

LEC 04

ArrayList

BEFORE WE START

*Talk to your neighbors:
Coffee or tea? Or something else?*

Music: [122 25wi Lecture Tunes](#) 

Instructor: Elba Garza

TAs:	Ayush	Heon	Harshitha	Aishah
	Andrew	Izak	Marcus	Ben
	Logan	Colin	Carson	Ivory
	Kyle	Jessica	Jack	Cady
	Maggie	Shivani	Connor	Diya
	Nicole H	Ken	Cora	Katharine
	Caleb	Mia	Hannah	
	Nicole W	Ashley	Leo	
	Jacob	Chaafen	Anyia	

Questions during Class?

Raise hand or send here

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Lecture Outline

- **Announcements** ◀
- ArrayList Recap
- ArrayList Examples

Announcements

- Programming Assignment 0 due Thursday, Jan 23rd at 11:59 PM
- Plan to release C0 grades and feedback tomorrow!
 - General grading turnaround is ~1 week
 - Resubmission Cycle 0 will also be released tomorrow
 - Due Tues Jan 28th
 - Eligible assignment(s): C0
- Quiz 0 is next Tuesday (Jan 28th)!
 - Check the [Ed post](#) for instructions and logistics
 - Practice Quiz to be released soon (and solutions posted over the weekend)

Lecture Outline

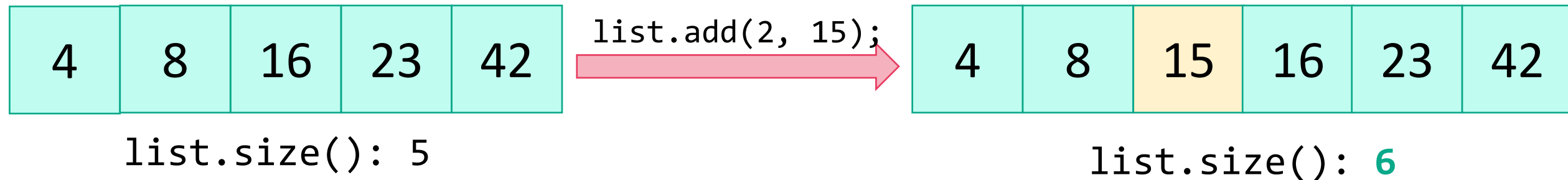
- Announcements
- **ArrayList Recap** ◀
- ArrayList Examples

ArrayList

ArrayLists are very similar to arrays

- Can hold multiple pieces of data (elements)
- Zero-based indexing
- Elements must all have the same type
 - ArrayLists can only hold Objects, so might need to use “wrapper” types: Integer, Double, Boolean, Character, etc.

But ArrayLists have dynamic length (so they can resize!)



ArrayList Methods

Method	Description
<code>add(type element)</code>	Adds <i>element</i> to the <i>end</i> of the ArrayList
<code>add(int index, type element)</code>	Adds <i>element</i> to the specified <i>index</i> in the ArrayList
<code>size()</code>	Returns the number of elements in the ArrayList
<code>contains(type element)</code>	Returns true if <i>element</i> is contained in the ArrayList, false otherwise
<code>get(int index)</code>	Returns the element at <i>index</i> in the ArrayList
<code>remove(int index)</code>	Removes the element at <i>index</i> from the ArrayList and returns the removed element.
<code>indexOf(type element)</code>	Returns the index of <i>element</i> in the ArrayList; returns -1 if the <i>element</i> doesn't exist in the ArrayList
<code>set(int index, type element)</code>	Sets the element at <i>index</i> to the given <i>element</i> and returns the old value

ArrayList Methods Usage

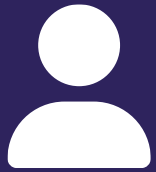
- Whenever referring to “the ArrayList”, we are referring to the ArrayList we’re calling the method *on*!

```
List<String> list = new ArrayList<String>();  
list.add("hello");  
list.add(0, "world");  
list.indexOf("world"); // what is the output?
```

```
String[] list = new String[2];  
list[0] = "hello";  
list[0] = "world";  
list[1] = "hello";  
//... indexOf?
```

Lecture Outline

- Announcements
- ArrayList Recap
- **ArrayList Examples** 



Practice : Think

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What is the best “plain English” description of this method?

```
public static void method(ArrayList<Double> list) {  
    for (int i = 0; i < list.size(); i++) {  
        System.out.println(" " + i + ") " + list.get(i));  
    }  
}
```

- A) Prints stuff
- B) Prints out the list from front to back, with elements numbered 0, 1, 2, ...
- C) Prints out the list from front to back
- D) Prints out the list from back to front
- E) Prints out the elements of the list using a for loop that starts at 0 and runs until one less than the size of the list and at each point prints out the element at that index.



