

CSC 230 Elementary Data Structures and Algorithms
Spring 2014 - Assignment 4
Due Wednesday, March 26, 2014, 8:00am

Assignment 4 Skills

Designing an ADT
Creating an interface based on ADT
Implementing an ADT using an interface

Assignment 4 Background

For this assignment, we wish to implement a Set Data Structure. We will define our Set Abstract Data Type (ADT) as: a Set is an unordered, finite collection of objects with no duplicates.

Our Set ADT is similar to our Bag ADT, with one notable difference: duplicates were allowed in bags, but are not allowed in sets.

Assignment 4 Requirements

1. (25%) Write an interface called **SetInterface**. This interface will define required set operations. This interface should have the following methods defined:
 - (a) Add, that adds an element to the set if able.
 - (b) Remove (random), that removes a (random) element from the set. This does not have to be truly random.
 - (c) Remove (specified), that removes a specified element from the set if able.
 - (d) isEmpty, that determines the emptiness of the set.
 - (e) getCurrentSize, that returns the number of elements currently in the set.
 - (f) clear, that removes all elements from the set.
 - (g) contains, that determines whether a specified element is in the set.
 - (h) union, that returns a set with all of the elements of this set, and the specified set.
 - (i) intersection, that returns a set with all of the common elements in this set, and the specified set.
 - (j) difference, that returns a set with all of the elements in this set, that are not in the specified set.
2. (10%) Provide comments for the interface as necessary being sure to document:
 - (a) the expected behavior of each method.
 - (b) the return types, and expected return values (if any).
 - (c) the conditions for success/failure, and expected handling of such (if any).
 - (d) anything else of importance in your design choices.
3. (40%) Write a class called **ArraySet** that implements the **SetInterface** interface. This class should include the following:
 - (a) an array to hold the set elements (use an array of Objects).
 - (b) implementations for all of the interface methods.
 - (c) a toString method for displaying the contents of the set.

4. (10%) Provide comments for the class as necessary being sure to document:
 - (a) how you chose to add elements to the array.
 - (b) how you chose to remove elements from the array.
 - (c) how you chose to track the size of the set.
 - (d) anything else of importance in your implementation choices.
5. (15%) Write a `main` method in a file called `SetTest.java`. Your main method should test your implementation thoroughly. Be sure to document what you are testing at each point.

Assignment 4 Submission Submit on Blackboard:

1. `SetInterface.java`
2. `ArraySet.java`
3. `SetTest.java`

Required Each submitted file should include your name and a statement that this is your own work. This should appear as a comment at the beginning of any code file.