

Program #1 (20 points)

Due Date: Feb. 9 (Monday) at 10pm;

Grace Date: Feb. 11 (Wednesday) at 10pm

Program Description

You will extend Program 0 and implement additional methods to manipulate an integer list with at most **10** elements. Your program should read and process commands from the standard input and produce required output. A command line is composed of a single character followed by parameters as shown below. (Note that the commands are NOT case-sensitive. For example, your program should work on either A or a when adding integers.)

```
A integer1 integer2 .....
D integer
E
P
V
Q
```

- **A** command—add integer(s) to the list. If the list has reached its maximum capacity, display “List is full, 21 not added.” where 21 is the integer you are trying to add. If the integer is successfully added, display “21 has been added to the list.”
- **D** command—remove an integer from the list. First, check if the list is empty. If the list is empty, display “Empty list!” If the integer doesn’t exist, display “21 is not in the list.” Otherwise, display “21 has been removed from the list.” There will be no “empty slot” in the array allowed. That is, you **MUST** move everybody up one position to “fill” the deleted slot. **-2 points** if it is done inappropriately.
- **E** command—turn odd numbers in the list to even numbers by adding 1 to the odd numbers. Print out the list after they are made even.
- **P** command—output all integers in the list. If the list is empty, display “Empty list!”
- **V** command—output the average of the integers in the list, and then output a list of integers that are smaller than the average. If the list is empty, display “Empty list!”
- **Q** command—terminate the program and display “Good Bye!”

Program Requirement

1. This is an **individual assignment**. Sharing your solution could result in being accused of **plagiarism**.
2. Create project Prog1 like you did in Prog0. Copy the Java files from Prog0 to Prog1\src folder. Change the Prog0.java to Prog1.java. Change the class name in Prog1.java to Prog1.
3. Add the above commands to ListManipulator class. Your program must handle bad commands! Use the method `.equalsIgnoreCase()` of String class to check the commands.
4. You **MUST** implement the following methods in IntegerList class and use them, **-2 points** for each method not implemented and/or not used. (Note that “private” methods can only be accessed within the class.)
 - `private int find(int num)`
 - `private boolean isEmpty()`
 - `private boolean isFull()`
 - `private float average()`
 - `public void add(int num) // A command`
 - `public void remove(int num) // D command`
 - `public void makeEven() // E command`
 - `public void printLessThanAverage() // V command`
 - `public void print() // P command`

5. You **MUST** follow the software development ground rules. I will use the rubric in the ground rules to grade your program. Particularly, you **MUST** have a comment block on top of every method with the following format, where `@param` lists the parameters and `@return` describes what will be returned.

```
/**
 * ...
 * @param
 * @return
 */
```

6. You **MUST** use **SE tools** to keep an up-to-date log of the time spent working. You must use the automatic punch in and punch out when possible. Select the activities and provide specific comments about what you worked on during that period. Up to **-5 points** if this is not done or you do not log all your time or you do not provide specific comments as to what you were working on.
7. You can start testing your program interactively by entering the following sample input. When your program is working, you can copy the following input and save it to a file (such as `P1.in`) to test your program. To run your program under Windows command line, `cd ...\Progl\dist` and type: `java -jar Progl.jar < P1.in`. (Note that you must save `P1.in` in `...\Progl\dist` folder.)

Sample Input

```
D 123
P
V
A 123 45 33 54 21 19 30
D 11
D 54
P
V
E
A 101 200 251 2
p
bad
d 200
p
d 123
d 46
d 34
d 54
D 22
D 20
p
v
d 30
d 101
d 2
d 251
D 251
p
d 124
d 124
Q
```

Sample Output

```
Empty list!
Empty list!
Empty list!
123 has been added to the list.
45 has been added to the list.
33 has been added to the list.
54 has been added to the list.
21 has been added to the list.
19 has been added to the list.
30 has been added to the list.
11 is not in the list.
54 has been removed from the list.
List of integers: 123 45 33 21 19 30
Average: 45.166668
Integers less than average: 45 33 21 19 30
List of integers: 124 46 34 22 20 30
101 has been added to the list.
200 has been added to the list.
251 has been added to the list.
2 has been added to the list.
List of integers: 124 46 34 22 20 30 101 200 251 2
Command 'bad' not supported.
200 has been removed from the list.
List of integers: 124 46 34 22 20 30 101 251 2
123 is not in the list.
46 has been removed from the list.
34 has been removed from the list.
54 is not in the list.
22 has been removed from the list.
20 has been removed from the list.
List of integers: 124 30 101 251 2
Average: 101.6
Integers less than average: 30 101 2
30 has been removed from the list.
101 has been removed from the list.
2 has been removed from the list.
251 has been removed from the list.
251 is not in the list.
List of integers: 124
124 has been removed from the list.
Empty list!
Good Bye!
```