

# CSE 344 - Homework 1 Report

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## 1 Introduction

This report presents the design and implementation details of a Student Grade Management System in C programming language. The system allows users to manage student grades stored in a file, providing functionalities to add, search, sort, and display student grades.

## 2 System Structure

The system is created with the structure of two different C files and programs.

One being the main program that accepts the input from the user through the terminal and creates a child process for the execution of the user's input. While the main process waits for the child process, the child process parses the user input, checks if it's a valid command, and if so then it executes the parsed command. The errors and results are shown to the user throughout the process.

The child process is also responsible of updating the log file, which consists of given inputs of the user and the execution result of said input. It does not show the **result** of the command itself, which may be of unknown length, instead it shows the **execution result** of the command, i.e success, failure, or error.

## 3 Compilation

The make file compiles two `.out` files. Which then the user should execute only the `main.out` for usage, `executor.out` plays the child process role who is responsible with command executions. The `make clean` command deletes the corresponding `.o`, `.out`, and `.log` files.

## 4 Command Implementation and Examples

### 4.1 Show Available Commands

**Description:** The program shows the user the available commands for them to use.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's one and only one then it proceeds to check the first argument to see if it's "gtuStudentGrades". If the string is indeed that then the available commands are shown.

**Example:**

```

eren@eren-Lenovo-Ideapad-330-15IKB:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> gtuStudentGrades
gtuStudentGrades
    Shows available commands
gtuStudentGrades <filename>
    Creates a new grade file
searchStudent <filename> <studentName>
    Searches for a student in the grade file
addStudentGrade <filename> <studentName> <grade>
    Adds a new student grade to the grade file
showAll <filename>
    Shows all students and their grades
listGrades <filename>
    Shows the first 5 students and their grades
listSome <filename> <pageLength> <pageIndex>
    Shows a page of students and their grades
    pageLength: An integer greater than 0
    pageIndex: An integer greater than 0
sortAll <filename> <sortBy> <sortIn>
    Shows all students and their grades in sorted order
    sortBy: n/name or g/grade
    sortIn: a/ascending or d/descending
>>> 

```

Figure 1: Available commands

## 4.2 Create Grade File

**Description:** The program creates a new file with the given file name. Any existing file with the exact name will be overwritten.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's two and only two then it proceeds to check the first argument to see if it's "gtuStudentGrades". If the string is indeed correct then the executor attempts to create a file with given name with the permissions of read/write for owner, and read for the group and others.

**Example:**

```

eren@eren-Lenovo-Ideapad-330-15IKB:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> gtuStudentGrades cse344_grades.txt
File created
>>> 

```

Figure 2: Successful creation of cse344\_grades.txt

**Errors:** Since the reproducing of file creation errors are cumbersome you can see the fairly short source code here, which shows how the process behaves in the case of an error.

```

int create_grade_file(char *file_name)
{
    int file_descriptor = open(file_name, O_RDWR);
    if (file_descriptor == -1)
    {
        perror("Error opening file");
        return -1;
    }
    if (close(file_descriptor) == -1)
    {
        perror("Error closing file");
        return -1;
    }
};

```

Figure 3: General handling of file errors throughout the program

### 4.3 Add Student Grade

**Description:** Appends the given student name with the given grade at the end of the given file.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's four and only four then it proceeds to check the first argument to see if it's "addStudentGrade". If the string is indeed correct then the executor attempts to open the file with given name with write privilege and append the given student name with the given grade next to it.

**Example:**

```
eren@eren-Lenovo-Ideapad-330-15IK8:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> gtuStudentGrades new.txt
File created
>>> showAll new.txt
The file is empty
>>> addStudentGrade new.txt "Eren Cakar" "AA"
Grade added
>>> showAll new.txt
Eren Cakar, AA
>>> addStudentGrade new.txt "Ahsen Turk" "AA"
Grade added
>>> showAll new.txt
Eren Cakar, AA
Ahsen Turk, AA
>>> □
```

Figure 4: addStudentGrade usage

**Errors:** Apart from usual open/write/close errors of file manipulation system calls and incorrect command structure, there is no special error for this command.

### 4.4 Search for Student Grade

**Description:** Searches for a student's grade by name.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's three and only three then it proceeds to check the first argument to see if it's "searchStudent". If the string is indeed correct then the executor attempts to open the file with given name and search the given student name throughout the contents of the file. The moment the process finds a match it prints out the found line and terminates.

