CSc 3320: Systems Programming

Fall 2021

Midterm 2: Total points = 200

Assigned: 17th Nov 2021

Submission Deadline: 6th Dec 2021, Monday, 11.59 PM (No extensions. If your submission is not received by this time then it will NOT be accepted.)

Submission instructions:

1. Create a Google doc for your submission.
2. Start your responses from page 2 of the document and copy these instructions on page 1.
3. Fill in your name, campus ID and panther # in the fields provided. If this information is missing TWO POINTS WILL BE DEDUCTED.
4. Keep this page 1 intact. If this *submissions instructions* page is missing in your submission TWO POINTS WILL BE DEDUCTED.
5. Start your responses to each QUESTION on a new page.
6. If you are being asked to write code, copy the code into a separate txt file and submit that as well. The code should be executable. E.g. if asked for a C script then provide myfile.c so that we can execute that script. In your answer to the specific question, provide the steps on how to execute your file (like a ReadMe).
7. Provide the evidence of your outputs through a screenshot and/or screen video-recordings and copy the same into the document.
8. Upon completion, download a .PDF version of the google doc document and submit the same along with all the supplementary files (videos, pictures, scripts etc).

Full Name: Nafisa Nawal

Campus ID: nnawal2

Panther #: 002398884

READ THESE NOTES BEFORE YOU START!

- **Questions 1-4 are 30pts each.**
- **Questions 5 and 6 are 40 pts each.**
- **All questions MUST be ATTEMPTED. Your MIDTERM 2 will NOT be evaluated if there is NO ATTEMPT for even 1 question.**
- **All programs have to be well commented. Non-commented programs will receive 0 points. Comments have to be comprehensible and concise.**

1. Consider the array given below. Write a C program that must be able to sort the elements in the array. You must use pointers in your code to work with the arrays. The sort functionality must be implemented as a separate function named “sort_numeric()”

