CS-212: LAB 5 – Link List

Learning Objective:

- Forming a link list with data from an input file
- Merging two link list together

This lab has three parts:

- You will read data in from two data files creating two separate link list.
- You will create a third link list by merging both link lists together into one link list.
- All three link lists will be printed to an output file.
- There is an extra credit worth just over 20%

Lab 5 Setup:

1. Open a new terminal window to SSH into your account on the [bingweb.binghamton.com] server. When logged in, make sure you are in your home directory by typing the following command if you are not already there. The "~" is just a shortcut symbol that means home directory:

```
cd ~
```

2. Change your current directory to the "CS212" directory by typing:

```
cd CS212
```

3. Confirm that you are in the "CS212" directory by typing:

```
pwd
```

4. Create a directory for Lab5.

```
mkdir Lab5
```

5. Move into the new directory

```
cd Lab5
```

6. Create a new c file for you to write your lab.
   > <Last Name><FirstInitial>_Lab5.c
   > <Last Name><FirstInitial>_Lab5_Functions.c
   > <Last Name><FirstInitial>_Lab5.h

   Example: I would create FoosJ_Lab5.c, FoosJ_lab5_Functions.c and FoosJ_Lab5.h

   Note: <Last Name><First Initial>_Lab5.c will only have your main function.

INTRODUCTION:

You will create three link list. The first and second will be a list of records where the data is read in from an input file. The third link list will be the first two link list merged. All three of your link lists will be printed to your output file.

Creating your structures:

(Structure definitions must be done in the header file)

Using a typedef, create structure called recordType that contains the following data:

String: Book title
String: Book author
String: Book publishing company
Int: Year published
String: ISBN
Double: Cost of the book

Using a typedef, create another structure called nodeType that will have the following data:

recordType: Information on one book
nodeType Pointer: Pointer to the next node

Functions:

Function 0: PrintHeader, PrintDivider, CenterString

- Copy these functions from your previous labs

Function 1: OpenFiles / Closefiles

- Files will need to be open and closed in these functions

Function 2: ReadDataFromFile

- Using a file processing loop read in the data for one record
- Call create node to copy the data into your new node
- Call AddNodeToList to add the new list to your link list.

Function 3: CreateNode

- Copy data from the input file into your new node
- Don't forget to assign the pointer to NULL.

Function 4: AddNodeToList

- This function will take two parameters, one for the link list and one for the new node
- Insert the new node into the link list.
- This function must work for all three link lists.

Function 5: PrintList

- Along with other parameters, once parameter should be a title describing the link list
- Print the title centered to the screen (Call CenterString)
- Use while loop to traverse your link list.
- For each node in your link list, call PrintOneRecord

Function 6: PrintOneRecord

- Print one record (node) to your output file.

Function 7: MergList(pointer to the first list, pointer to the second list, pointer to the new merged list)

- For this function DO NOT just change the pNext of the last node of the first list to equal the first node of the second list.
- Use two while loops (The first for the first list, the second for the second list.)
- Each while loop will have a temp pointer point to every node in the list. Make a copy of the node and send the that node and the pointer for the third link list into AddNodeToList

Note: You may, if you wish, create more functions to subdivide the tasks for this function.

Function 8: FreeTheList

- Use a while loop to go through your link list and call free for each node

Main Function:

- Create pointers for your three link lists
- You can open your files
- Print your header to the screen and the output file
- Read the data in for your first link list
- Read the data in for your second link list
- Merge your first two link list into your third link list
- Print all link list to an output file. (Call your PrintList function three times)
- Free all three of your link lists
- Close your files
- Test your three pointers against NULL, if they are NULL, print "*List name* is empty"

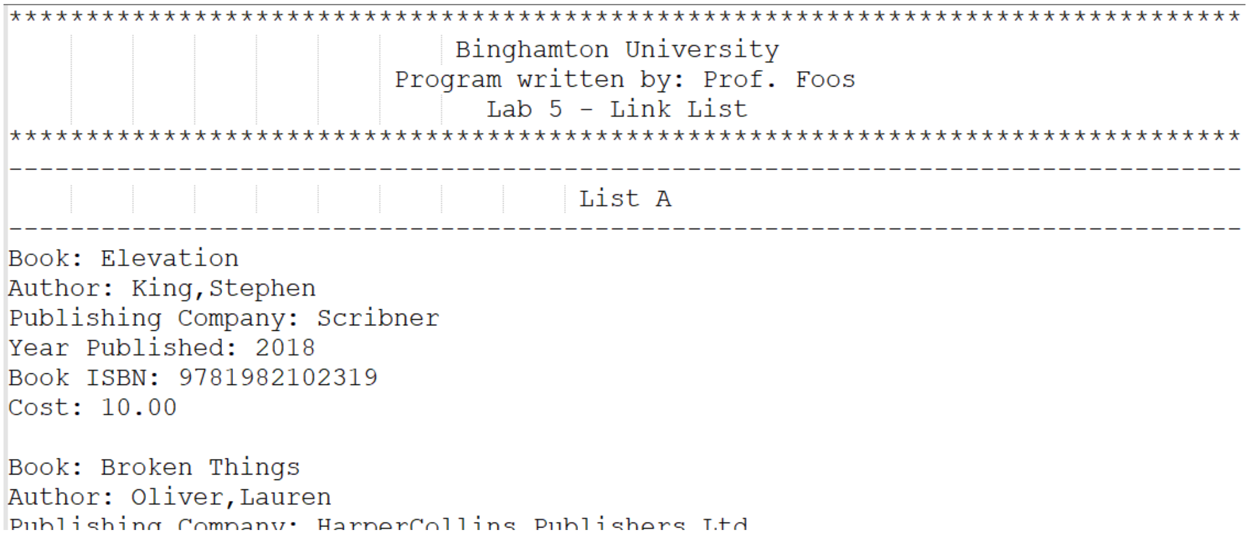
EXTRA CREDIT: 20%

If your lab does not run with proper output, no extra credit may be earned.