Practice : Pair

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What is the best “plain English” description of this method?

```
public static void method(ArrayList<Double> list) {  
    for (int i = 0; i < list.size(); i++) {  
        System.out.println(" " + i + ") " + list.get(i));  
    }  
}
```

“Plain English” descriptions are what we are generally looking for in your method comments!

- A) Prints stuff
- B) Prints out the list from front to back, with elements numbered 0, 1, 2, ...
- C) Prints out the list from front to back
- D) Prints out the list from back to front
- E) Prints out the elements of the list using a for loop that starts at 0 and runs until one less than the size of the list and at each point prints out the element at that index.

loadFromFile

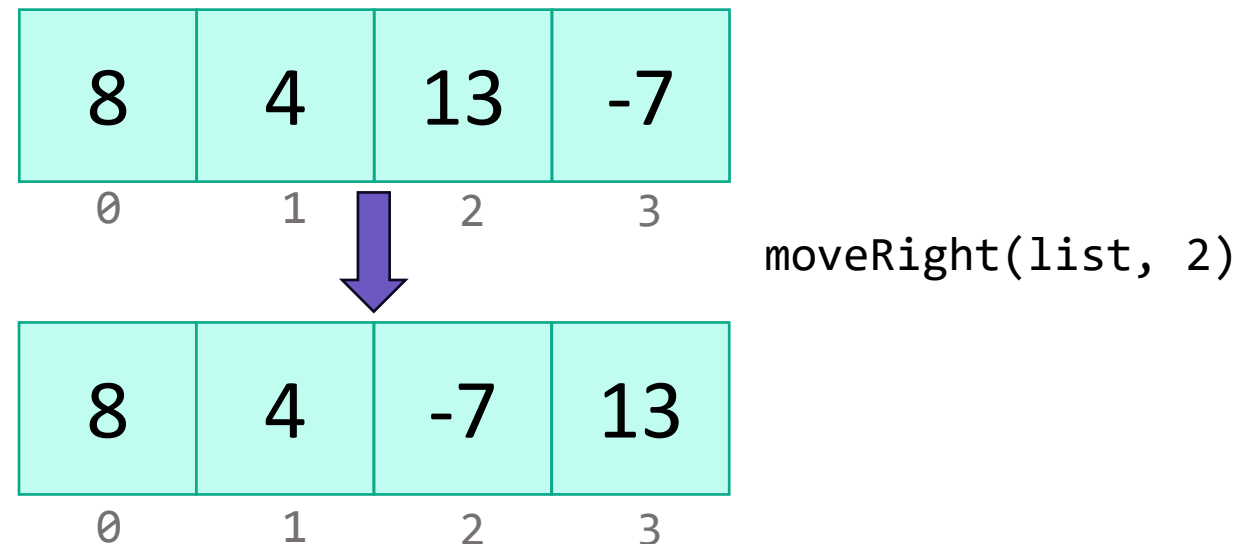
Write a method called `loadFromFile` that accepts a `Scanner` as a parameter and returns a new `ArrayList` of `Strings` where each element of the `ArrayList` is a line from the `Scanner`, matching the order of the `Scanner`'s contents.

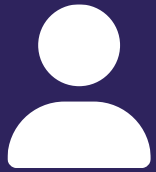
e.g., the first line in the `Scanner` is stored at index 0, the next line is stored at index 1, etc.

moveRight

Write a method called `moveRight` that accepts an `ArrayList` of integers `list` and an `int n` and moves the element at index `n` one space to the right in `list`.

For example, if `list` contains `[8, 4, 13, -7]` and our method is called with `moveRight(list, 2)`, after the method call `list` would contain `[8, 4, -7, 13]`.





Practice : Think



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What ArrayList methods (and in what order) could we use to implement the moveRight method?

