CSE 1242 - COMPUTER PROGRAMMING II
Programming Assignment # 3
DUE DATE: 20/05/2023 - 23:59 (No extension)

In this assignment, you should implement the following programs in C.

Q1. In this question, you will find the median of a given number list. The median is the middle value in an ordered integer list. If the size of the list is even, there is no middle value, and the median is the mean of the two middle values.

For example, for arr = [2,3,4], the median is 3.
For example, for arr = [2,3], the median is (2 + 3) / 2 = 2.5.

The list will be given in an input file ("input.txt" in your current directory). You should read the file, create the array, sort it, and find the median of all elements added so far.

Suppose that the following is the content of sample input file (input.txt):

```
addNumber 1
addNumber 4
findMedian
addNumber 2
addNumber 5
addNumber 3
findMedian
```

When a line starts with **`addNumber`**, then you shoul add the next integer to the array. When a line starts with **`findMedian`**, then you should find the median of all elements added so far.

The output for the given input should be:

`Output:` **(***shown on the console display***)**

```
2.5
3
```

`Explanation:`

```
Median of [1, 4] is (1+4)/2 = 2.5.
Median of [1, 2, 3, 4, 5] is 3.
```

Your program should run correctly for different input data.

Your implementation should include the following method definitions:

```c
void addNumber(int* numArray, int size, int num) {
```

```
}
void sortArray(int* numArray, int size) {

}

double findMedian(int* numArray, int size) {

}
```

Q2. In this question, you will implement a basic calculator, using strings. Given a string s representing a valid expression, implement a basic calculator to evaluate it, and return the result of the evaluation.

Note: You are not allowed to use any built-in function which evaluates strings as mathematical expressions.

Example 1:
Input: "1 + 1"
Output: 2

Example 2:
Input: "2-1 + 2"
Output: 3

Example 3:
Input: "(1+(4+5+2)-3)+(6+8)"
Output: 23

Important Notes:

- The given string can only contain
  - **digits**
  - **+** → addition
  - **-** → subtraction
  - **(** → left paranthesis
  - **)** → right-paranthessis
  - ' ' → space(s).
- + and - will not be used in terms of unary operator, such as +5 or -5.
- There will be no two consecutive operators in the input, such as 5 ++ 5.
- Every number and running calculation will fit in a signed 32-bit integer.

- You are allowed to use only arrays (not *stacks*!) in this question.
- You have to use the following function definition in your implementation!

```
int calculate(char* s) {

}
```

Submission Instructions

Please zip and submit your files using filename YourNumberHW3.zip
(ex: 150713852HW3.zip) to Canvas system (under Assignments tab).
Your zip file should contain the following 2 files:

1. C source code for Q1 (Pro2_1_150713852.c)
2. C source code for Q2 (Pro2_2_150713852.c)

Your program must include necessary comments with your own words to explain your actions!

Notes:

1. Write a comment at the beginning of each program to explain the purpose of the program.
2. Write your name and student ID as a comment.
3. Include necessary comments to explain your actions.
4. Select meaningful names for your variables and class names.
5. You are allowed to use the materials that you have learned in lectures & labs.
6. Do not use things that you did not learn in the course.
7. **Program submissions** should be done through the Canvas class page, under the assignments tab. Do not send program submissions through e-mail. E-mail attachments will not be accepted as valid submissions.
8. You are responsible for making sure you are turning in the right file, and that it is not corrupted in anyway. We will not allow resubmissions if you turn in the wrong file, even if you can prove that you have not modified the file after the deadline.
9. In case of any form of **copying and cheating** on solutions, all parts will get **ZERO** grade. You should submit your own work. In case of any forms of cheating or copying, both giver and receiver are equally culpable and suffer equal penalties.
   All types of plagiarism will result in zero grade from the homework.
10. No late submission will be accepted.
11. Please note that selected parts of your assignment will be graded!