**Example:**

```
eren@eren-Lenovo-Ideapad-330-15IK8:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> searchStudent grades.txt Eren
Eren Cakar, AA
>>> searchStudent grades_.txt Eren
Error opening file: No such file or directory
>>> searchStudent grades.txt Kerim
No results found
>>> searchStudent grades.txt Linda
Linda Harris, FF
>>> searchStudent grades.txt "Linda John"
Linda John Miller, BB
>>> □
```

Figure 5: searchStudent usage

## 4.5 Display Student Grades

**Description:** Displays all student grades stored in the file.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's two and only two then it proceeds to check the first argument to see if it's "showAll". If the string is indeed correct then the executor attempts to open the file with given name and prints out its content.

**Example:**

```
eren@eren-Lenovo-ideapad-330-15IK8:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> showAll grades.txt
Anthony Charles Robert Jackson, DC
Elizabeth Patricia Martinez, FF
Sandra Barbara Sandra Clark, CC
Michael Smith, NA
Sarah Anderson, FF
William William Garcia, VF
Mark Elizabeth Jessica Lopez, BA
Mary Margaret Garcia, NA
Linda Harris, FF
Patricia Hernandez, DC
Christopher Daniel Sarah Martin, CC
Margaret Richard Hernandez, VF
Lisa Margaret Hernandez, FF
Margaret Clark, DC
Mary Hernandez, VF
John Robert Clark, CB
Robert Betty William Garcia, NA
Jennifer Barbara Garcia, DC
Joseph Barbara Williams, NA
Richard Linda John Miller, BB
Elizabeth Lee, CC
James Ramirez, BB
Mary Lopez, BB
David Matthew Garcia, CC
Anthony Michael Nancy Jackson, FF
James Anthony Johnson, VF
James Mary Jessica Lopez, AA
Sarah Rodriguez, NA
Karen Christopher Williams, DC
Joseph Thomas, CB
Margaret Matthew Christopher Wilson, BB
John William Elizabeth Wilson, CC
Patricia Moore, BA
Jessica Lopez, NA
Linda Elizabeth Gonzalez, NA
Barbara Joseph Brown, CB
Eren Cakar, AA
>>> 
```

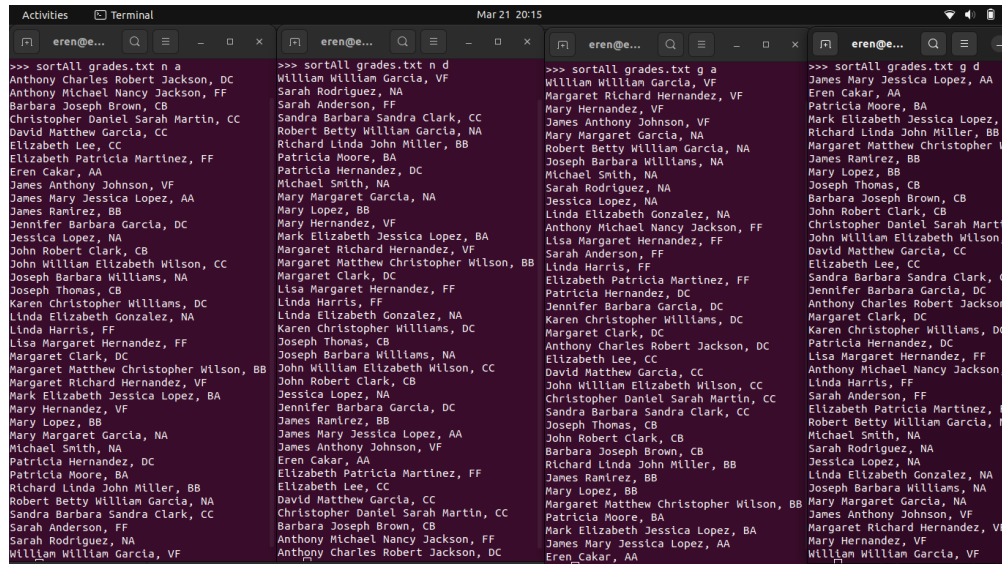
Figure 6: showAll usage

## 4.6 Sort Student Grades

**Description:** Prints the lines in the given file in sorted order.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's two and only two then it proceeds to check the first argument to see if it's "sortAll". Then the corresponding function takes the filename of the file containing student grades, as well as parameters specifying the sorting criteria (by name or grade) and the order (ascending or descending). First, the file is read and its contents are stored in memory. Then, the sorting algorithm is applied based on the specified criteria and order. Finally, the sorted entries are printed to the standard output.