- A) `list.remove(n);`
`list.add(n);`
- B) `int element = list.remove(n);`
`list.add(n, element);`
- C) `list.add(n);`
`list.remove(n-1);`
- D) `int element = list.remove(n);`
`list.add(n+1, element);`



Practice : Pair



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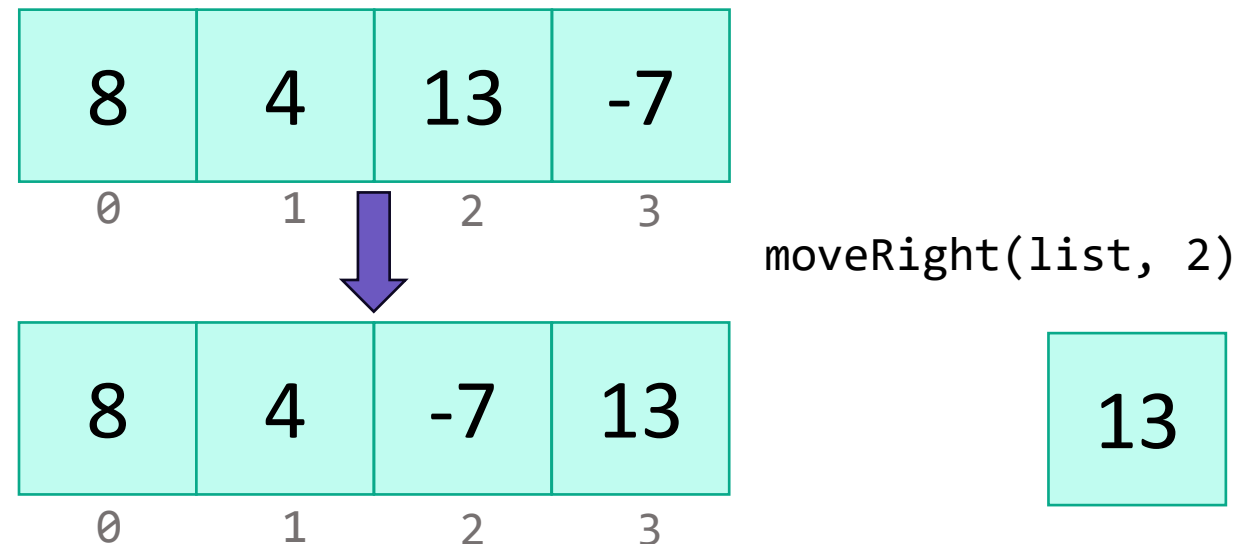
What ArrayList methods (and in what order) could we use to implement the `moveRight` method?

- A) `list.remove(n);`
`list.add(n);`
- B) `int element = list.remove(n);`
`list.add(n, element);`
- C) `list.add(n);`
`list.remove(n-1);`
- D) `int element = list.remove(n);`
`list.add(n+1, element);`

moveRight

Write a method called `moveRight` that accepts an `ArrayList` of integers `list` and an `int n` and moves the element at index `n` one space to the right in `list`.

For example, if `list` contains `[8, 4, 13, -7]` and our method is called with `moveRight(list, 2)`, after the method call `list` would contain `[8, 4, -7, 13]`.



Edge Cases! (And Testing)

When writing a method, especially one that takes input of some kind (e.g., parameters, user input, a Scanner with input) it's good to think carefully about what assumptions you can make (or cannot make) about this input.

Edge case: A scenario that is uncommon but possible, especially at the “edge” of a parameter's valid range.

- ? What happens if the user passes a negative number to `moveDown`?
- ? What happens if the user passes a number larger than the length of the list to `moveDown`?

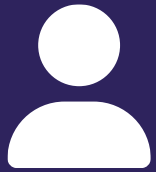
More [testing tips](#) on the course website's Resources page!

compareToList

Write a method called `compareToList` that accepts two `ArrayLists` of integers `list1` and `list2` as parameters and compares the elements of the two lists, printing out the locations of common elements in each of the `ArrayLists`.

For example, if `list1` contained `[5, 6, 7, 8]` and `list2` contained `[7, 5, 9, 0, 2]`, a call to `compareToList(list1, list2)` would produce output such as:

- 5 (list1 at 0, list2 at 1)
- 7 (list1 at 2, list2 at 0)



Practice : Think

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Spend 1 min on your own thinking about how you would implement this method! (focus on *pseudocode*)

Write a method called `compareToList` that accepts two `ArrayLists` of integers `list1` and `list2` as parameters and compares the elements of the two lists, printing out the locations of common elements in each of the `ArrayLists`.

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- 5 (`list1` at 0, `list2` at 1)
- 7 (`list1` at 2, `list2` at 0)



Practice : Pair



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Spend **2** min discussing about how you would implement this method with a neighbor! (focus on *pseudocode*)

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topN

Write a method called `topN` that accepts an `ArrayList` of characters `list` and an `int n` and returns a new `ArrayList` of characters that contains the first `n` elements of `list`.

For example, if `list` contained
`['m', 'a', 't', 'i', 'l', 'd', 'a']`,
a call to `topN(list, 4)` would return an `ArrayList`
containing `['m', 'a', 't', 'i']`