Programming Project #5
EGRE246 Fall 2019
Bag ADT

1 Project Overview

A *multiset* in mathematics is a type of set that allows for multiple instances of each of its elements. In Computer Science a multiset is often called a `bag` – a unordered container of zero or more (usually) homogeneous elements. For this project you are to implement a `bag` ADT with the specifications given below.

2 File `bag.h`

```
#ifndef BAG_H
#define BAG_H

#include <stdbool.h>
#include "itemType.h"

typedef struct bagType *bag;

bag createBag();   // create a new bag
void freeBag(bag); // deallocates a bat

void emptyBag(bag);             // emptys the bag
void bagCopy(bag b1,bag b2);    // copies b2 to b1, overwriting b1
int size(bag);                  // returns the number of items in bag
int count(bag b,itemType x);    // returns number of items x in b
int eraseOne(bag,itemType);     // erases the value x in b, returns # removed
void add(bag,itemType);         // inserts value in bag
itemType get(bag b,int n);      // returns item at n in b where 0 is first item
bool contains(bag b,itemType x);// returns true if x is in b, false otherwise
bool isEmpty(bag);              // return true if bag is empty
bool equals(bag b1,bag b2);     // returns true if b1 == b2
char *toBagString(bag);         // returns a string representation of
                                // a bag in this format: "{2,-1,4,6,4}",
                                // or "{}" for an empty bag
#endif
```

3 File `itemType.h`

```
#ifndef ITEMTYPE_H
#define ITEMTYPE_H
```

```
#include "limits.h"

#define NULLITEM INT_MIN // defines a null (none) item of type itemType

typedef int itemType;

int itemcmp(itemType n1,itemType n2); // returns -1 if n1<n2, 0 if n1==n2, 1 if n1>n2
char *toItemString(itemType n); // returns a string representation of n

#endif
```

Note that any time one compares items of type `itemType` in your `bag` module you should call `itemcmp`. Also if one needs a string representation of an `itemType` value the function `toItemString` should be called. A sample `itemType` implementation will be available off the class web pages.

4 Implementation

You must implement your `bag` as a singly linked list in the manner presented in class. You should be able to declare a `bag` named `b1` by using the declaration '`bag b1`'.

5 Deliverables

You may work with a partner on this project, though if you do you should only turn in a single solution with both of your names in the comment section. **You should only turn in your `bag` implementation file!** I will test your code with my own test programs. Name your file `proj5`*XXXX*`.c` where *XXXX* is the last 4 digits of your student id number. For example, if your student id number is V12345678, your file will be named `proj55678.c` . Projects this term will be submitted via the web using a link off of the class web page (`http://danresler.net/egre246`). Be sure to keep a receipt of your file submission. Note you need not turn in an executable file or your driver program!

Due date: Monday, November 4 @ 12noon