Extra Java Problems (Solution)

Problem 1

The following function is defined:

```
1  public static int[] Q1(int[] arr)
2  {
3          int n = arr.length;
4          int arr2[] = new int[n];
5
6          for (int i=0; i<n; i++)
7                  arr2[i] = arr[n-i-1];
8
9          return arr2;
10 }
```

Note: the line

```
4          int arr2[] = new int[n];
```

creates a new array of integers of length `n` called `arr2`.

1. What will the function return for the input `[1,0,5,7,2,3]`?

   Answer:
   First, line `3` will assign the variable `n` a value of `6` (since the length of the array is 6).
   Then, line `4` creates a new array called `arr2` of length `n=6`.
   Let's now follow the `for` loop using a table:

`i`	`n-i-1`	`arr[n-i-1]`
0	5	3
1	4	2
2	3	7
3	2	5
4	1	0
5	0	1

   Meaning that for the input `[1,0,5,7,2,3]` the function `Q1` returns `[3,2,7,5,0,1]`.

2. What does the function return in general?

   Answer:
   The function returns a reversed copy of the input array.

Problem 2

The following function is defined:

```
1  public static boolean Q2(int[] arr1, int[] arr2)
2  {
3          if (arr1.length != arr2.length)
4                  return false;
5
6          boolean condition = true;
7          int i = 0;
```

```
        while (condition==true && i<arr1.length)
        {
                if (arr1[i] != arr2[i])
                        condition = false;
                i++;
        }

        return condition;
}
```

Follow the code carefully and explain what does the function do.

Answer:
The lines

```
        if (arr1.length != arr2.length)
                return false;
```

checks whether the two input arrays have identical lengths. If they don't, then it immediatly returns `false`.

If the two input arrays have the same lengths, the function continues to create two variables, a boolean called `condition` which is set to `true`, and an integer `i` set to `0`. A `while` loop then runs so long as `condition` is `true` and `i` is smaller then the length of `arr1` (which is also the length of array `arr2`). If any of the elements `i` of the two arrays are not identical, `condition` is set to `false` and the `while` loop stops. Otherwise it continues to interate with the integer `i` until it reaches the length of `arr1`.

The function then returns the value of `condition`.

What the function does is to check whether the two input arrays are identical. If they are, it returns `true`, otherwise it returns `false`.

Problem 3

The Fibonacci sequence $\{F_i\}$ is defined as follows:

$$F_i = F_{i-2} + F_{i-1},$$

with $F_0 = F_1 = 1$.
For example, the first 10 terms of the sequence are

$$1, 1, 2, 3, 5, 8, 13, 21, 34, 55, \ldots$$

1. Write a Java function that takes an integer $n \geq 2$ and returns the first n values of the Fibonacci sequence.

   Answer:

```java
public static int[] Fib(int n)
{
        int fibArray[] = new int[n+1];
        fibArray[0] = 1;
        fibArray[1] = 1;
        for (int i=2; i<=n; i++)
                fibArray[i] = fibArray[i-2] + fibArray[i-1];

        return fibArray;
}
```

2. **Challange**: Write a **recursive** function that takes an integer $n \geq 0$ and returns the value of F_n.

Answer:

```java
public static int Fib2(int n)
{
        if (n==0) return 1;
        if (n==1) return 1;
        return Fib2(n-2) + Fib2(n-1);
}
```