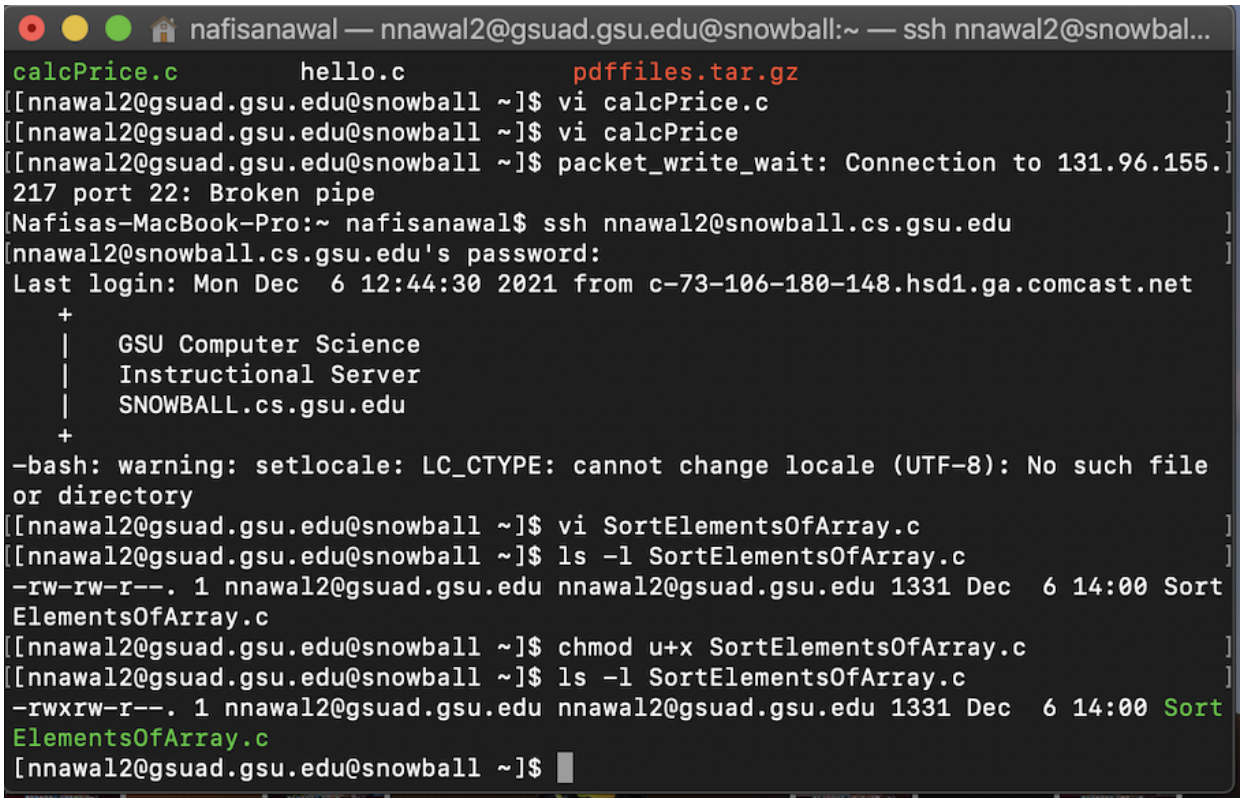
   Array for your evaluation

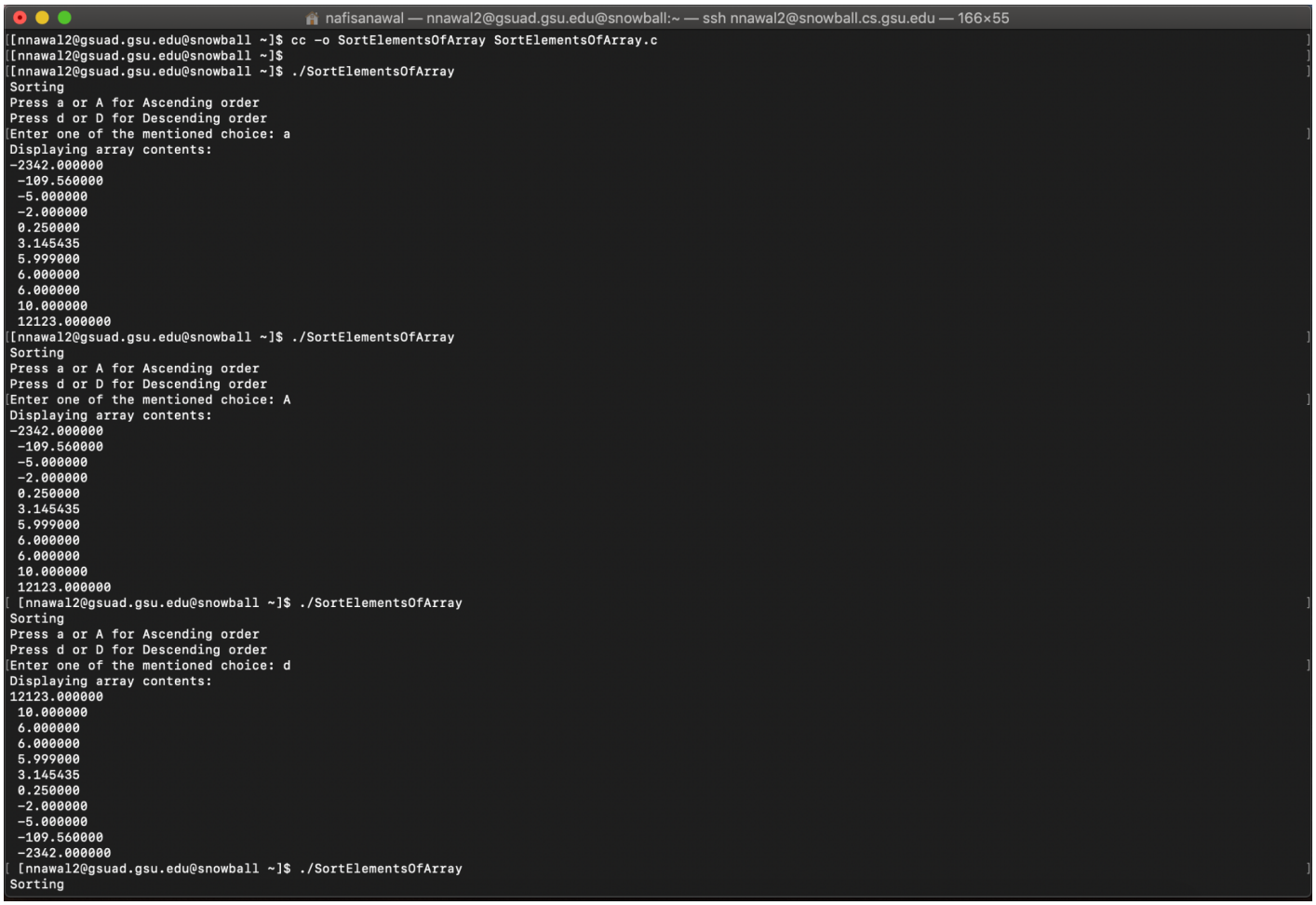
   [10, 0.25, -2342, 12123, 3.145435, 6, 6, 5.999, -2, -5, -109.56]

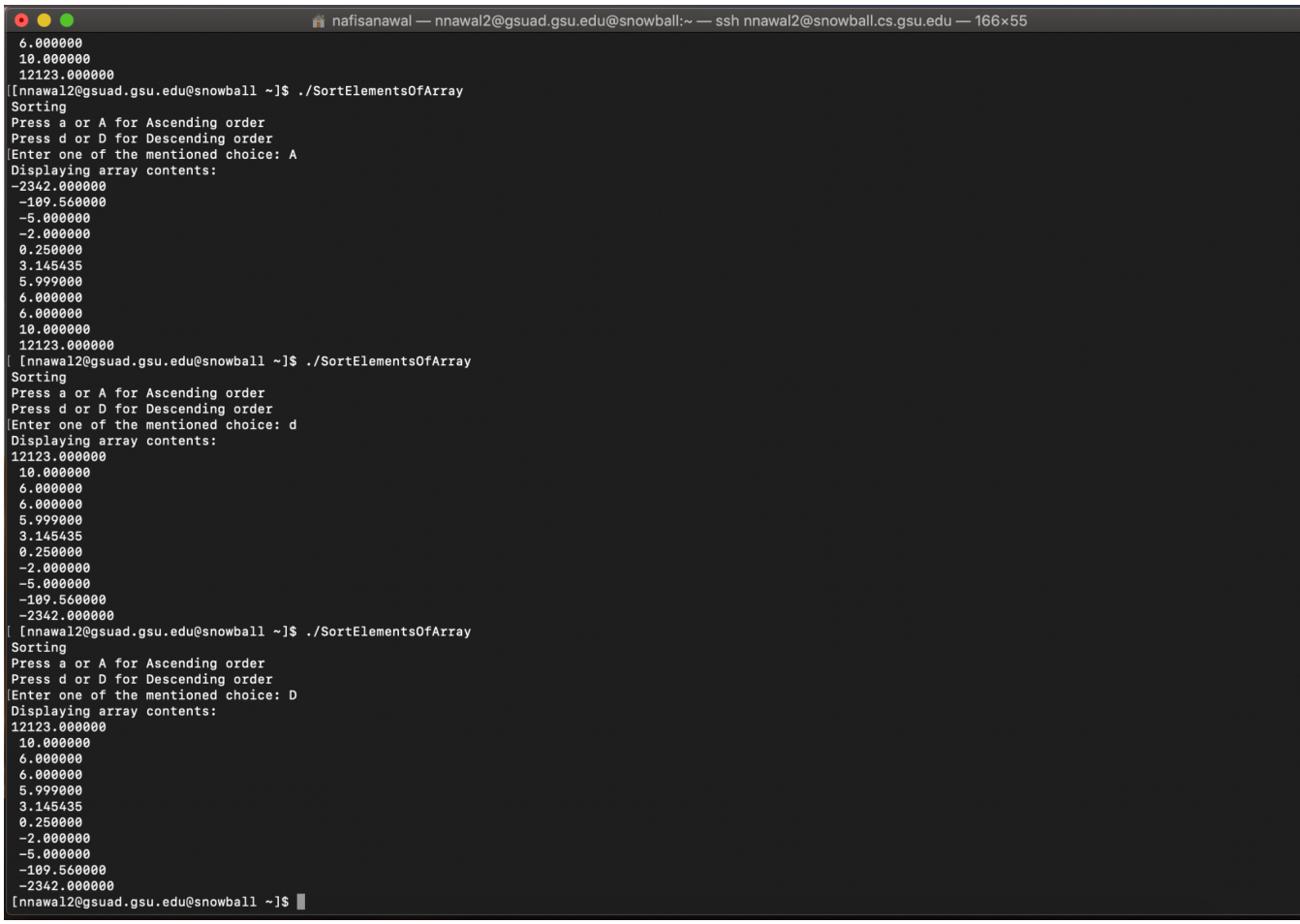
   If given user input A or a: sort in Ascending order