To obtain the extra credit, all link lists must be in alphabetical order by book title.

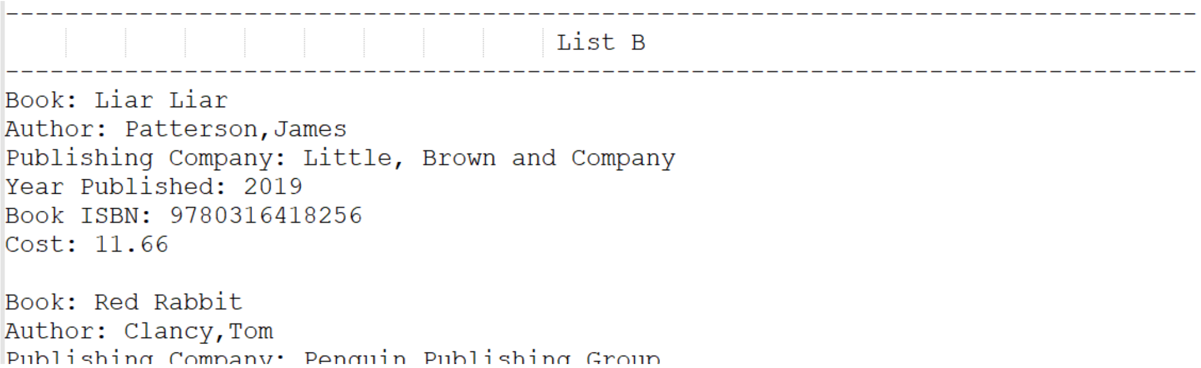
HINT: To compare two strings, use the strcmp function. (You can google this if you don't know how this function works, or you can ask for help.)

SAMPLE OUTPUT:



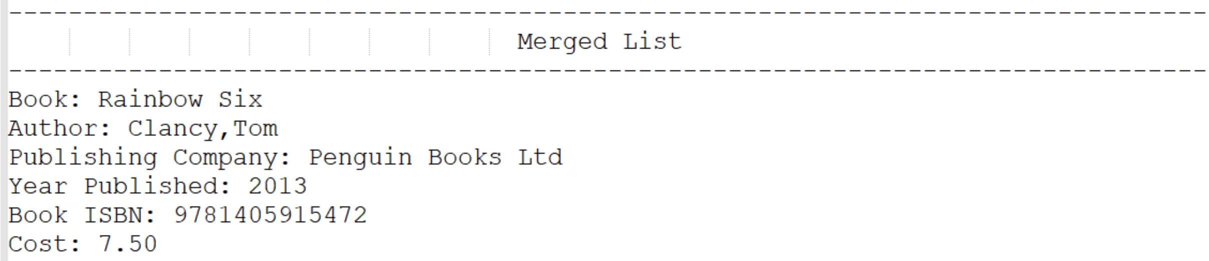
```
********************************************************************************
                             Binghamton University
                         Program written by: Prof. Foos
                               Lab 5 - Link List
********************************************************************************
--------------------------------------------------------------------------------
                                     List A
--------------------------------------------------------------------------------
Book: Elevation
Author: King,Stephen
Publishing Company: Scribner
Year Published: 2018
Book ISBN: 9781982102319
Cost: 10.00

Book: Broken Things
Author: Oliver,Lauren
Publishing Company: HarperCollins Publishers Ltd
```



```
--------------------------------------------------------------------------------
                                     List B
--------------------------------------------------------------------------------
Book: Liar Liar
Author: Patterson,James
Publishing Company: Little, Brown and Company
Year Published: 2019
Book ISBN: 9780316418256
Cost: 11.66

Book: Red Rabbit
Author: Clancy,Tom
Publishing Company: Penguin Publishing Group
```



```
--------------------------------------------------------------------------------
                                  Merged List
--------------------------------------------------------------------------------
Book: Rainbow Six
Author: Clancy,Tom
Publishing Company: Penguin Books Ltd
Year Published: 2013
Book ISBN: 9781405915472
Cost: 7.50
```

NOTE: The light grey vertical lines you see in the output are because of Notepad++, not your lab.

RUNNING YOUR PROGRAM

Your program must run in gcc on the unix operating system with 0 errors and 0 warnings.

To run your program:

```
gcc *.c -Wall
```

This will create an output file named a.out

Valgrind must run with 0 errors and 0 warnings.

To run Valgrind:

```
valgrind --leak-check=full ./a.out
```

FILES TO SUBMIT:

<Last Name><FirstInitial>_Lab5.c
<Last Name><FirstInitial>_Lab5_Functions.c
<Last Name><FirstInitial>_Lab5.h

Lab5_Output.txt

ADDITIONAL PARTIAL CREDIT GRADING RUBRIC:

NOTE: The full rubric is on Brightspace under Misc

None.

Note to Grader: Any partial credit outside of the rubric must be approved by the teacher.