Arrays and ArrayLists

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Overview

- Both arrays and ArrayLists are data structures that hold a group of elements with the same data type or a subclass of that data type(e.g. a collection of ints, String objects, Humans in which there are different types of humans like students, etc.). They are also classes in the Java.util package.
- Elements, which are an item in an array, are stored in positions in the array called indexes. The first element has index [0], and the last element has index [array length - 1].
- They are similar in function, but are applied for different situations using different syntax.

When to use Which?

- The most distinct difference between Arrays and ArrayLists lies in that Arrays are defined with a limit on the number of elements it stores.
- The programmer uses Arrays with the knowledge on the number of elements the program needs, for to delete or add an element, a new array must be made and the contents of the old one must be copied into the new one.
- Conversely, the programmer uses ArrayLists when uncertain of the number of elements needed. This is known as dynamic sizing.
- They have different syntax, but the fundamental ideas are the same.

General Syntax

- One of the fundamental operations on both is the transversal of them. This is done, most of the time, with a for/for each loop that works the same way.
  - (for int x = 0; x < array.length; x++)

    //do stuff
  - for(int x : array)

    //do stuff
- The indexes are the same for both.

Arrays Syntax

- Declaration - dataType[] arrayName = new dataType[length]; or dataType[] arrayName = new dataType[] {put, contents, here};
- Shorthand - dataType[] arrayName = {put, contents, here};
- When accessing an index, use square brackets around the index value - arrayName[integerIndex].

E.g.

int[] numbers = new int[5]; int[] numbers = {1,2,3,4,5}; numbers[0] = 1;

- To access the length of the array, it is just *indentifier*.length

ArrayList Syntax

- ArrayList is declared like any other object.
  - ArrayList list = new ArrayList();
- If you are sure about the type:
  - ArrayList <String>list = new ArrayList<String>();
- Instead of variable length, return method size() is used to access the length.
- To alter the ArrayList, which is its inherent purpose, one uses the methods in the next slide.

ArrayList Methods

- ArrayLists have several methods which are extremely useful:
  - boolean add (E e) - adds the desired element to the end of the list and returns true if successful.
  - void add (int index, E element) - adds the desired element to the specified index and pushes all elements afterwards one place back.
  - E remove (int index) - returns the element removed after removing the element at index index and shifting other elements one place forward.
  - E set (int index, E element) - sets the element at the specified index to the specified value and returns the data being replaced.
  - E get (int index) - returns the contents of the specified index.

Personal Reflection

- This unit taught be a pillar of programming - arrays. It is amazingly powerful in that it simplifies so many things. I have learned arrays in the past from previous ICS courses, but ArrayLists were new. I find that they are very convenient in that it solves the problem of the limit on the number of elements with its dynamically-sized array.
- I found the Arrays and ArrayLists problems do be a challenge as with all problems in this course, but fun nevertheless. At the beginning, I, including many others, thought the Countries problem to be impossible because of how the file was structured. However, we eventually found a way.