

## 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); new object
4  int x = size - 5; x=22
5  if (x < 15) {
6      myDog.bark(8);
7  }
8  while (x > 3) { 22 > 3 play 19>2
9      x -= 1;
10     myDog.play();
11 }
12 int[] numList = {2, 4, 6, 8};
13 System.out.print("Hello "); Hello
14 System.out.println("Dog: " + name); Dog: Fido
15 System.out.println(numList[1]); 4
16 if (numList[3] == 8) {
17     System.out.println("potato"); ✓ potato
18 }
```

For your convenience, here is the same code in Python:

```
1  size = 27
2  name = "Fido"
3  myDog = Dog(name, size)
4  x = size - 5;
5  if x < 15:
6      myDog.bark(8)
7  while x > 3:
8      x -= 1
9      myDog.play()
10 numList = [2, 4, 6, 8]
11 print("Hello")
12 print("Dog: " + name)
13 print(numList[1])
14 if numList[3] == 8:
15     print("potato")
```

## 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 }

```

$x = 4$   
 $answer = 2$   
 $index = 3$

第一次 ✓  
 $6 < 4$  ✗

第二次  
 $3 < 4$  ✓  
 $x = 3$   
 $answer = 4$

(a) What mystery returns if `inputArray = [3, 0, 4, 6, 3]` and `k = 2`.

(b) Can you explain in English what does mystery do?

本例, 最小数

找出第  $k$  个元素后, 小于  $array[k]$  的最后一个元素位置

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 }

```

交换  
 $index$  &  $target\ index$

$i$   $ti$   $tem$   
0 0 3  
1 1  
2 4

$[3, 0, 3, 6, 4]$   
 ~~$[3, 0, 3, 4, 6]$~~   
 $[0, 3, 3, 4, 6]$

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

### 3 Writing Your First Program

Implement `fib` which takes in an integer `n` and returns the  $n$ th Fibonacci number. You may not need to use all the lines.

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

```
public static int fib(int n) {
    if n == 0
    return 0
    if n == 1
    return 1
    else
    return fib(n-2) + fib(n-1)
}
```

记事本?

*Extra:* Implement `fib` in 5 lines or fewer. Your answer must be efficient. You don't have to make use of the parameter `k` in your solution.

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

```
int n = n
int k = 0 // 作为计数, 初始值
f0 = 0
f1 = 1
while (n != k) {
    temp = f0
    f0 = f1
    f1 = f1 + temp
    k++
}
```

return f0;

k	f0	f1
0	1	1
1	1	2
2	2	3

循环一次, 迭代一次