   If given user input D or d: sort in Descending order

Answer:




nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
[nnawal2@gsuad.gsu.edu@snowball ~]$ cc -o SortElementsOfArray SortElementsOfArray.c
[nnawal2@gsuad.gsu.edu@snowball ~]$
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting
Press a or A for Ascending order
Press d or D for Descending order
Enter one of the mentioned choice: a
Displaying array contents:
-2342.000000
-109.560000
-5.000000
-2.000000
0.250000
3.145435
5.999000
6.000000
6.000000
10.000000
12123.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting
Press a or A for Ascending order
Press d or D for Descending order
Enter one of the mentioned choice: A
Displaying array contents:
-2342.000000
-109.560000
-5.000000
-2.000000
0.250000
3.145435
5.999000
6.000000
6.000000
10.000000
12123.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting
Press a or A for Ascending order
Press d or D for Descending order
Enter one of the mentioned choice: d
Displaying array contents:
12123.000000
10.000000
6.000000
6.000000
5.999000
3.145435
0.250000
-2.000000
-5.000000
-109.560000
-2342.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting


nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
6.000000
10.000000
12123.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting
Press a or A for Ascending order
Press d or D for Descending order
Enter one of the mentioned choice: A
Displaying array contents:
-2342.000000
-109.560000
-5.000000
-2.000000
0.250000
3.145435
5.999000
6.000000
6.000000
10.000000
12123.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting
Press a or A for Ascending order
Press d or D for Descending order
Enter one of the mentioned choice: d
Displaying array contents:
12123.000000
10.000000
6.000000
6.000000
5.999000
3.145435
0.250000
-2.000000
-5.000000
-109.560000
-2342.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./SortElementsOfArray
Sorting
Press a or A for Ascending order
Press d or D for Descending order
Enter one of the mentioned choice: D
Displaying array contents:
12123.000000
10.000000
6.000000
6.000000
5.999000
3.145435
0.250000
-2.000000
-5.000000
-109.560000
-2342.000000
[nnawal2@gsuad.gsu.edu@snowball ~]$

2. Consider the list of names given below. Write a C program that will first create a string array that will contain this list and then sort the elements in the array as per alphabetical order. You must use pointers in your code to work with the arrays. The sort functionality must be implemented as a separate function named “sort_alphabetic()”. The program can be case insensitive (i.e. capital or small letters are treated the same).