Example:



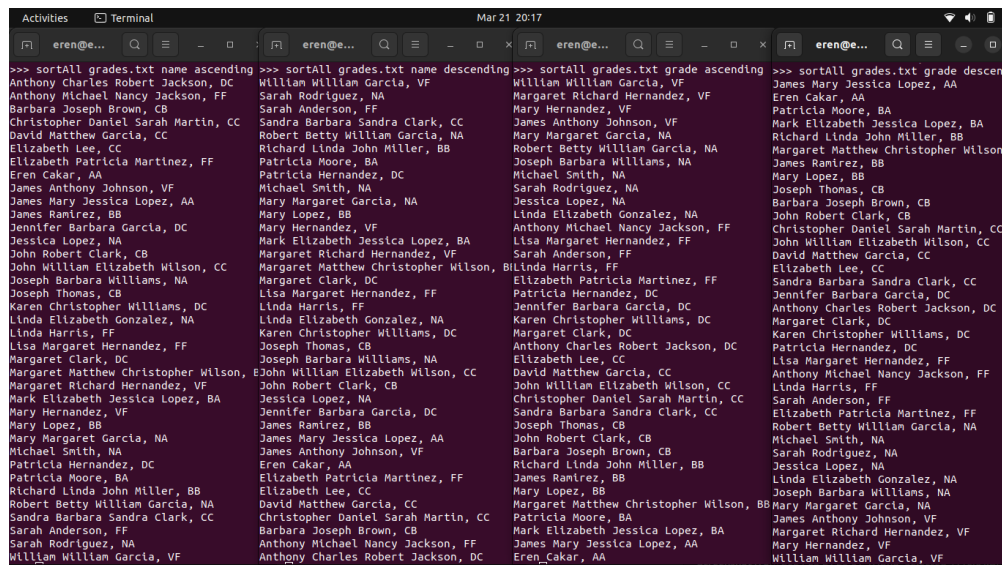
```
eren@e... >>> sortall grades.txt n a
Anthony Charles Robert Jackson, DC
Anthony Michael Nancy Jackson, FF
Barbara Joseph Brown, CB
Christopher Daniel Sarah Martin, CC
David Matthew Garcia, CC
Elizabeth Lee, CC
Elizabeth Patricia Martinez, FF
Eren Cakar, AA
James Anthony Johnson, VF
James Mary Jessica Lopez, AA
James Ramirez, BB
Jennifer Barbara Garcia, DC
Jessica Lopez, NA
John Robert Clark, CB
John William Elizabeth Wilson, CC
Joseph Barbara Williams, NA
Joseph Thomas, CB
Karen Christopher Williams, DC
Linda Elizabeth Gonzalez, NA
Linda Harris, FF
Lisa Margaret Hernandez, FF
Margaret Clark, DC
Margaret Matthew Christopher Wilson, BB
Margaret Richard Hernandez, VF
Mark Elizabeth Jessica Lopez, BA
Mary Hernandez, VF
Mary Lopez, BB
Mary Margaret Garcia, NA
Michael Smith, NA
Patricia Hernandez, DC
Patricia Moore, BA
Richard Linda John Miller, BB
Robert Betty William Garcia, NA
Sandra Barbara Sandra Clark, CC
Sarah Anderson, FF
Sarah Rodriguez, NA
William William Garcia, VF

eren@e... >>> sortall grades.txt n d
William William Garcia, VF
Sarah Rodriguez, NA
Sarah Anderson, FF
Sandra Barbara Sandra Clark, CC
Robert Betty William Garcia, NA
Richard Linda John Miller, BB
Patricia Moore, BA
Patricia Hernandez, DC
Michael Smith, NA
Mary Margaret Garcia, NA
Mary Lopez, BB
Mary Hernandez, VF
Mark Elizabeth Jessica Lopez, BA
Margaret Richard Hernandez, VF
Margaret Matthew Christopher Wilson, BB
Lisa Margaret Hernandez, FF
Linda Harris, FF
Linda Elizabeth Gonzalez, NA
Karen Christopher Williams, DC
Joseph Thomas, CB
Joseph Barbara Williams, NA
John William Elizabeth Wilson, CC
John Robert Clark, CB
Jessica Lopez, NA
James Mary Jessica Lopez, AA
James Anthony Johnson, VF
Eren Cakar, AA
Elizabeth Patricia Martinez, FF
Elizabeth Lee, CC
David Matthew Garcia, CC
Christopher Daniel Sarah Martin, CC
Barbara Joseph Brown, CB
Anthony Michael Nancy Jackson, FF
Anthony Charles Robert Jackson, DC

