1 Javaian Rhapsody

Next to each line, write out what you think the code will do when it is run. Assume the Singer class exists and that the code below compiles.

```java
String disagree = "no";
int x = 7;
Singer queen = new Singer("Queen");

while (x > 0) {
    x -= 1;
    queen.sing(disagree);
}

String[] phrases = {"Oh", "mamma mia", "let me go"};
System.out.print(phrases[0]);
for (int i = 0; i < 3; i += 1) {
    System.out.print(" "+ phrases[1]);
}
System.out.print(" "+ phrases[2]);
```

2 Mystery

Below is a function (or method) called mystery1. It takes an array of integers called inputArray and an integer k as arguments and returns an integer.

```java
public static int mystery1(int[] inputArray, int k) {
    int x = inputArray[k];
    int answer = k;
    int index = k + 1;
    while (index < inputArray.length) {
        if (inputArray[index] < x) {
            x = inputArray[index];
            answer = index;
        }
        index = index + 1;
    }
    return answer;
}
```

Write the return value of mystery1 if inputArray is the array {3, 0, 4, 6, 3} and k is 2. Then, describe in English what mystery1 returns.
Extra: Below is another function called mystery2. It takes an array of integers called inputArray as an argument and returns nothing.

```java
public static void mystery2(int[] inputArray) {
    int index = 0;
    while (index < inputArray.length) {
        int targetIndex = mystery1(inputArray, index);
        int temp = inputArray[targetIndex];
        inputArray[targetIndex] = inputArray[index];
        inputArray[index] = temp;
        index = index + 1;
    }
}
```

Write what mystery2 will do if inputArray is the array {3, 0, 4, 6, 3}. Then, describe in English what mystery2 does.

3 Fibonacci

Implement fib1 recursively. fib1 takes in an integer N and returns an integer representing the Nth Fibonacci number. The Fibonacci sequence is 0, 1, 1, 2, 3, 5, 8, 13, 21, ... \ldots, where 0 is the 0th Fibonacci number.

```java
public static int fib1(int N) {
}
```

Extra: Implement fib2 in 5 lines or fewer that avoids redundant computation. fib2 takes in an integer N and helper arguments k, f0, and f1 and returns an integer representing the Nth Fibonacci number. If you’re stuck, try implementing fib1 iteratively and then see how you can transform your iterative approach to implement fib2.

```java
public static int fib2(int N, int k, int f0, int f1) {
}
```