

CS251 Data Structures – Fall 2009

Program 1 – It's In the Bag

50 points

Due: Oct. 1

For this project you are to create a C++ class to implement the Bag Abstract Data Type using dynamic memory. Your `Bag` class should implement the following operations:

**Bag()** - a constructor which creates an empty Bag.

**Bag(int a[ ], int n)** - a constructor which creates a Bag with the initial values stored in array `a`.

**bool isEmpty()** - returns `true` if the Bag is empty.

**void makeEmpty()** - delete all elements from the Bag.

**int size()** - returns the number of elements in the Bag.

**void insert(int x)** - inserts `x` into the Bag.

**bool delete(int x), bool deleteAll(int x)** - deletes the first instance or all the instances of `x` in the Bag. These functions return `true` if at least one `x` was deleted.

**bool contains(int x)** - returns `true` if `x` is in the Bag.

**int count(int x)** - returns the number of times `x` is in the Bag.

In addition, your code should include the following:

1. Overload the operations `+` and `-` to implement non-mutating values of `insert` and `deleteAll`. For example, given two `Bag` variables `a` and `b`, the statement `b = a + 2;` would leave `a` unchanged and set `b` equal to the result of adding 2 to `a`.
2. Overload the `<<` operation to allow for easy output of a Bag.
3. Any other methods necessary to make a dynamic class work properly.

You should hand-in three files for this project: `Bagxxx.h` and `Bagxxx.cpp` which implement your `Bag` class (where `xxx` are the lowercase first three letters of your last name), and a driver program `useBagxxx.cpp` which demonstrates that your `Bag` class works correctly.