Sabanci University

Faculty of Engineering and Natural Sciences
CS204 Advanced Programming
Summer 2019-2020

Take-Home Exam 2 – Anadolu Agency
Due: 20 July 2020 23:55 (SHARP)

DISCLAIMER:

Your program should be a robust one such that you have to consider all relevant user mistakes and extreme cases; you are expected to take actions accordingly!

Only checking the sample run cases might not be sufficient as your solution will be checked against a variety of samples different from the provided samples; however checking these test cases are highly encouraged and recommended, as well.

You must NOT collaborate with your friends and discuss your solutions with each other. You have to write down the code on your own. Plagiarism will not be tolerated AND cooperation is not an excuse!

After this take-home exam deadline, all students will be called for a demo to explain how they approached and solved the problem.

Introduction

The aim of this take-home exam is to have you work with linked lists. You are asked to implement a system where an agency like Anadolu Agency can enter votes of the political parties during an election.

Inputs and Data Structures

Your program will read information from the standard input (cin) only. All the information gathered from the user ***must* be stored in a doubly linked list**. **Use of other data structures (such as vectors, dynamic arrays) are clearly forbidden, *even for intermediate operations*. Also, you need to use your own linked list implementation.** Borrowing one from open source libraries or your friend is considered plagiarism. You may implement your linked list as a class, but it is not obligatory.

Format of the Inputs and The Program Flow

During each phase of the program, a menu like the following will be displayed to the user:

```
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.
```

The user will enter a number and a particular action will be taken regarding that option. The user may choose something other than the five options given. In this case, an error should be displayed and a new input should be requested. You may assume that the user will always enter an integer for this input, but again, this integer may be a wrong option number.

If the user chooses option 5, then your program should exit by displaying a message. Exact messages in each situation are given in the *Sample Runs* section.

If the user chooses option 1, another input should be requested where the user will enter the party name (abbreviation) and the number of votes to be added to that party's current votes. These two pieces of information will be entered in a single line, separated by a space. You may assume that the party name (abbreviation) will not have any spaces/tabs etc. You may also assume that the second piece of information will always be a positive integer. After parsing the input, the number of votes should be reflected to our doubly linked list. If this party is already in the list, then the number of votes should be incremented by the new value; if not, a new node should be added to the doubly linked list with the given value. In both situations, the linked list **should remain sorted** and the sorting rules are:

1. Higher vote number comes prior,
2. If equal votes, lower name in the alphabetical order comes prior.

If the user chooses option 2, another input should be requested just like in option 1. Here, a party name (abbreviation) and a positive integer will be the inputs. If the party name is not in the list, an error message will be displayed. Otherwise, the number of votes should be decremented by the value given by the user. This operation may result in the sorting order to be disrupted, so you should make sure to rearrange the nodes when needed. This operation may also result in the number of votes to be 0 (zero) or below that. In such cases, the node for that party should be deleted from the linked list completely.

Option 3 will have the program display the current information in the linked list. In each line, a party name (abbreviation) and the respective vote count should be displayed (with a tab character in-between).

Option 4 will have the program display the information just like Option 3, but in the reverse order.

There are a couple of things that are forbidden in this take-home exam:

- Sorting the linked list items while displaying -> **huge downgrade**

  Explanation: The linked list should be always kept sorted and ready.

- Ghosting linked list nodes while displaying -> **huge downgrade**

  Explanation: You should indeed remove the nodes from the linked list when their vote numbers drop to 0 or below. A solution such as marking them deleted and ignoring them while displaying is completely out of order.

- Using another data structure as helper or main data holder -> **grade of zero!**

  Explanation: Your task is to use one doubly linked list for all operations.

- Not deallocating the unused linked list nodes -> **huge downgrade!**

  Explanation: Detaching nodes from the linked list is good enough for a working program, but it causes memory leaks. You must also *delete* a node whenever it is becoming obsolete. Also, at the end of your program, before returning from the main function, you should *delete* all the nodes of the linked list.

These strict rules will be manually checked up during grading and also be asked to you during the demos.