eren@e... >>> sortall grades.txt g a
William William Garcia, VF
Margaret Richard Hernandez, VF
Mary Hernandez, VF
James Anthony Johnson, VF
Mary Margaret Garcia, NA
Robert Betty William Garcia, NA
Joseph Barbara Williams, NA
Michael Smith, NA
Sarah Rodriguez, NA
Jessica Lopez, NA
Linda Elizabeth Gonzalez, NA
Anthony Michael Nancy Jackson, FF
Lisa Margaret Hernandez, FF
Sarah Anderson, FF
Linda Harris, FF
Elizabeth Patricia Martinez, FF
Patricia Hernandez, DC
Jennifer Barbara Garcia, DC
Karen Christopher Williams, DC
Margaret Clark, DC
Anthony Charles Robert Jackson, DC
Elizabeth Lee, CC
David Matthew Garcia, CC
John Robert Clark, CB
Christopher Daniel Sarah Martin, CC
Sandra Barbara Sandra Clark, CC
Joseph Thomas, CB
John Robert Clark, CB
Barbara Joseph Brown, CB
Richard Linda John Miller, BB
James Ramirez, BB
Mary Lopez, BB
Margaret Matthew Christopher Wilson, BB
Patricia Moore, BA
Mark Elizabeth Jessica Lopez, BA
James Mary Jessica Lopez, AA
Eren Cakar, AA

eren@e... >>> sortall grades.txt g d
James Mary Jessica Lopez, AA
Eren Cakar, AA
Patricia Moore, BA
Mark Elizabeth Jessica Lopez, BA
Richard Linda John Miller, BB
Margaret Matthew Christopher Wilson, BB
James Ramirez, BB
Mary Lopez, BB
Joseph Thomas, CB
Barbara Joseph Brown, CB
John Robert Clark, CB
Christopher Daniel Sarah Martin, CC
John William Elizabeth Wilson, CC
David Matthew Garcia, CC
Elizabeth Lee, CC
Sandra Barbara Sandra Clark, CC
Jennifer Barbara Garcia, DC
Anthony Charles Robert Jackson, DC
Margaret Clark, DC
Karen Christopher Williams, DC
Patricia Hernandez, DC
Lisa Margaret Hernandez, FF
Anthony Michael Nancy Jackson, FF
Linda Harris, FF
Sarah Anderson, FF
Elizabeth Patricia Martinez, FF
Robert Betty William Garcia, NA
Michael Smith, NA
Sarah Rodriguez, NA
Jessica Lopez, NA
Linda Elizabeth Gonzalez, NA
Joseph Barbara Williams, NA
Joseph Thomas, CB
James Anthony Johnson, VF
Margaret Richard Hernandez, VF
Mary Hernandez, VF
William William Garcia, VF
```

