along with the grade of each student in an exam. Define a struct with two fields: Name and Grade. Create an array of this struct to store the students' data. All grades are integers that have to be in the range from 0 to 100 (inclusive). At the beginning, you will need to ask the teacher for the size of the class (the number of students) and use dynamic memory to create the array.

The program will display (its outputs) the following:

1. The complete list of students along with their grades in a descending order of the grades.
2. The average and median of the students' grades.
3. The name of the student with the maximum grade and displays this grade.
4. The name of the student with the minimum grade and displays this grade.

Each one of the above four outputs must be implemented in a separate function where the array is passed to these functions as a parameter. Do not use any global variables in your program.