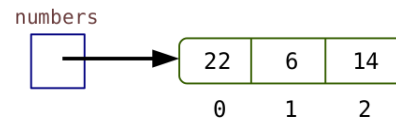


Model 1 Array Lists

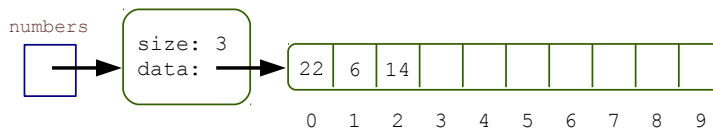
Arrays store elements in one *contiguous* block of memory. Since elements are stored together, you can immediately access any element by its index.

```
int[] numbers = {22, 6, 14};  
System.out.println(numbers[1]);
```



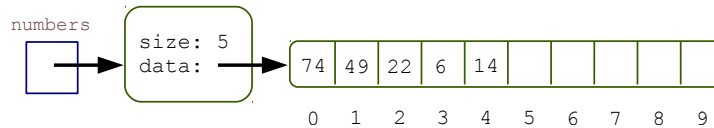
The ArrayList collection implements List and uses an array (internally) to store its elements.

```
ArrayList<Integer> numbers = new ArrayList<>();  
numbers.add(22);  
numbers.add(6);  
numbers.add(14);
```



When new values are inserted, existing array elements are moved to the right.

```
numbers.add(0, 49);  
numbers.add(0, 74);
```



If the array fills up, ArrayList automatically creates a new array about 50% larger. All current values must be copied into the new array, and the old array is then garbage collected.

Questions (15 min)

Start time:

1. Why does Java use the name ArrayList? (What do the words Array and List indicate?)
2. How many array operations (i.e., integer assignments) were required to add 49 and 79 to the front of the second diagram in Model 1?
3. Imagine the internal array for numbers is full (i.e., with size=10 above). If you request one more element to be added (at the end), how big will the new array be?

4. Continuing the previous question, what operations are required to add one more element when the array is full? Briefly describe each operation, beginning with creating the new array.

5. Discuss why ArrayList is a poor choice of List in the program below:

```
1 import java.util.ArrayList;
2 import java.util.List;
3
4 public class ArraysAreBad {
5
6     public static void main(String[] args) {
7         List<String> list = new ArrayList<>();
8         System.out.println("Start");
9         addAndRemove(list);
10        System.out.println("Done!");
11    }
12
13    public static void addAndRemove(List<String> list) {
14        for (int i = 0; i < 1000000; i++) {
15            list.add(0, "A"); // add at index 0
16        }
17        for (int i = 0; i < 1000000; i++) {
18            list.remove(0); // remove at index 0
19        }
20    }
21 }
```

6. Arrays are simple and effective. Why would we want anything but ArrayList?