Sample Runs

Below, we provide some sample runs of the program that you will develop. The *italic* and **bold** phrases are the standard input (cin) taken from the user (i.e., like ***this***). You have to display the required information in the same order and with the same words/spaces as here; in other words, there must be an exact match!

We will be automatically grading your take-home exam using GradeChecker, so it is very important to satisfy the exact same output given in the sample runs. You can utilize GradeChecker (http://sky.sabanciuniv.edu:8080/GradeChecker/) to check whether your code is working in the expected way. To be able to use GradeChecker, you should upload all of your files used in the take-home exam **without zipping them**. Just a reminder, you will see a character ¶ which refers to a newline in your expected output.

Sample Run 1

```
Welcome to the Election Sheet.
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

6
Please enter a valid option!

-10
Please enter a valid option!

3

There aren't any records.

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

There aren't any records.

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

-5
Please enter a valid option!

1

Please enter party name and votes to add: xrp 100
Success!
```

```
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

xrp     100

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

5

Program exiting..
```

Sample Run 2

```
Welcome to the Election Sheet.
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: adp 150
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.
```

```
1

Please enter party name and votes to add: ydd 300
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

ydd     300
adp     150

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

adp     150
ydd     300

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: fns 40
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

ydd     300
adp     150
fns     40

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

fns     40
adp     150
ydd     300

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: ark 65
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

ydd     300
```

```
adp     150
ark     65
fns     40

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

5

Program exiting..
```

Sample Run 3

```
Welcome to the Election Sheet.
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: asd 500
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

asd     500

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: fgh 700
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: asd 300
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

asd     800
fgh     700

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

fgh     700
asd     800
```

```
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: jkl 150
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

asd     800
fgh     700
jkl     150

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: jkl 600
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3
```

```
asd     800
jkl     750
fgh     700

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: asd 200
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

asd     600
fgh     700
jkl     750

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: fgh 1100
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

jkl     750
asd     600

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

5

Program exiting..
```

Sample Run 4

```
Welcome to the Election Sheet.
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: drtpdrtp 30
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1
```

```
Please enter party name and votes to add: adr 50
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

drtpdrtp        30
adr     50

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: adr 20
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: abc 50
Given party does not exist.

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.
```

```
3

adr     30
drtpdrtp        30

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: zkp 100
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

zkp     100
adr     30
drtpdrtp        30

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: drtpdrtp 30
Success!

Please make a choice from the following menu:
```

```
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: hyp 120
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

adr     30
zkp     100
hyp     120

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: adr 200
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3
```

```
adr     230
hyp     120
zkp     100

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: zkp 300
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

hyp     120
adr     230
zkp     400

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: hyp 500
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

hyp     620
zkp     400
adr     230

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

1

Please enter party name and votes to add: adr 200
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

hyp     620
adr     430
zkp     400

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: hyp 200
Success!
```

```
Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

4

zkp     400
hyp     420
adr     430

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: adr 430
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

hyp     420
zkp     400

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.
```

```
2

Please enter party name and votes to remove: hyp 1000
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

2

Please enter party name and votes to remove: zkp 2000
Success!

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

3

There aren't any records.

Please make a choice from the following menu:
1. Enter votes,
2. Remove votes,
3. Display current standings (from best to worst),
4. Display current standings (from worst to best),
5. Finish.

5

Program exiting..
```

Some Important Rules

Although some of the information is given below, please also read the take-home exam submission and grading policies from the lecture notes of the first week. In order to get a full credit, your program must be efficient, modular (with the use of functions), well commented and indented. Besides, you also have to use understandable identifier names. Presence of any redundant computation, bad indentation, meaningless identifiers or missing/irrelevant comments may decrease your grade in case that we detect them.

When we grade your take-home exams, we pay attention to these issues. Moreover, in order to observe the real performance of your code, we are going to run your programs in Release mode and **we may test your programs with very large test cases**. Hence, take into consideration the efficiency of your algorithms other than correctness.

How to get help?