List for your evaluation

Systems

Programming

Deep

Learning

Internet

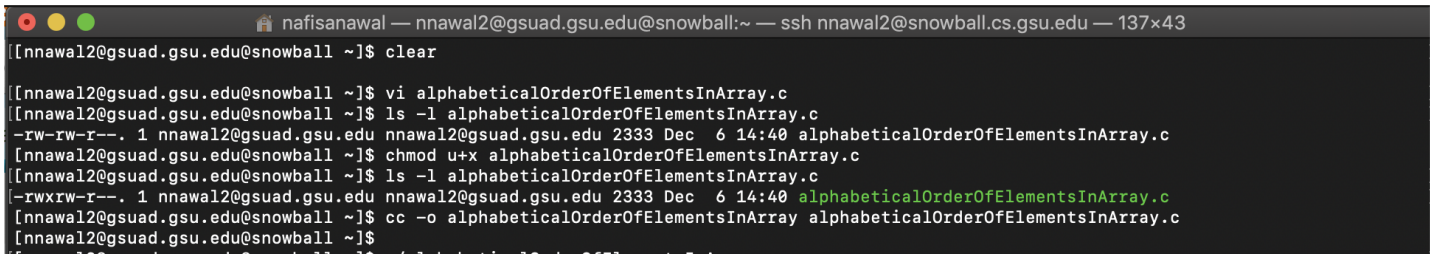
Things

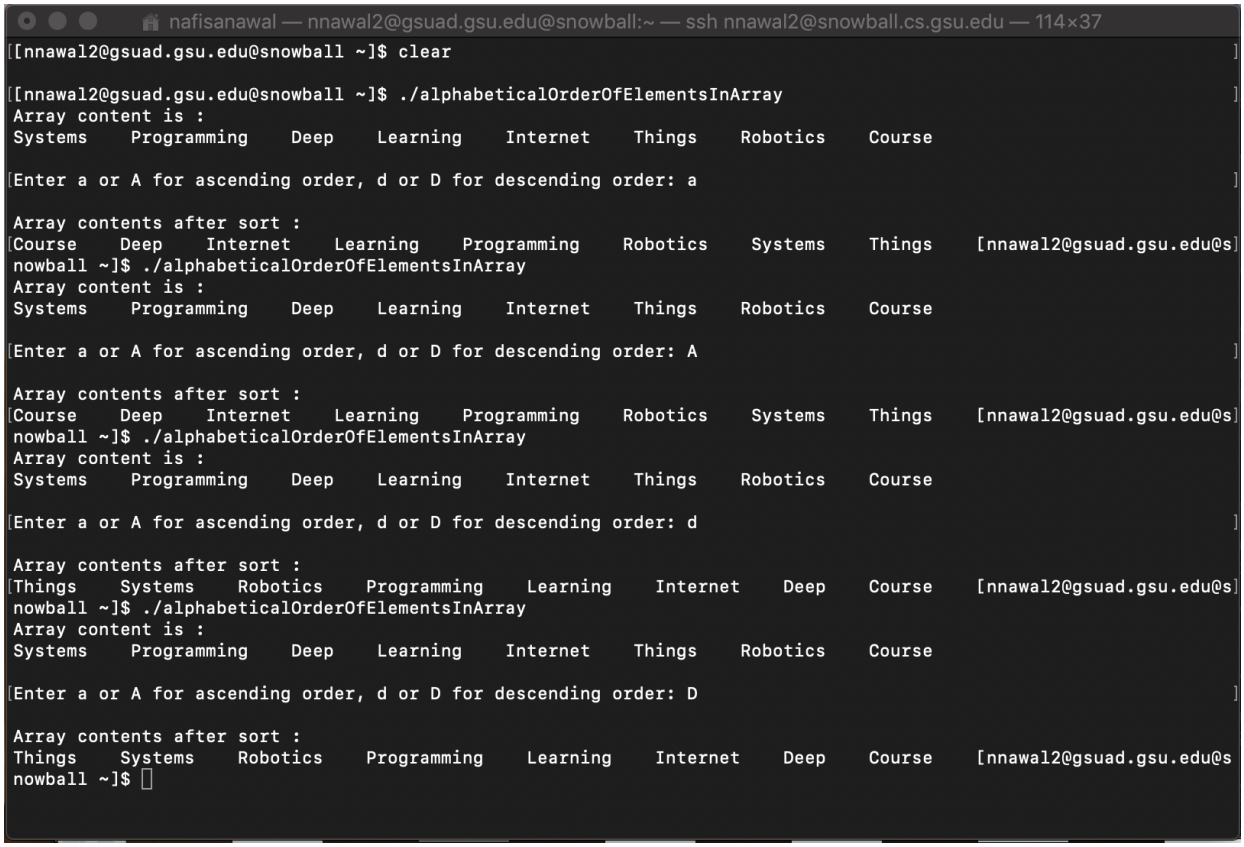
Robotics

Course

If given user input A or a: sort in alphabetical order (a comes first) If given user input D or d: sort in reverse alphabetical order(z comes first)

Answer :



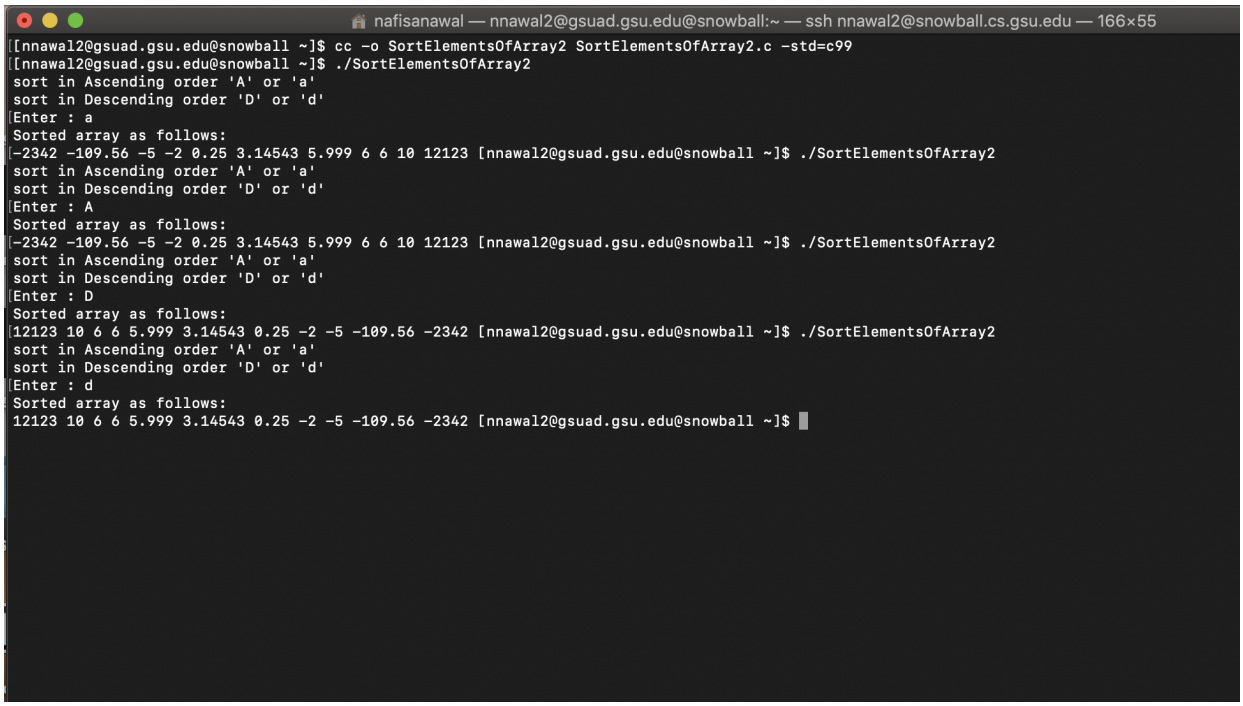


3. Repeat Question 1 or Question 2, considering that the number of elements can potentially increase. That is, the size of the array will be unknown at the start of the program. Note that the requirement of using pointers still holds.

Show proof of evaluation of your program being able to work for more than 10 entries. Show 5 evaluation trials in your submission. You can pick any number of entries between 10 and 30 for your trials.

(Hint: *To solve this, use dynamic memory allocation, where you will NOT treat the input array as a known or finite size. Allocate memory space (e.g. malloc()) as and when the number of elements in the list increases).*

Answer :



4. Using C programming and using Structures or Unions in your program, build a COVID vaccine registration form where any user can register by filling in their First Name, Last Name, Date of Birth (mm/dd/yyyy), Dose number (1 or 2), Date of previous dose, Type of vaccine (e.g. Pfizer, Moderna, Johnson & Johnson etc.), Residential zip code.