Figure 7: With first letter of options



```
eren@e... >>> sortall grades.txt name ascending
Anthony Charles Robert Jackson, DC
Anthony Michael Nancy Jackson, FF
Barbara Joseph Brown, CB
Christopher Daniel Sarah Martin, CC
David Matthew Garcia, CC
Elizabeth Lee, CC
Elizabeth Patricia Martinez, FF
Eren Cakar, AA
James Anthony Johnson, VF
James Mary Jessica Lopez, AA
James Ramirez, BB
Jennifer Barbara Garcia, DC
Jessica Lopez, NA
John Robert Clark, CB
John William Elizabeth Wilson, CC
Joseph Barbara Williams, NA
Joseph Thomas, CB
Karen Christopher Williams, DC
Linda Elizabeth Gonzalez, NA
Linda Harris, FF
Lisa Margaret Hernandez, FF
Margaret Clark, DC
Margaret Matthew Christopher Wilson, BB
Margaret Richard Hernandez, VF
Mark Elizabeth Jessica Lopez, BA
Mary Hernandez, VF
Mary Lopez, BB
Mary Margaret Garcia, NA
Michael Smith, NA
Patricia Hernandez, DC
Patricia Moore, BA
Richard Linda John Miller, BB
Robert Betty William Garcia, NA
Sandra Barbara Sandra Clark, CC
Sarah Anderson, FF
Sarah Rodriguez, NA
William William Garcia, VF

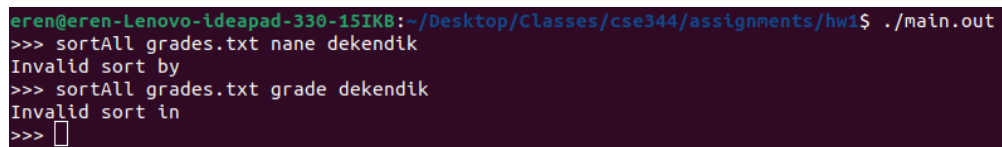
eren@e... >>> sortall grades.txt name descending
William William Garcia, VF
Sarah Rodriguez, NA
Sarah Anderson, FF
Sandra Barbara Sandra Clark, CC
Robert Betty William Garcia, NA
Richard Linda John Miller, BB
Patricia Moore, BA
Patricia Hernandez, DC
Michael Smith, NA
Mary Margaret Garcia, NA
Mary Lopez, BB
Mary Hernandez, VF
Mark Elizabeth Jessica Lopez, BA
Margaret Richard Hernandez, VF
Margaret Matthew Christopher Wilson, BB
Lisa Margaret Hernandez, FF
Linda Harris, FF
Linda Elizabeth Gonzalez, NA
Karen Christopher Williams, DC
Joseph Thomas, CB
Joseph Barbara Williams, NA
John William Elizabeth Wilson, CC
John Robert Clark, CB
Jessica Lopez, NA
James Mary Jessica Lopez, AA
James Anthony Johnson, VF
Eren Cakar, AA
Elizabeth Patricia Martinez, FF
Elizabeth Lee, CC
David Matthew Garcia, CC
Christopher Daniel Sarah Martin, CC
Barbara Joseph Brown, CB
Anthony Michael Nancy Jackson, FF
Anthony Charles Robert Jackson, DC

eren@e... >>> sortall grades.txt grade ascending
William William Garcia, VF
Margaret Richard Hernandez, VF
Mary Hernandez, VF
James Anthony Johnson, VF
Mary Margaret Garcia, NA
Robert Betty William Garcia, NA
Joseph Barbara Williams, NA
Michael Smith, NA
Sarah Rodriguez, NA
Jessica Lopez, NA
Linda Elizabeth Gonzalez, NA
Anthony Michael Nancy Jackson, FF
Lisa Margaret Hernandez, FF
Sarah Anderson, FF
Linda Harris, FF
Elizabeth Patricia Martinez, FF
Patricia Hernandez, DC
Jennifer Barbara Garcia, DC
Karen Christopher Williams, DC
Margaret Clark, DC
Anthony Charles Robert Jackson, DC
Elizabeth Lee, CC
David Matthew Garcia, CC
John William Elizabeth Wilson, CC
Christopher Daniel Sarah Martin, CC
Sandra Barbara Sandra Clark, CC
Joseph Thomas, CB
John Robert Clark, CB
Barbara Joseph Brown, CB
Richard Linda John Miller, BB
James Ramirez, BB
Mary Lopez, BB
Margaret Matthew Christopher Wilson, BB
Patricia Moore, BA
Mark Elizabeth Jessica Lopez, BA
James Mary Jessica Lopez, AA
Eren Cakar, AA

eren@e... >>> sortall grades.txt grade descending
James Mary Jessica Lopez, AA
Eren Cakar, AA
Patricia Moore, BA
Mark Elizabeth Jessica Lopez, BA
Richard Linda John Miller, BB
Margaret Matthew Christopher Wilson, BB
James Ramirez, BB
Mary Lopez, BB
Joseph Thomas, CB
Barbara Joseph Brown, CB
John Robert Clark, CB
Christopher Daniel Sarah Martin, CC
John William Elizabeth Wilson, CC
David Matthew Garcia, CC
Elizabeth Lee, CC
Sandra Barbara Sandra Clark, CC
Jennifer Barbara Garcia, DC
Anthony Charles Robert Jackson, DC
Margaret Clark, DC
Karen Christopher Williams, DC
Patricia Hernandez, DC
Lisa Margaret Hernandez, FF
Anthony Michael Nancy Jackson, FF
Linda Harris, FF
Sarah Anderson, FF
Elizabeth Patricia Martinez, FF
Robert Betty William Garcia, NA
Michael Smith, NA
Sarah Rodriguez, NA
Jessica Lopez, NA
Linda Elizabeth Gonzalez, NA
Joseph Barbara Williams, NA
Mary Margaret Garcia, NA
James Anthony Johnson, VF
Margaret Richard Hernandez, VF
Mary Hernandez, VF
William William Garcia, VF
```

