LEC 04

ArrayList

Questions during Class?

Raise hand or send here

sli.do   #cse122

BEFORE WE START

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

Music: [122 26Wi Lecture Tunes](...) ⛄

Instructor: Adrian Salguero

TAs:

Ava	Dalton	Neal	Shreyank
Blake R	Dani	Neha	Sthiti
Blake P	David	Nicolae	Sushma
Cady	Diya	Nicole	Suyash
Caleb	Hanna	Rio	TJ
Cole	Ivy	Rohan	Wesley
Colin	Mahima	Saachi	Yang
Connor	Medha	Shreya	

Lecture Outline

- **Announcements**

- ArrayList Recap

- ArrayList Examples

Announcements

- Programming Assignment 0 due Thursday, Jan 22nd at 11:59pm PT

- 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 27th
    - Eligible assignment(s): C0

- Quiz 0 is next Tuesday (Jan 27th)!
  - There will be an Ed post later tonight with instructions and logistics
  - Practice Quiz to be released EOD Thursday (and solutions posted over the weekend)
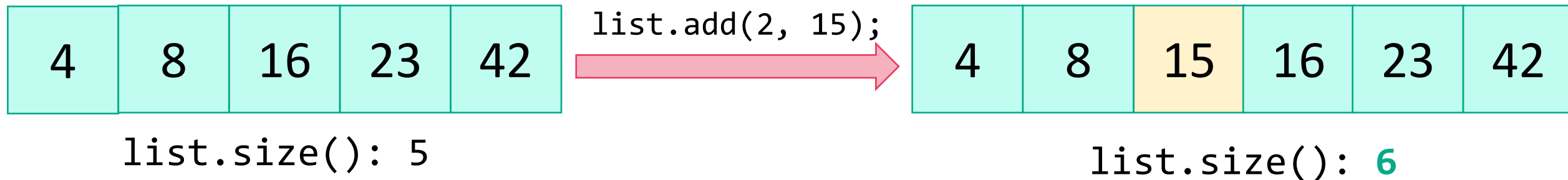
Lecture Outline

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- **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 <u>same</u> type

  - ArrayLists can <u>only</u> hold Objects, so might need to use "wrapper" types: `Integer, Double, Boolean, Character, etc.`

<u>But</u> ArrayLists have dynamic length (so they can resize!)

4	8	16	23	42

`list.add(2, 15);`

4	8	15	16	23	42

list.size(): 5

list.size(): 6

ArrayList Methods

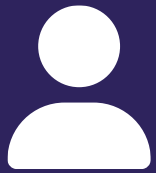| Method	Description
add(type *element*)	Adds *element* to the **end** of the ArrayList
add(int *index*, type *element*)	Adds *element* to the specified **index** in the ArrayList
size()	Returns the number of elements in the ArrayList
contains(type *element*)	Returns true if *element* is contained in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

ArrayList Methods Usage

- Whenever referring to "the ArrayList", we are referring to the ArrayList we're calling the method <u>on</u>!

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

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

Lecture Outline

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- **ArrayList Examples** ◀

Practice : Think

What is the best "plain English" description of this method?

```java
public static void method(List<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

What is the best "plain English" description of this method?

