LEC 02

CSE 122

ArrayList

Questions during Class?

Raise hand or send here

sli.do #cse-122

BEFORE WE START

Talk to your neighbors:

Dogs or cats?

Music: Hunter/Miya's Playlist

Instructor	Hunter Schafer / **Miya Natsuhara**		
TAs	Ajay	Gaurav	Melissa
	Andrew	Hilal	Noa
	Anson	Hitesh	Parker
	Anthony	Jake	Poojitha
	Audrey	Jin	Samuel
	Chloe	Joe	Sara
	Colton	Joe	Simon
	Connor	Karen	Sravani
	Elizabeth	Kyler	Tan
	Evelyn	Leon	Vivek

Lecture Outline

- Announcements
- ArrayList Recap
- ArrayList Examples

Announcements

- The Introductory Programming Lab (IPL) is open and in full swing!
  - MGH 334
  - Schedule on the course website, staffed by our awesome TAs
  - Open 12:30pm-9:30pm most days!

- Programming Assignment 0 (P0) is due on Thursday (Oct 6)

Getting Help

- Discussion Board
  - Feel free to make a public or private post on Ed
  - We encourage you to answer other peoples' questions! A great way to learn
- Introductory Programming Lab (Office Hours)
  - TAs can help you face to face in office hours, and look at your code
  - You can go to the IPL with **any** course questions, not just assignments
- Section
  - Work through related problems, get to know your TA who is here to support you
- Your Peers
  - We encourage you to form study groups! Discord or Ed are great places to do that
- Email
  - We prefer that all content and logistic questions go on the Ed discussion board (even if you make them private). 503 of you >>> 33 of us!
  - For serious personal circumstances, you can email Hunter/Miya directly. It never hurts to email us, but if it's a common logistic question, we will politely tell you to post on the discussion board.

    cse122-22au-instructors@cs.washington.edu

Reminders: Review Java Syntax

Java Tutorial reviews all the relevant programming features you should familiar with (even if you don't know them in Java).

Hunter has also recorded a 30-minute video going over some Java review along with some practice problems (all in this Ed lesson).

Lecture Outline

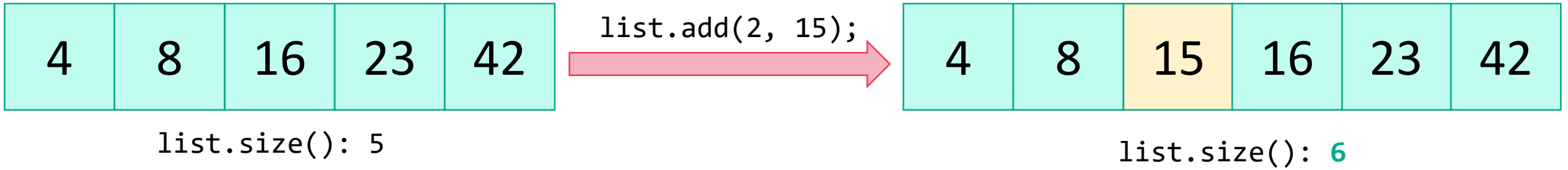
- Announcements
- ArrayList Recap
- ArrayList Examples

ArrayList

ArrayLists are very similar to arrays

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

BUT ArrayLists have dynamic length (so they can resize)



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

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

```
ArrayList<String> list = new ArrayList<String>();
list.add("hello");
list.add(0, "world");
list.indexOf("hello");
```

Lecture Outline

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

Practice : Think

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In-Class Activities

- **Goal**: Get you actively participating in your learning
- Typical Activity
  - Question is posed
  - **Think** (1 min): Think about the question on your own
  - **Pair** (2 min): Talk with your neighbor to discuss question
    - If you arrive at different conclusions, discuss your logic and figure out why you differ!
    - If you arrived at the same conclusion, discuss why the other answers might be wrong!
  - **Share** (1 min): We discuss the conclusions as a class
- During each of the **Think** and **Pair** stages, you will respond to the question via a sli.do poll
  - Not worth any points, just here to help you learn!

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));
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```

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.

moveDown

Write a method called `moveDown` 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 `moveDown(list, 2)`, after the method call `list` would contain `[8, 4, -7, 13]` (notice that the elements at indexes 2 and 3 have swapped places).

Practice : Think

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What ArrayList methods (and in what order) could we use to implement the moveDown 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 moveDown 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);
```

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`.

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 : Pair

sli.do #cse-122

Spend 2 min discussing about how you would implement this method with a neighbor! (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`.

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 3)
- 7 (list1 at 2, list2 at 0)
```

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 `['g', 'u', 'm', 'b', 'a', 'l', 'l']`, a call to `topN(list, 4)` would return an `ArrayList` containing `['g', 'u', 'm', 'b']`