BEFORE WE START

Talk to your neighbors:

Or better yet, talk to your friends/roommates, since you’re likely at home!

Instructors  Elba Garza
TAs

Abigail  Autumn
Claire  Colin
Jacob  Jasmine
Kevin  Kyle
Mia  Poojitha
Rucha  Smriti
Shreya

Ambika  Ayush
Colin  Jaylyn
Mia  Marcus
Rucha  Rishi
Shreya  Shananda
Smriti  Steven

Arthur  Atharva
Chloë  Chloë
Elizabeth  Helena
Jaylyn  Kavya
Marcus  Megana
Rishi  Rohini
Shananda  Shivani
Steven  Zane
Lecture Outline

• Announcements

• Optional

• Recap of Collections

• Dumb Data Structures

• Collections
Announcements

- Resubmission Cycle 5 (R5) out; due November 21\textsuperscript{st} by 11:59 PM
- Programming Assignment 3 (P3) out tonight!
  - Due November 27\textsuperscript{th} by 11:59 PM
  - Note IPL will be very limited next week; plan accordingly
- Quiz 2 delayed to November 28\textsuperscript{th}
  - No quiz section on November 21\textsuperscript{st}! 🦃
- Lecture on November 22\textsuperscript{nd}, however. 🦃
  - If you come to class, I’ll bring snacks!
- Reminder on Final Exam: Tuesday, December 12\textsuperscript{th} 12:30 – 2:20 PM
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Optional

Optional is a Java class that is used to handle situations where a value is *sometimes* there.

Like a collection, Optional uses <> to denote the type it contains.

e.g., Optional<String>, Optional<Integer>, Optional<Point>
## Optional Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional.empty()</td>
<td>Creates an empty Optional object</td>
</tr>
<tr>
<td>Optional.of(...)</td>
<td>Creates an Optional object holding the object it’s given</td>
</tr>
<tr>
<td>isEmpty()</td>
<td>Returns true if there is no value stored, and false otherwise</td>
</tr>
<tr>
<td>isPresent()</td>
<td>Returns true if there is a value stored, and false otherwise</td>
</tr>
<tr>
<td>get()</td>
<td>Returns the stored object from the Optional (if one is stored; otherwise throws a NoSuchElementException)</td>
</tr>
</tbody>
</table>

The Optional class has more than just these methods, but these are what you’ll need to focus on for this class!
Optional Methods

isEmpty(), isPresent(), and get() are called like normal instance methods (on an actual instance of Optional).

Optional.of(...) and Optional.empty() are called differently

(Like the Math class methods)
Why Optional?

Using Optional can help programmers avoid NullPointerExceptions by making it explicit when a variable may or may not contain a value.

• Remember – null refers to the absence of an object!

There are other Optional methods (that you should explore in your own time if you’re interested) that can be really useful to cleanly work with data that may or may not be present.
Student / Course Example one more time...

Let’s add two more methods to Course.java:

```java
public void setCourseEvalLink(String url)

public Optional<String> getCourseEvalLink()
```

The link to the evaluations for a course doesn’t usually exist until the last few weeks of the quarter. What if a client calls getCourseEvalLink before one is set up?

Optional to the rescue!
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Goal for Today

Review some of the data structures we’ve talked about this quarter

Understand how Java organizes them with interfaces
Collections: What *classes* have we seen so far?

...
Collections: What *interfaces* have we seen so far?

...
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Dumb Data Structures

We’re going to create our own versions of these classes so we can dig into how they all relate to each other!

BUT they’re going to be real dumb.

If you want to get a sense of how they’re actually implemented, go take CSE 123!
DumbArrayIntList

DumbArrayIntList()
add(int value)
add(int index, int value)
contains(int value)
isEmpty()
get(int index)

set(int index, int value)
remove(int index)
size()
indexOf(int value)
toString()
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IntCollection Relationships

- **IntCollection**
  - **IntQueue**
    - implements `class DumbLinkedIntList`
  - **IntList**
    - extends `class DumbArrayIntList`
  - **IntSet**
    - extends `class DumbHashIntSet`
    - implements `class DumbTreeIntSet`