```java
public static void method(List<Double> list) {
    for (int i = 0; i < list.size(); i++) {
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    }
}
```

"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 <u>right</u> 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]`.

8	4	13	-7
0	1	2	3

`moveRight(list, 2)`

8	4	-7	13
0	1	2	3
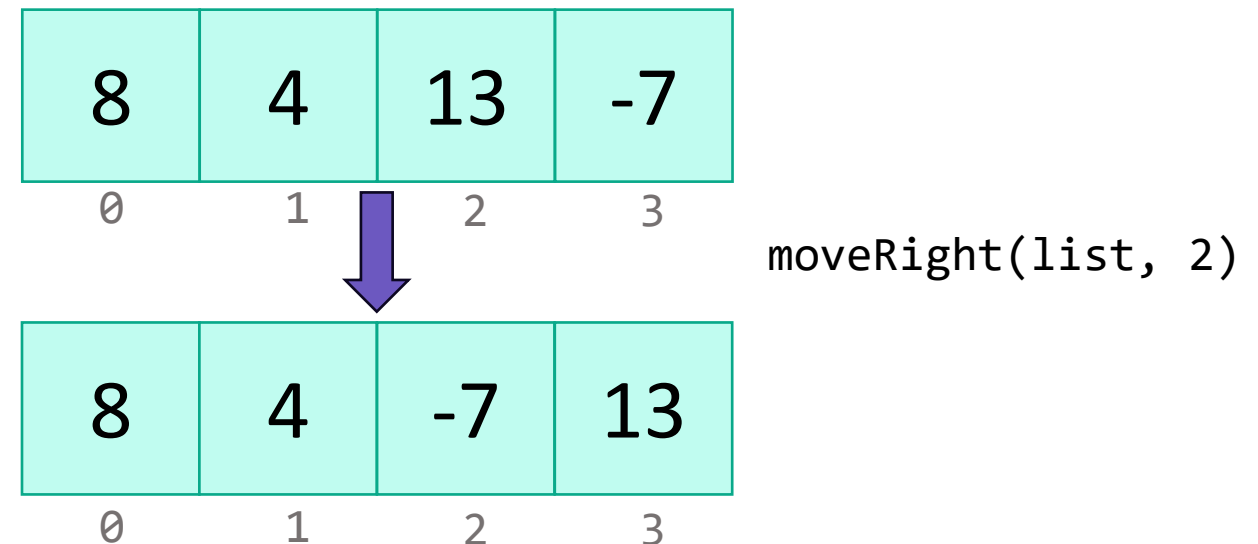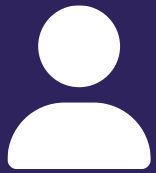
Practice : Think

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

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

A) `list.remove(n);`
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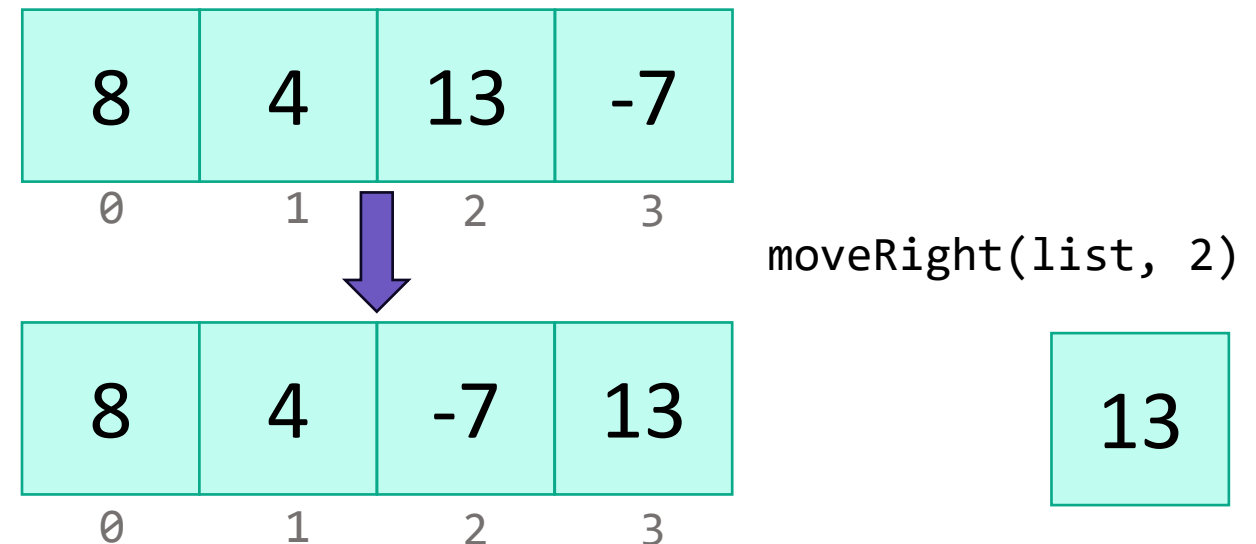
Edge Cases! (And Testing)

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)
```
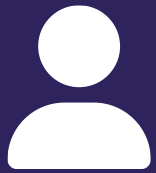
Practice : Think

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

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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']`