   Upon registration, the system must output a 8 letter alphanumeric code that will be unique to that user. The code is generated as <First letter of First Name><First Letter of Last Name><current age of user -as of registration date><First letter of Vaccine type><last 3 numbers of zipcode>

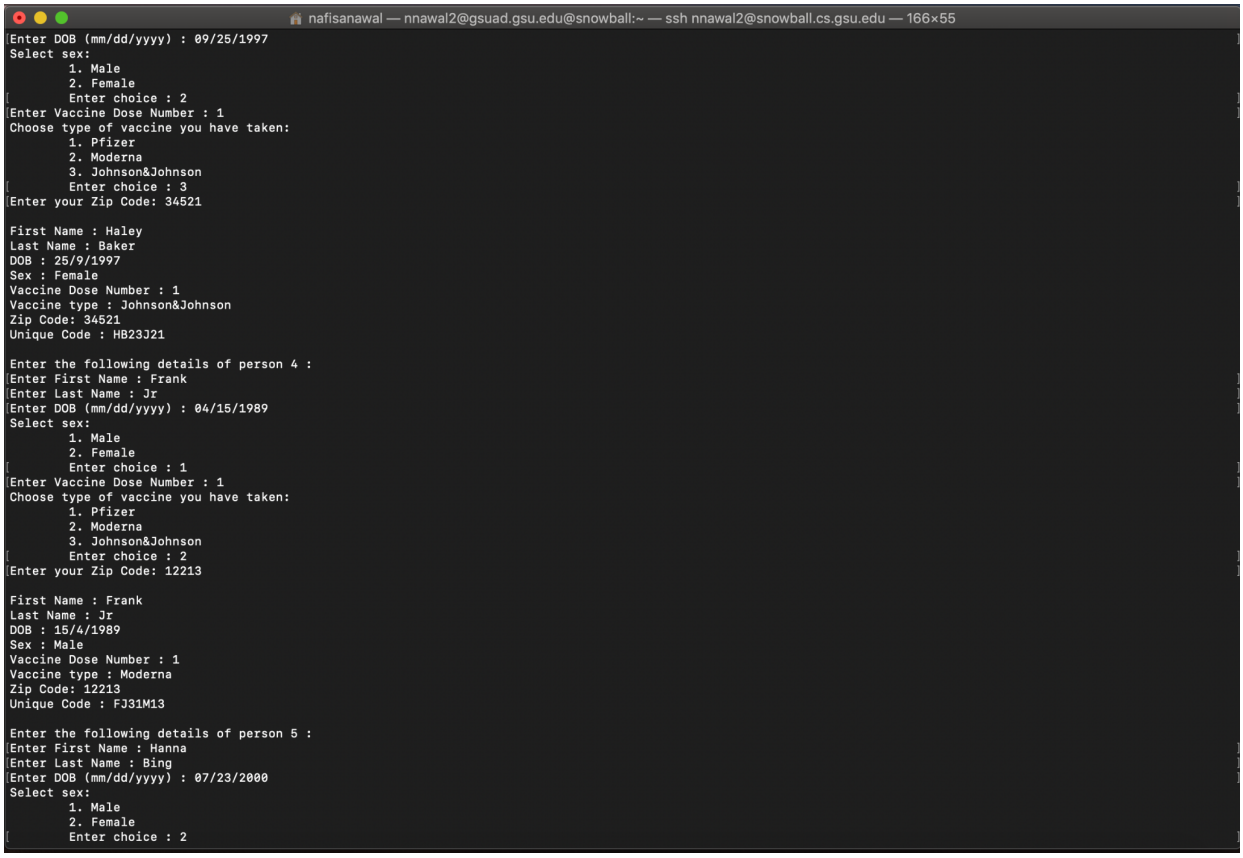
   Add functionality in your program such that it will display all the user's information on the screen (one item in each line).

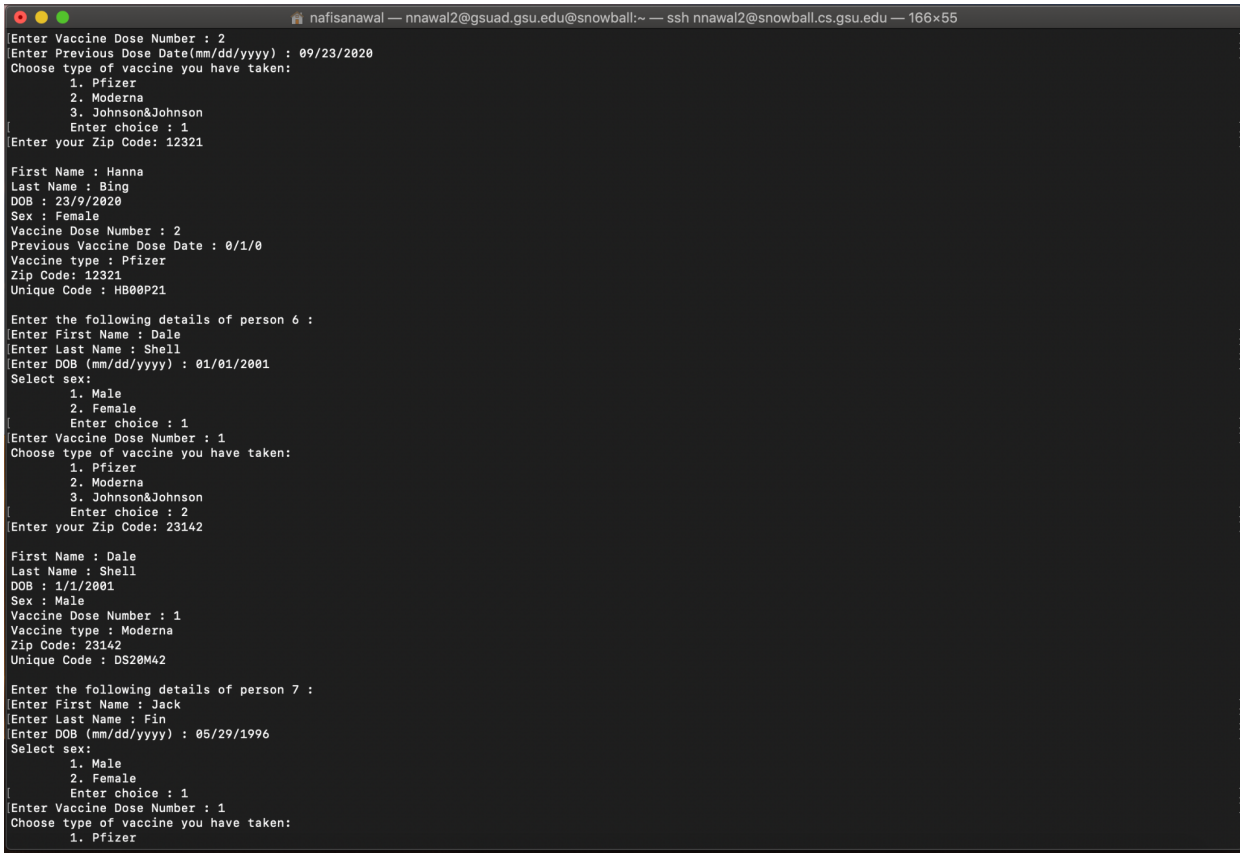
   Show an evaluation trial for registering at least 10 users. For registration, ,for relevant questions, users must choose values based on the options provided. Use pseudo values instead of actual personal details.
   (Hint: Write a program that contains main(), register(), generate_code() and retrieve() functions, at the least).

