CS 61B Spring 2019 | Data Structures Josh Hug

Discussion 1: Introduction to Java

1 Our First Java Program

Below is our first Java program of the semester. Next to each line, write out what you think the code will do when run. *This exercise is adapted from Head First Java.*

```
1  int size = 27;
2  String name = "Fido";
3  Dog myDog = new Dog(name, size);
4  int x = size - 5;
5  if (x < 15) {
6      myDog.bark(8);
7  }
8
9  while (x > 3) {
10     x -= 1;
11     myDog.play();
12 }
13
14 int[] numList = {2, 4, 6, 8};
15 System.out.print("Hello ");
16 System.out.println("Dog: " + name);
17
18 System.out.println(numList[1]);
19 if (numList[3] == 8) {
20     System.out.println("potato");
21 }
```

2 Mystery

This is a function (a.k.a. method). It takes an array of integers and an integer as arguments, and returns an integer.

```
1  public static int mystery(int[] inputArray, int k) {
2      int x = inputArray[k];
3      int answer = k;
4      int index = k + 1;
5      while (index < inputArray.length) {
6          if (inputArray[index] < x) {
7              x = inputArray[index];
8              answer = index;
9          }
10         index = index + 1;
11     }
12     return answer;
13 }
```

Describe in English what `mystery` returns if `inputArray = [3, 0, 4, 6, 3]` and `k = 2`.

Returns the index of the minimal number from array[k] to the end of the array.
If k=2, min of 4,6,3 is 3. 3's index is 4. Return value is 4.

Extra: This is another function. It takes an array of integers and returns nothing.

```
1  public static void mystery2(int[] inputArray) {
2      int index = 0;
3      while (index < inputArray.length) {
4          int targetIndex = mystery(inputArray, index);
5          int temp = inputArray[targetIndex];
6          inputArray[targetIndex] = inputArray[index];
7          inputArray[index] = temp;
8          index = index + 1;
9      }
10 }
```

Describe what `mystery2` does if `inputArray = [3, 0, 4, 6, 3]`.

In each while loop, swap the current number with the minimum after it.
=> Sorting from min to max.
inputArray = [3,0,4,6,3]. mystery2 will change it into [0,3,3,4,6].

3 Writing Your First Program

Implement `fib` which takes in an integer `n` and returns the nth Fibonacci number.

The Fibonacci sequence is $0, 1, 1, 2, 3, 5, 8, 13, 21, \ldots$.

```
public static int fib(int n) {
    if (n==0) {
        return 0;
    } else if (n==1) {
        return 1;
    } else {
        int[] arr = new int[n];
        arr[0] = 0;
        arr[1] = 1;
        for (int i=2; i<n ; i++) {
            arr[i] = arr[i-1] + arr[i-2];
        }
    }   return arr[n-1];
}
```

Extra: Implement `fib` in 5 lines or fewer. Your answer must be efficient.

```
public static int fib2(int n, int k, int f0, int f1) {
    if (n==0) {
        return f0;
    } else {
        return fib2(n-1, k, f1, f0+f1);
    }
}
```