CS 100 Lab Nine – Spring 2019

Create a directory named **lab9** and download **lab9.c** as shown below from Blackboard to that directory. This program maintains a linked list of students, where each student contains a name (one-word only) and a GPA. The program operates as follows.

- Prompts the user for names and GPAs, building the list with calls to **add**, printing the list after each add
- Prompts the user for a name, and then prints the GPA of that student

Two sample inputs for the program are shown at the right of the code. You must complete the following.

- Write the function **getGPA** that returns the gpa of the name passed to it, or **-1.0** if the name doesn't exist.
- Re-write **add** so that all the students will be ordered by descending GPA. For those with the same GPA, they will be ordered alphabetically. Do **not** add a name if it already exists in the list and print an error message. It is recommended to write a helper function **compareStudents** that compares two students and returns **-1**, **1** or **0**, depending on the positions of the two students in the sorted linked list.

```c
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
typedef struct _student {
    char *name;
    double gpa;
    struct _student *next;
} Student;
Student *createStudent(char name[], double gpa, Student *next) {
    Student *pNew=malloc(sizeof(Student));
    pNew->name=malloc(strlen(name)+1);
    strcpy(pNew->name, name);
    pNew->gpa = gpa;
    pNew->next = next;
    return pNew;
}
int compareStudents(Student *pNew, Student *pExisting) {
    return -1;
}
Student *add(Student *head, char name[], double gpa) {
    return createStudent(name, gpa, head);
}
void print(char prefix[], Student *head) {
    printf("%s", prefix);
    for (Student *ptr=head; ptr!=NULL; ptr=ptr->next)
        printf("[%s-%g] ", ptr->name, ptr->gpa);
    printf("\n");
}
double getGPA(Student *head, char name[]) {
    return -1.0;
}
int main(void) {
    char name[100];
    double gpa;
    Student *head = NULL;
    while (1) { // build the list
        printf("\nEnter a name (one word) and gpa, or xxx and 0 to exit: ");
        scanf("%s%lf", name, &gpa);
        if (strcmp(name, "xxx")==0) break;
        head=add(head, name, gpa);
        print("\n\tNow the list is: ", head);
    }
    while (1) { // perform search
        printf("\nEnter a name to look up the gpa or xxx to exit: ");
        scanf("%s", name);
        if (strcmp(name, "xxx")==0) break;
        gpa=getGPA(head, name);
        if (gpa<0)
            printf("\n\t%s does not exist\n", name);
        else
            printf("\n\t%s has a GPA of %g\n", name, gpa);
    }
    return 0;
}
```

Fred 3.5
Barney 2.4
Betty 3.9
Wilma 3.5
xxx 0
Fred
Betty
xxx

Betty 3.5
Fred 2.5
Fred 2.9
Wilma 2.9
Wilma 3.0
xxx 0
Pebbles
xxx

Submit your lab

First, on your machine, compress your **lab9** directory into a single (compressed) file, i.e. **lab9.zip**.

Second, once you have a compressed file named **lab9.zip**, submit that file to Blackboard.