CS 220 Software Design II

Spring 2022

In-class Exercises 05

 ${\it University~of~Wisconsin~-La~Crosse}$

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1. Name one advantage ArrayList gives us as programmers over using an array.

2. Describe the calculation that allows us to jump directly to any index in an array, skipping over intermediate indexes.

3. Describe what problem we encounter when setting up an array list, such that we cannot store any type of data in our array list. In what piece of code is this problem made manifest?

4. Consider the below beginnings of an implementation of the ArrayList class. Implement a public method that has a return type of ArrayList<E> called split which takes in a given index and splits the list at that index, removing and returning the sublist created by starting at the index through the end of the list (somewhat similar to substring(int)). The new sublist must have at least one element in it; an empty sublist means an invalid index was given. Your method should modify the size attribute as appropriate for the current list, and should throw an IndexOutOfBoundsException if required. For example, consider an ArrayList storing the values [1, 2, 3, null]. Calling split at index 3 would be invalid, at index 2 would result in the original list looking like [1, 2, null, null] and returning [3], and at index 0 would result in the original list looking like [null, null, null, null] and returning [1, 2, 3]. Note that the portrayed sublists returned might have additional null values depending on how the list grows. Bonus: how can you write this code such that the new array list never needs to grow?

```
public class ArrayList<E> {
2
3
        private static int DEFAULT_CAPACITY = 10;
 4
        private Object data[];
5
        private int size;
6
7
        public ArrayList(int index) { ... }
8
9
        public void add(E e) { ... }
10
        public boolean add(int index, E e) { ... }
11
12
        public E remove(int index) { ... }
13
14
15
```