

CSE 2105 – Data Structures
2016 – 2017 Fall Semester Project
The Bag ADT

Write an implementation for data structure **Bag** as a Java class, which is similar to a set, but it may contain several instances of the same member. For example, {'to', 'be', 'or', 'not', 'to', 'be'} is a bag of words, which is equal to {'be', 'be', 'not', 'or', 'to', 'to'} (since order of members is insignificant), but is unequal to {'be', 'not', 'or', 'to'} (since the number of instances is significant). Adding a member increases the number of instances in the bag by one and removing a member decreases the number of instances in the bag by one. *The member is deleted from the bag when it has no instances.*

Think that “how would you represent a bag without actually storing multiple instances of the same member?” Your implementation should be **efficient**.

Don't forget that you cannot use any pre-written Java Api Class. You must write your own code for data structures (You are allowed to use lab source codes that we examined so far.)

Your implementation must be **generic**, i.e. your bag can accept any type of instances. (Use Java Generics !)

Your ADT should provide at least these operations:

- **add(T item)** : Inserts item in the bag.
- **clear()** : Removes all of the elements from this bag.
- **contains(T item)** : Returns true if this bag contains the specified element and false otherwise.
- **distinctSize()** : Returns the distinct number of elements in this bag. (For example, for the bag {'to', 'be', 'or', 'not', 'to', 'be'} distinctSize is 4)
- **elementSize(T item)** : Returns the number of this item in this bag. (For example, for the bag {'to', 'be', 'or', 'not', 'to', 'be'} elementSize('be') is 2)
- **isEmpty()** : Returns true if this collection contains no elements.
- **remove(T item)** : Removes a single instance of item from this bag and returns true if it is present; otherwise returns false.
- **size()** : Returns the total number of elements in this bag. (For example, for the bag {'to', 'be', 'or', 'not', 'to', 'be'} size is 6)
- **toString()** : Returns a string that displays the elements in the bag.

Please write a Test program (a separate Java class) proves that your container(bag) works properly.

P.S.: You can prepare your project yourself (single person) or as **at most two** people groups. You have to submit a **report (very important !)**, and Java code (your classes) of your program. Please upload your compressed(zip/rar) file(that includes your report and Java code files) to the **moodle** page of the course to the appropriate area before **1 December 2016 Thursday, 17:00**.