Figure 8: With full name of options

Errors:



```
eren@eren-Lenovo-ideapad-330-15IKB:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> sortall grades.txt nane dekendik
Invalid sort by
>>> sortall grades.txt grade dekendik
Invalid sort in
>>>
```

Figure 9: Incorrect inputs

## 4.7 List Specific Student Grades

**Description:** Displays entries between the range specified by page number and page length.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's four and only four then it proceeds to check the first argument to see if it's "listSome". Then the given file is read up until the end of specified page's last line. And only prints the lines of that page by checking if the read line is in its range.

**Example:**

```
eren@eren-Lenovo-ideapad-330-15IKB:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> listSome grades.txt 5 2
William William Garcia, VF
Mark Elizabeth Jessica Lopez, BA
Mary Margaret Garcia, NA
Linda Harris, FF
Patricia Hernandez, DC
>>> listSome grades.txt 10 1
Anthony Charles Robert Jackson, DC
Elizabeth Patricia Martinez, FF
Sandra Barbara Sandra Clark, CC
Michael Smith, NA
Sarah Anderson, FF
William William Garcia, VF
Mark Elizabeth Jessica Lopez, BA
Mary Margaret Garcia, NA
Linda Harris, FF
Patricia Hernandez, DC
>>> listSome grades.txt 0 5
Invalid page length or index
>>> listSome grades.txt 5 0
Invalid page length or index
>>> □
```

Figure 10: Two correct and two false usages

## 4.8 List First 5 Student Grades

**Description:** Displays the first 5 entries of student grades.

**Implementation:** The executor (child process responsible with command execution) basically first checks the number of arguments it was given. If it's two and only two then it proceeds to check the first argument to see if it's "listGrades". Then the function implemented for "listSome" command is called with page length as 5 and page number as 1.

