### Before We Start

**Talk to your neighbors:**

**Dogs or cats?**

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**Music:** Miya’s 23wi CSE 122 Playlist

<table>
<thead>
<tr>
<th>Instructor</th>
<th>TAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miya Natsuha</td>
<td>Ayush, Connor, Poojitha, Andrew A, Jasmine, Darel, Gabe, Karen, Colton</td>
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<td></td>
<td>Atharva, Julia, Megan, Joey, Eesha, Lilian, Thomas, Leon, Melissa, Audrey</td>
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<td>Ernie, Di, Logan, Shivani, Michelle, Steven, Kevin, Ken, Vivek, Autumn</td>
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<td>Ambika, Elizabeth, Joe, Jin, Ben, Evelyn, Kent</td>
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</tbody>
</table>
Lecture Outline

- Announcements
- ArrayList Recap
- ArrayList Examples
Announcements

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

• Programming Assignment 0 due Thursday, Jan 12
  - Make sure to hit “Mark” to submit!
  - Mark as many times as you want – we will grade the latest submission made before the deadline
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! Ed is a great place to do that

• Email
  - We prefer that all content and logistic questions go on the Ed discussion board (even if you make them private). 700+ of you >>> 38 of us!
  - For serious personal circumstances, you can email Miya directly. It never hurts to email me, but if it’s a common logistic question, I may politely tell you to post on the discussion board.

  mnats@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).

Recordings of the Java Review Sessions from Monday (1/9) are posted on the course calendar.
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)

```java
list.add(2, 15);
```

<table>
<thead>
<tr>
<th>4</th>
<th>8</th>
<th>16</th>
<th>23</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>list.size(): 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>15</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>list.size(): 6</td>
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## ArrayList Methods

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<td>Sets the element at <code>index</code> to the given <code>element</code> and returns the old value</td>
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ArrayList Methods

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

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

• Announcements

• ArrayList Recap

• ArrayList Examples
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

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

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

```java
public static void method(ArrayList<Double> list) {
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A) Prints stuff  
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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.

“Plain English” descriptions are what we are generally looking for in your method comments!
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]` (notice that the elements at indexes 2 and 3 have swapped places).
Practice : Think

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);`
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

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