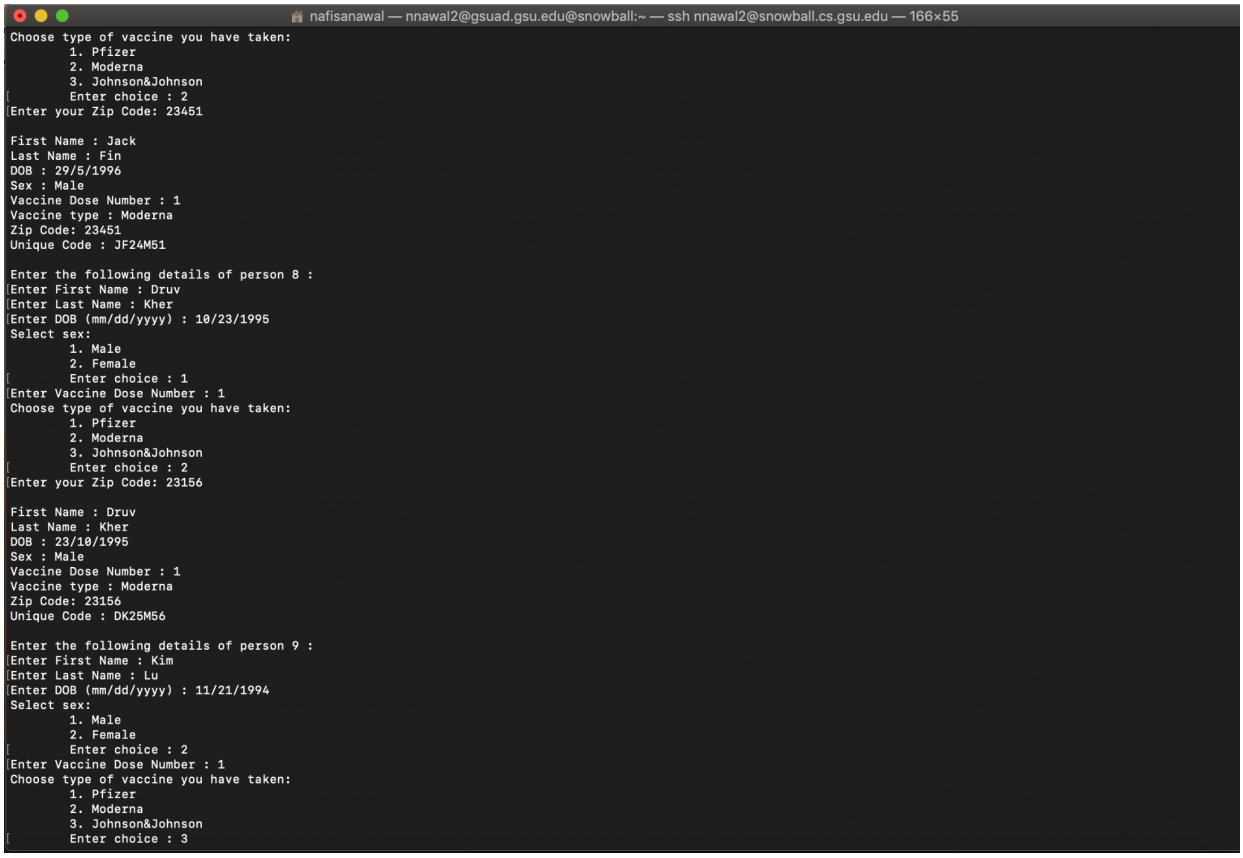
Answer :