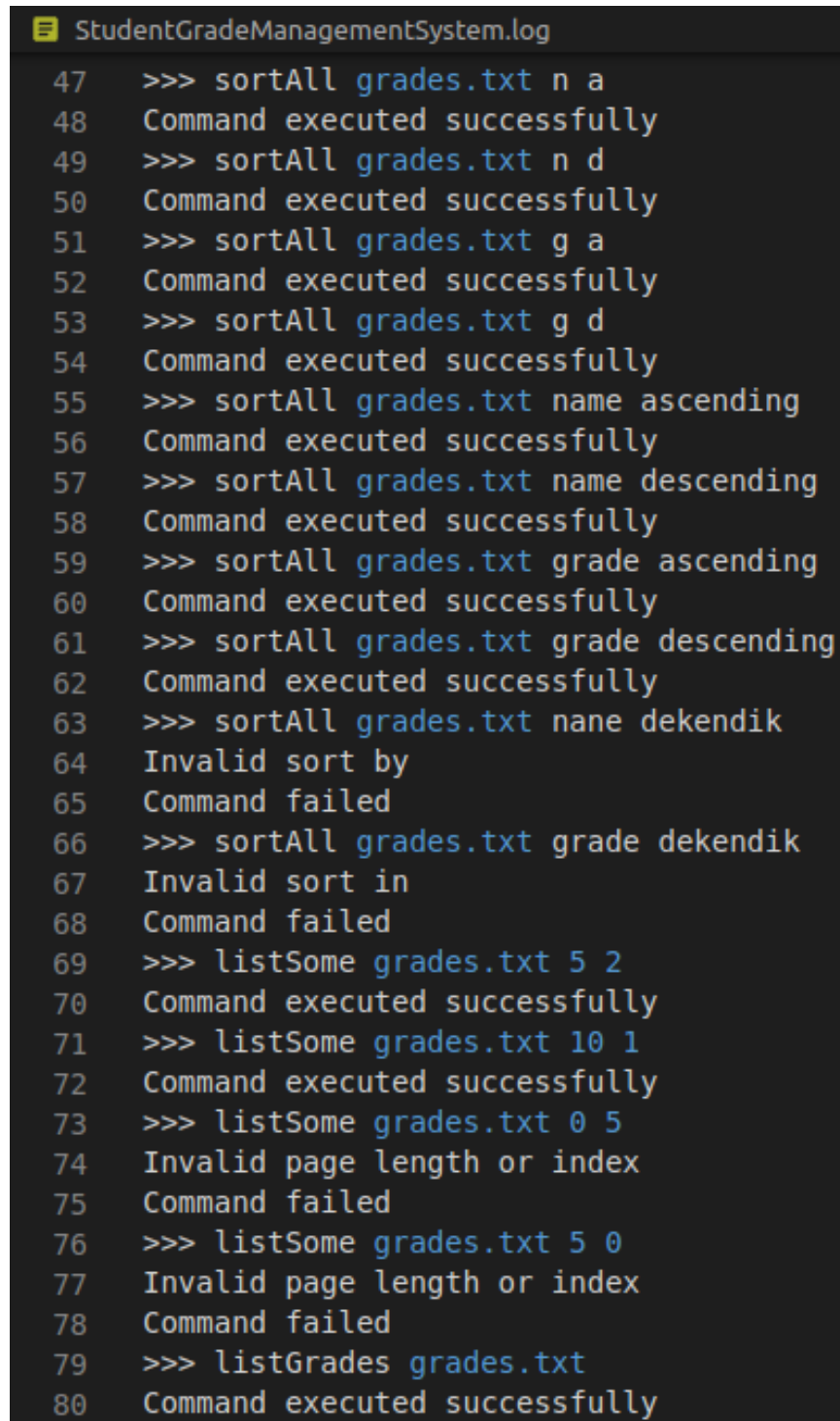
**Example:**

```
eren@eren-Lenovo-ideapad-330-15IKB:~/Desktop/Classes/cse344/assignments/hw1$ ./main.out
>>> listGrades grades.txt
Anthony Charles Robert Jackson, DC
Elizabeth Patricia Martinez, FF
Sandra Barbara Sandra Clark, CC
Michael Smith, NA
Sarah Anderson, FF
>>> □
```

Figure 11: listGrades usage

## 4.9 Log File

Here you can see the a part of the log file with the logging of the commands from the last three subsections.



```
StudentGradeManagementSystem.log
47  >>> sortAll grades.txt n a
48  Command executed successfully
49  >>> sortAll grades.txt n d
50  Command executed successfully
51  >>> sortAll grades.txt g a
52  Command executed successfully
53  >>> sortAll grades.txt g d
54  Command executed successfully
55  >>> sortAll grades.txt name ascending
56  Command executed successfully
57  >>> sortAll grades.txt name descending
58  Command executed successfully
59  >>> sortAll grades.txt grade ascending
60  Command executed successfully
61  >>> sortAll grades.txt grade descending
62  Command executed successfully
63  >>> sortAll grades.txt nane dekendik
64  Invalid sort by
65  Command failed
66  >>> sortAll grades.txt grade dekendik
67  Invalid sort in
68  Command failed
69  >>> listSome grades.txt 5 2
70  Command executed successfully
71  >>> listSome grades.txt 10 1
72  Command executed successfully
73  >>> listSome grades.txt 0 5
74  Invalid page length or index
75  Command failed
76  >>> listSome grades.txt 5 0
77  Invalid page length or index
78  Command failed
79  >>> listGrades grades.txt
80  Command executed successfully
```

Figure 12: Log of the commands from the last three subsections