

Name: \_\_\_\_\_

Problem	Points	Score
1	50	
2	50	
Total	100	

Notes:

- (1) The first step in this exam is to create a workspace in the following directory:

`/data/courses/ece_1111/current/exams/ex_01`

Your directory should be your last name all lowercase, followed by an underscore, followed by your first name (e.g, “picone\_joseph”). Set the permissions using “`chmod u+rwx,g-rwx,o-rwx <lastname>`” so only you have read and write permission to this directory. Create subdirectories within this directory: p01, p02, ... You will use these for problems 1 and 2, ... respectively. Put ALL your code in these directories. Do not touch your files after the exam is over.

- (2) Your code must be nicely formatted and well commented, use Makefiles, etc. as we have done all semester. Failure to do these things will significantly lower your grade.
- (3) You can use code I wrote in class (hint!) or code you submitted for your homework and lab assignments (hint!!!!).
- (4) For this exam you are allowed to open a terminal window on your computer, you are allowed to web surf with Google, but you cannot use online chat or other interactive services, such as ChatGPT. Trust me – if you use that tool, I’ll probably be able to figure it out ;)

**(50 pts) Problem No. 1:**

Create a file named data.txt with four lines of text:

```
A is for apple.  
b is for banana.  
C is for cantaloupe.  
g is for grapes.
```

Assume the length of a line is exactly 99 bytes – no more, no less.

Write a program that does the following:

- (1) Creates an array that is a fixed dimension of N lines x 99 characters (e.g., char[N][99]).
- (2) Read the file line by line into this array.
- (3) Prints the contents of the array to stdout.
- (4) Sorts the array using the following sort criterion:
  - Case insensitive
  - Compares strings based on the number of alphabetic characters in the string (e.g., characters in the range [A-Z] or [a-z]).
  - Orders the sort in descending order – longest strings first.

Your program should work for any file, not just the example above.

**(50 pts) Problem No. 2:**

You work for the famous ACME Corporation as a software engineer. Before there was the Internet, there was ACME. If your goal was to capture the speed roadrunner, ACME was your go-to mail order company (<https://www.youtube.com/watch?v=9m7evoFF83c...> I know, a very dated reference ☺)

Your job today is to write a program that reads a list of customers for ACME and stores it in a linked list. Your input file contains data of the form:

- Customer name
- Customer address
- <blank line>

Once you read the data into memory, you should close the input file and display the contents of the linked list in a human-readable form.

An example input file might look like this:

```
Wile E. Coyote
101 Desert Valley, Death Valley Junction, California, 92328
```

```
The RoadRunner
123 Beep Beep Drive, Hollywood, California, 33004
```

The output would look like this:

```
Customer Number: 1
Customer Name: Wile E. Coyote
Customer Address: 101 Desert Valley, Death Valley Junction, California, 92328
```

```
Customer Number: 2
Customer Name: The RoadRunner
Customer Address: 123 Beep Beep Drive, Hollywood, California, 33004
```

You must represent each customer record as a structure, and you must store the customer records in a linked list.