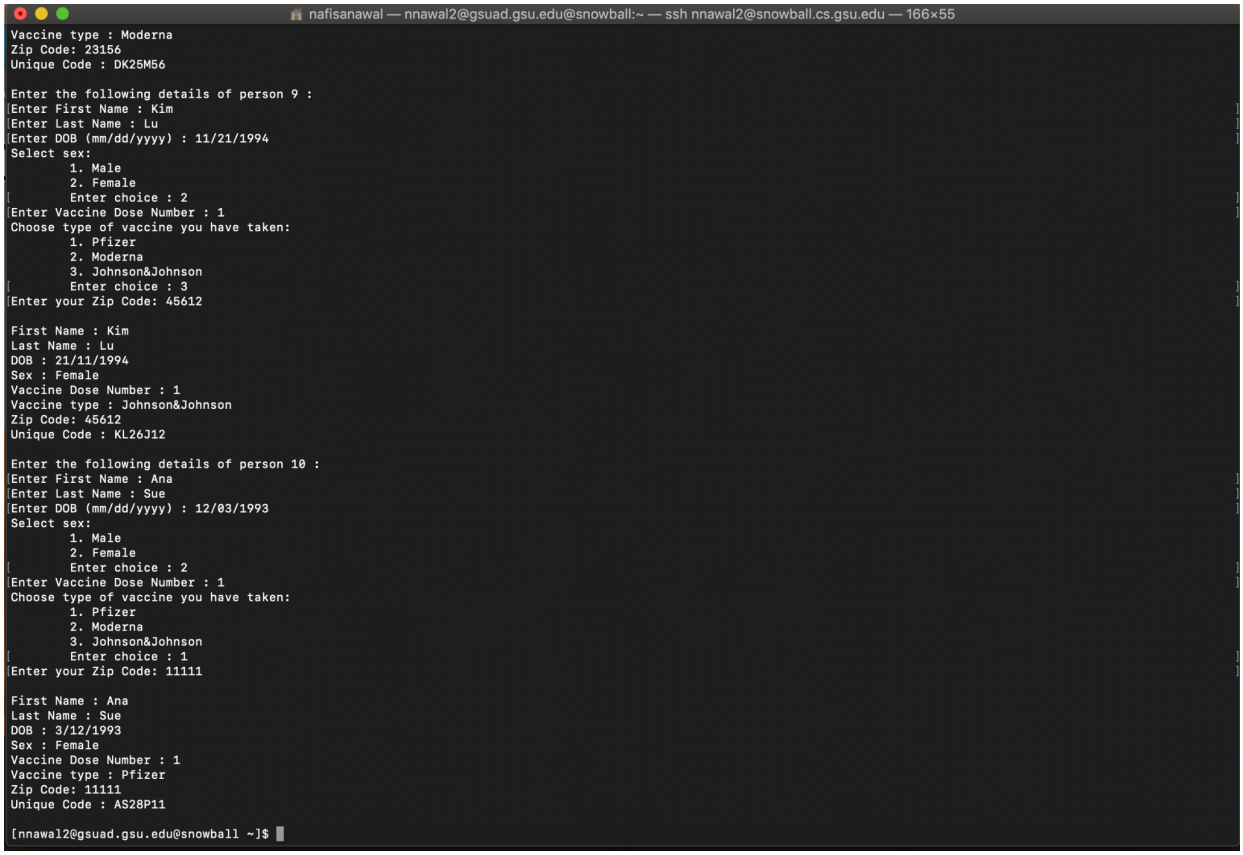
```
nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 142×51
[nnawal2@gsuad.gsu.edu@snowball ~]$ vi CovidRegistration.c
[nnawal2@gsuad.gsu.edu@snowball ~]$ ls -l CovidRegistration.c
-rw-rw-r--. 1 nnawal2@gsuad.gsu.edu nnawal2@gsuad.gsu.edu 3954 Dec  6 15:43 CovidRegistration.c
[nnawal2@gsuad.gsu.edu@snowball ~]$ chmod u+x CovidRegistration.c
[nnawal2@gsuad.gsu.edu@snowball ~]$ ls -l CovidRegistration.c
-rwxrw-r--. 1 nnawal2@gsuad.gsu.edu nnawal2@gsuad.gsu.edu 3954 Dec  6 15:43 CovidRegistration.c
[nnawal2@gsuad.gsu.edu@snowball ~]$ cc -o CovidRegistration CovidRegistration.c
```

```
nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
[nnawal2@gsuad.gsu.edu@snowball ~]$ ./CovidRegistration
 Enter the following details of person 1 :
[Enter First Name : Nafisa
[Enter Last Name : Nawal
[Enter DOB (mm/dd/yyyy) : 02/03/1999
 Select sex:
        1. Male
        2. Female
[       Enter choice : 2
[Enter Vaccine Dose Number : 1
 Choose type of vaccine you have taken:
        1. Pfizer
        2. Moderna
        3. Johnson&Johnson
[       Enter choice : 2
[Enter your Zip Code: 12345

 First Name : Nafisa
 Last Name : Nawal
 DOB : 3/2/1999
 Sex : Female
 Vaccine Dose Number : 1
 Vaccine type : Moderna
 Zip Code: 12345
 Unique Code : NN22M45

 Enter the following details of person 2 :
[Enter First Name : Dave
[Enter Last Name : Hals
[Enter DOB (mm/dd/yyyy) : 09/28/1996
 Select sex:
        1. Male
        2. Female
[       Enter choice : 1
[Enter Vaccine Dose Number : 1
 Choose type of vaccine you have taken:
        1. Pfizer
        2. Moderna
        3. Johnson&Johnson
[       Enter choice : 2
[Enter your Zip Code: 12342

 First Name : Dave
 Last Name : Hals
 DOB : 28/9/1996
 Sex : Male
 Vaccine Dose Number : 1
 Vaccine type : Moderna
 Zip Code: 12342
 Unique Code : DH24M42

 Enter the following details of person 3 :
[Enter First Name : Haley
[Enter Last Name : Baker
[Enter DOB (mm/dd/yyyy) : 09/25/1997
```


nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
Enter DOB (mm/dd/yyyy) : 09/25/1997
Select sex:
1. Male
2. Female
Enter choice : 2
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 3
Enter your Zip Code: 34521
First Name : Haley
Last Name : Baker
DOB : 25/9/1997
Sex : Female
Vaccine Dose Number : 1
Vaccine type : Johnson&Johnson
Zip Code: 34521
Unique Code : HB23J21
Enter the following details of person 4 :
Enter First Name : Frank
Enter Last Name : Jr
Enter DOB (mm/dd/yyyy) : 04/15/1989
Select sex:
1. Male
2. Female
Enter choice : 1
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 2
Enter your Zip Code: 12213
First Name : Frank
Last Name : Jr
DOB : 15/4/1989
Sex : Male
Vaccine Dose Number : 1
Vaccine type : Moderna
Zip Code: 12213
Unique Code : FJ31M13
Enter the following details of person 5 :
Enter First Name : Hanna
Enter Last Name : Bing
Enter DOB (mm/dd/yyyy) : 07/23/2000
Select sex:
1. Male
2. Female
Enter choice : 2


nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
Enter Vaccine Dose Number : 2
Enter Previous Dose Date(mm/dd/yyyy) : 09/23/2020
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 1
Enter your Zip Code: 12321
First Name : Hanna
Last Name : Bing
DOB : 23/9/2020
Sex : Female
Vaccine Dose Number : 2
Previous Vaccine Dose Date : 0/1/0
Vaccine type : Pfizer
Zip Code: 12321
Unique Code : HB00P21
Enter the following details of person 6 :
Enter First Name : Dale
Enter Last Name : Shell
Enter DOB (mm/dd/yyyy) : 01/01/2001
Select sex:
1. Male
2. Female
Enter choice : 1
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 2
Enter your Zip Code: 23142
First Name : Dale
Last Name : Shell
DOB : 1/1/2001
Sex : Male
Vaccine Dose Number : 1
Vaccine type : Moderna
Zip Code: 23142
Unique Code : DS20M42
Enter the following details of person 7 :
Enter First Name : Jack
Enter Last Name : Fin
Enter DOB (mm/dd/yyyy) : 05/29/1996
Select sex:
1. Male
2. Female
Enter choice : 1
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer


nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 2
Enter your Zip Code: 23451
First Name : Jack
Last Name : Fin
DOB : 29/5/1996
Sex : Male
Vaccine Dose Number : 1
Vaccine type : Moderna
Zip Code: 23451
Unique Code : JF24M51
Enter the following details of person 8 :
Enter First Name : Druv
Enter Last Name : Kher
Enter DOB (mm/dd/yyyy) : 10/23/1995
Select sex:
1. Male
2. Female
Enter choice : 1
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 2
Enter your Zip Code: 23156
First Name : Druv
Last Name : Kher
DOB : 23/10/1995
Sex : Male
Vaccine Dose Number : 1
Vaccine type : Moderna
Zip Code: 23156
Unique Code : DK25M56
Enter the following details of person 9 :
Enter First Name : Kim
Enter Last Name : Lu
Enter DOB (mm/dd/yyyy) : 11/21/1994
Select sex:
1. Male
2. Female
Enter choice : 2
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 3


nafisanawal — nnawal2@gsuad.gsu.edu@snowball:~ — ssh nnawal2@snowball.cs.gsu.edu — 166×55
Vaccine type : Moderna
Zip Code: 23156
Unique Code : DK25M56
Enter the following details of person 9 :
Enter First Name : Kim
Enter Last Name : Lu
Enter DOB (mm/dd/yyyy) : 11/21/1994
Select sex:
1. Male
2. Female
Enter choice : 2
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 3
Enter your Zip Code: 45612
First Name : Kim
Last Name : Lu
DOB : 21/11/1994
Sex : Female
Vaccine Dose Number : 1
Vaccine type : Johnson&Johnson
Zip Code: 45612
Unique Code : KL26J12
Enter the following details of person 10 :
Enter First Name : Ana
Enter Last Name : Sue
Enter DOB (mm/dd/yyyy) : 12/03/1993
Select sex:
1. Male
2. Female
Enter choice : 2
Enter Vaccine Dose Number : 1
Choose type of vaccine you have taken:
1. Pfizer
2. Moderna
3. Johnson&Johnson
Enter choice : 1
Enter your Zip Code: 11111
First Name : Ana
Last Name : Sue
DOB : 3/12/1993
Sex : Female
Vaccine Dose Number : 1
Vaccine type : Pfizer
Zip Code: 11111
Unique Code : AS28P11
[nnawal2@gsuad.gsu.edu@snowball ~]$

5. Copy the contents of this document into a text file. Make sure the spacings and indentations are included. Write a C program that READS the TEXT file and then outputs

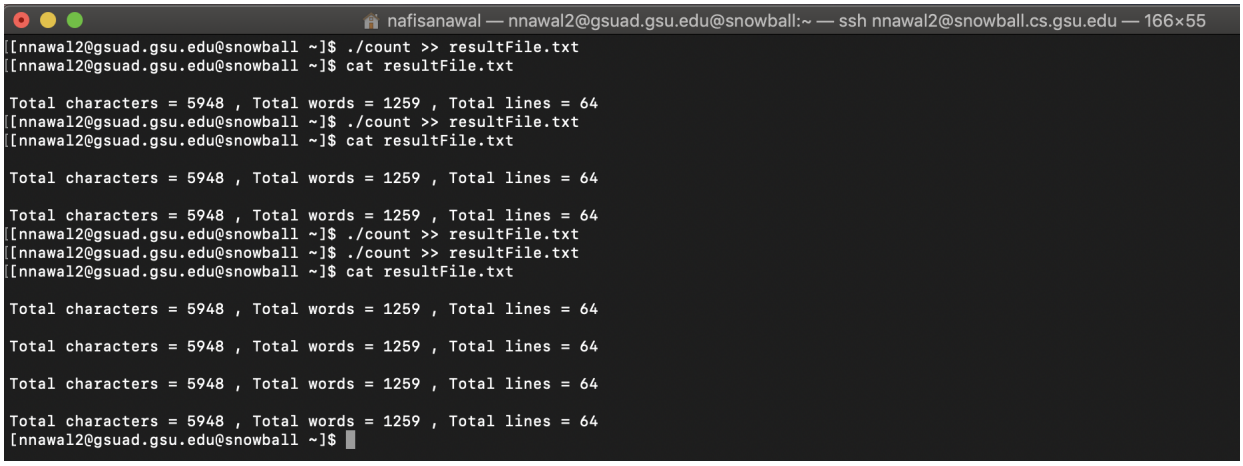
   a. the number of characters (space is to be considered a character), b. number of words (a word is any sequence of non-white-space characters) c. number of lines.

-- Each of the functionalities a, b, and c above must be written as FUNCTIONS and passing of arguments MUST be through POINTERS. -- Name the functions problem5char.c, problem5words.c, and problem5lines.c

-- Write a Makefile that will execute the main C program to include all these three scripts.

-- All these outputs from (number of chars, words and lines) must be saved into ANOTHER text file row-wise. Every execution of your script with a new input must APPEND the outputs to a new row in that text file. You can separate each value in a row using any delimiter of your choice (e.g. comma or semi-colon etc)

Answer :



6. Repeat everything in Problem 5, but create the functionalities a, b and c as HEADER (Library) files and execute using a Make file.

Answer :