A290/A590
Tools for Computing
System Programming with C and Unix.

Assignment 4

DUE Friday, October 14, 2016 by 11:59.59.99PM (before MIDNIGHT)
Submit your A4.c **file to your Canvas "Homework ASSIGNMENT 4" assignment in the Homework ASSIGNMENTS group**

Preliminary Information:

You will be creating and submitting one file for this Assignment: A4.c.

Assignment 4 Program Description:

There are several parts to this assignment. You will need to create a Main Menu that allows the user to choose between the "programs" you will be creating, each with its own menu. Read carefully to be sure everything happens in the correct order and that all of your options yield the expected output, displayed/formatted exactly as shown. NOTE: I have **not** supplied an example of the Main Menu. I will leave that up to you, but you must be sure it allows the user to select either program plus "Exit" and then exit gracefully when done with any Main Menu option.

It may be easier to understand the functionality of the program by carefully examining the Sample Output, as it is a bit challenging to describe. The sample binary for A4 will probably be even more useful.

The First Problem: Cricket is a game that has 11 players. While the most skilled batsmen hit early in the line-up, all 11 players may come to bat. Define an appropriately named structure that will describe the following information: **Player name**, **team name**, **batting average**. Using the previously defined structure and the proper code and function prototypes, declare an appropriately named array with sufficient elements to track at least 5 teams and all their players. Write a program/function to read from user input, the information about the number of teams, and up to 11 players on each of those teams, with the output being the on-screen printing of a team-wise list containing names of players with their batting average.

The Second Problem: Write a program using appropriate function prototypes to create a linked list that starts empty, i.e., has no nodes. NOTE: This makes this a **very different** linked list from the linked list you created for **Program 4**. Each node can hold a single `int` as data. Your program should support 7 operations:

1. Insert a Node at the end,
2. Insert a Node at the beginning,
3. Delete a Node from the end,
4. Delete a Node from the beginning,
5. Insert a Node in the middle (nth position),
6. Delete a Node from the middle (nth position), and
7. Modify the `int` value of any Node currently in the list.
8. Exit gracefully after as many operations as the user chooses.

ALSO be sure to display the values of all nodes currently in the list, in first-to-last order, **after each operation**. See sample output for details.

SAMPLE OUTPUT BEGINS ON NEXT PAGE.

AGAIN, I have **not** provided sample output for your Main Menu, which should allow the choice of either “Cricket” or “Linked List” plus “Exit.” It **DOES NOT** have to allow you to return to the Main Menu upon exiting either of the primary applications.

Sample output for Cricket [after selection with Main Menu]:

```
[jwhitmer@silo.cs.indiana.edu] Cricket
Enter the number of teams you wish to record: 2
Enter the name(s) of the teams: England
Enter the name(s) of the teams: India

Enter the TOTAL number of players for all teams: 6
Enter the 1 Player name, Team name, and batting average: George England .345
Enter the 2 Player name, Team name, and batting average: John England .364
Enter the 3 Player name, Team name, and batting average: Stan India .412
Enter the 4 Player name, Team name, and batting average: Charles England .212
Enter the 5 Player name, Team name, and batting average: Frank India .392
Enter the 6 Player name, Team name, and batting average: Harry India .111


Listing of players and batting average according to team names:

England-
        George    0.345000
        John      0.364000
        Charles   0.212000

India-
        Stan      0.412000
        Frank     0.392000
        Harry     0.111000
```

Sample output for Linked List [after selection with Main Menu]: NOTE THE MENU ITEMS ARE SELECTED “OUT-OF-ORDER” IN THE EXAMPLE BELOW TO PROPERLY POPULATE THE LIST SO ALL POSSIBLE OUTPUTS ARE SHOWN.

```
[jwhitmer@silo.cs.indiana.edu] LinkedList


This program initializes a linked list.
It starts out empty, so the first thing you probably
want to do is insert a node.

After that, enjoy trying the various functions.

[Please note: This program is designed to accept integer values only.]

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
1
Enter your node in the list
1
The link list currently has these nodes:
1->
```

```
Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
1
Enter your node in the list
2
The link list currently has these nodes:
1->2->

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
2
Enter the value for the node you want to insert at the beginning
3
The link list currently has these nodes:
3->1->2->

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
2
Enter the value for the node you want to insert at the beginning
4
The link list currently has these nodes:
4->3->1->2->

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
5
Enter the value of the node after which you want to insert a new node
3
Enter the value of new node
12
The link list currently has these nodes:
4->3->12->1->2->
```

```
Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
3
The link list currently has these nodes:
4->3->12->1->

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
4
The link list currently has these nodes:
3->12->1->

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
6
Enter the value of the node that precedes the node you want to delete
3
The link list currently has these nodes:
3->1->

Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
7
Enter the value of the node you want to modify
1
Enter the new value for this node:
44
The link list currently has these nodes:
3->44->
```

[sample output continues on next page]

```
Please enter your choice
1. INSERT a node at the END of linklist
2. INSERT a node at the BEGINNING of linklist
3. DELETE a node at the END of linklist
4. DELETE a node from the BEGINNING of linklist
5. INSERT a node in the MIDDLE of linklist
6. DELETE a node from the MIDDLE of linklist
7. MODIFY any node in linklist
8. EXIT
8
[jwhitmer@silo.cs.indiana.edu]
```

Assignment 4 General Program Requirements:

Write your `main()` or "calling function" so the Main Menu functions as implied and each of the operations chosen with the Main Menu accepts the indicated input and produces the indicated output. REMEMBER: Your output should be displayed in exactly the same format as the sample output above.

Assignment 4 **must** include the following features:

1. Proper Comment Block at the head of the file.
2. Proper and appropriate "in-line" or "in the code" comments.
3. Input and output as indicated in each operation in both programs: Cricket and LinkedList.
4. Properly written `main()` with Main Menu that allows choice of 2 applications/programs.
5. Proper use of function prototypes whereever they can be used. [This means the simpler your **main()** is, the better.]
6. Your `A4.c` program compiles for testing.

Again, BE SURE you thoroughly comment your actual code and include the expected Heading Comment Block. These comments and comment block will represent 20% of your score for this Assignment.

Scoring:

Proper Comments and Heading Comment Block: **20 points**
File compiles and `main()` is written with Main Menu to select between two programs: **15 points**.
Cricket "program" runs and mimics all output as sampled above: **25 points**.
LinkedList "program" runs and mimics all output as sampled above: **40 points**.

Handing in your Assignment.

As with all other submitted programs, you will have to use some form of a "Secure FTP" program. It will usually take two steps to submit to Canvas: 1: Move the file from your silo account to the computer you are using, 2. Upload the file from the computer you are using to Canvas with the usual method. If you have questions about this, ask them ASAP.