Questions From Last Time

Is the book required?
- I want you to do what’s best for you. I rarely recommend textbooks in classes I teach, but I actually like this one a lot.

How do I review CSE 142?
- Review session on Monday at 3:30pm - 5:00pm in EEB 105
  - http://courses.cs.washington.edu/courses/cse143/16sp/lectures/03-28/slides/review.pdf
  - http://practiceit.cs.washington.edu/problem/list

Is it bad form to make an ArrayList where an Array would do?
- Yes. We’ll get there, but the short answer is “if you know the size upfront, using an ArrayList is a waste”.

How much help on HW can we get from the IPL and office hours?
- Great question. We won’t “pre-grade” your homework, but any other sorts of questions are fair game. If you ask a question, the worst that can happen is we’ll say “we can’t answer that”.

How can I help others without cheating?
- You can work together on anything that isn’t homework. Practice-it, practice exams, lecture problems, ...

emacs or vi?
- vim. full stop.

Favorite programming language?
- It depends on the situation. For quick and dirty scripts, Python. For teaching intro, Java. For writing clean code, Haskell. ...

Favorite color?
- Green (see slides.)

What’s your favorite candy?
- Not sure. I have celiac disease; so, I’m severely limited in what I can eat.

Macbook or surface?
- My main machine is a macbook, but I lecture from the surface. I’d recommend them both!

Do you want to jump rope in class?
- No. I’m good. Do you?

Does CSE have a room “CSE 404”?
- It doesn’t. I have joked about this before.

Questions From Last Time

At what level should my pikachu be before I use a thunderstone to evolve it?
- http://www.gamefaqs.com/boards/696959-pokemon-x/67478014
- http://www.gamefaqs.com/boards/696959-pokemon-x/69355531
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Drawings

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public class ArrayIntListClient {

// Notice the main! That’s usually a signal that we’re a client!
public static void main(String[] args) {

// BUG: We haven’t specified what “type” the list contains!
ArrayList list = new ArrayList();
for (int i = 0; i < 20; i++) {
    list.add(i);
}
System.out.println(list);
}
}

Today’s Goal
Replace Java’s ArrayList with our own version!

Another way of saying this: we will implement ArrayList.

Client vs. Implementor: Medication
For a tylenol pill, who is the client? Who is the implementor?

Java Examples
You’ve already been a client!
- DrawingPanel
- ArrayList
You’ve already been an implementor!
- Critter
Classes, Objects, and Instances

Wrapper Classes

int vs. Integer char vs. Character double vs. Double

The lowercase versions are primitive types; the uppercase versions are "wrapper classes".

The following is valid code:
1 int a = 5;
2 Integer b = 10;
3 int c = a + b; // You can treat ints and Integers as the same

When we create ArrayList's, we must use non-primitive types. So:
1 ArrayList<Integer> list1 = new ArrayList<Integer>();
2 ArrayList<String> list2 = new ArrayList<String>();

Example Class

A class is made up of field(s), constructor(s), and method(s).

Let's make an object Circle that represents a circle...

- with a size
- that can be moved right
- at a particular location

```java
public class Circle {
    // Fields -
    private int radius;
    private int x;
    private int y;
    // Constructor -
    public Circle(int radius, int x, int y) {
        this.radius = radius;
        this.x = x;
        this.y = y;
    }
    // Methods -
    public void moveRight(int numberOfUnits) {
        this.x += numberOfUnits;
    }
}
```

Implementor View of ArrayList

What behavior should we support? (Methods)

- add, remove, indexOf, etc.

What state do we keep track of? (Fields)

- Elements stored in the ArrayList (probably stored as an array!)
- Size of ArrayList

Two Views of an ArrayList

Client View:
```
3 -23 -5 222 35
```

Impl. View:
```
3 -23 -5 222 35 0 0 0
```

ArrayIntList

- No generics (only stores ints)
- Fewer methods: add(value), add(index, value), get(index), set(index, value), size(), isEmpty(), remove(index), indexOf(value), contains(value), toString()
Printing an ArrayIntList

System.out.println automatically calls toString on the given object. toString looks like:

```java
public String toString() {
    //...}

ArrayIntList toString:
```(size = 4)

```java
1 public String toString() {
2     //...}
3 }
```

```java
1 public String toString() {
2     if (this.size == 0) {
3         return "[]";
4     } else {
5         String result = "[" + this.data[0];
6         for (int i = 1; i < this.size; i++) {
7             result += ", " + this.data[i];
8         }
9         result += "]";
10        return result;
11    }
12 }
```

Implementing add #2

```java
(size = 4) 3 8 2 45 0 0 0 0
```

```java
list.add(1, 222):
(size = 5) 3 222 8 2 45 0 0 0 0
```

How do we add to the middle of the list?
- Shift over all elements starting from the end
- Put the new element in its index
- Increment the size

```java
1 public void add(int index, int value) {
2     for (int i = this.size; i > index; i--){
3         this.data[i] = this.data[i-1];
4     }
5     this.data[index] = value;
6     this.size++;
7 }
```

Today's Takeaways!

- Understand the difference between client and implementor
- Always use wrapper classes when creating an ArrayList of a primitive type
- Understand how ArrayList is implemented