You may ask your questions to TAs or to the instructor. Information regarding the office hours of the TAs and the instructor are available at SUCourse+.

YOU SHOULD USE GRADE CHECKER FOR THIS TAKE-HOME EXAM!

You should use GradeChecker (http://sky.sabanciuniv.edu:8080/GradeChecker/) to check your expected grade. Just a reminder, you will see a character ¶ which refers to a newline in your expected output.

GradeChecker and the automated grading system use a different compiler than MS Visual Studio does. Hence, you should check the "***Common Errors***" page to see some extra situations to consider while doing your take-home exam. If you do not consider these situations, you may get a lower score (even zero) even if your program works correctly with MS Visual Studio.

Common Errors Page: http://sky.sabanciuniv.edu:8080/GradeChecker/commonerrors.jsp

GradeChecker can be pretty busy and unresponsive during the last day of the submission. Due to this fact, leaving the take-home exam for the last day generally is not a good idea. You may wait for hours to test your take-home exam or make an untested submission, sorrily..

GradeChecker and Sample Runs together give a good estimate of how correct your implementation is, however we may test your programs with different test cases and **your final grade may conflict with what you have seen on GradeChecker.** We will also **manually** check your code (comments, indentations and so on), hence do not object to your grade based on the GradeChecker results; but rather, consider every detail on this documentation. **So please make sure that you have read this documentation carefully and covered all possible cases, even some other cases you may not have seen on GradeChecker or Sample Runs**. The cases that you *do not need* to consider are also given throughout this documentation.

Submit via SUCourse+ ONLY! **Grade Checker is not considered as a submission**. Paper, e-mail or any other methods are not acceptable, either.

The internal clock of SUCourse+ might be a couple of minutes skewed, so make sure you do not leave the submission to the last minute. In the case of failing to submit your take-home exam on time:

> "No successful submission on SUCourse+ on time = A grade of 0 directly."

What and where to submit (PLEASE READ, IMPORTANT)

You should test your program using GradeChecker. We will use the same UNIX based C++ compiler that Grade Checker uses for grading your take-home exam.

It'd be a good idea to write your name and lastname in the program (as a comment line of course). Do not use any Turkish characters anywhere in your code (not even in comment parts).

Submission guidelines are below. Since the grading process is automatic, you are expected to strictly follow these guidelines. If you do not follow these guidelines, your grade will be *zero*. The lack of even one space character in the output will result in your grade being zero, so please test your programs yourself and with the GradeChecker tool explained above.

- Name your cpp file that contains your program as follows:

  "SUCourse+UserName_the2.cpp"

  Your SUCourse+ username is actually your SUNet username which is used for checking sabanciuniv e-mails. Do NOT use any spaces, non-ASCII and Turkish characters in the file name. For example, if your SU e-mail address is **atam@sabanciuniv.edu**, then the file name must be: **"atam_the2.cpp"**

- Please make sure that this file is the latest version of your take-home exam program.

- You should upload all the .txt files to SUCourse+ as well (if any given),

- Do not zip any of the documents. Upload all of them as separate files.

- Submit your work **through SUCourse+ only**! You can use the GradeChecker only to see if your program can produce the correct outputs both in the correct order and in the correct format. It will not be considered as the official submission. You must submit your work to SUCourse+.

- If you would like to resubmit your work, you should first remove the existing file(s). This step is very important. If you do not delete the old file(s), we will receive both files and the old one may be graded.

You may visit the office hours if you have any questions regarding submissions.

Plagiarism

Plagiarism is checked by automated tools and we are very capable of detecting such cases. Be careful with that...

Exchange of abstract ideas are totally okay but once you start sharing the code with each other, it is very probable to get caught by plagiarism. So, do NOT send any part of your code to your friends by any means or you might be charged as well, although you have done your take-home exam by yourself. Take-home exams are to be done personally and you have to submit your own work. **Cooperation will NOT be counted as an excuse.**

In case of plagiarism, the rules on the Syllabus apply.

Good Luck!
Tolga Atam, Duygu K. Altop