

Object Oriented Programming TDA547

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The total number of points is 40. 20 points certainly guarantee a pass. 27p correspond to grade 4 and 32p to grade 5.

No other help materials except an English Dictionary are allowed. Write clean and readable Java code. Trivial syntax errors will be tolerated without affecting the grades. You don't have to comment your code unless if you really want to.

1. Read the following program:

```
public class Question1 {
    public static boolean check(int[] a) {
        for (int i = 0; i < a.length/2; i++) {
            if (a[i] != a[a.length-i-1])
                return false;
        }
        return true;
    }

    public static void main(String[] args) {
        System.out.println(check(new int[] {1,2,3,4}));
        System.out.println(check(new int[] {1,2,2,1}));
        System.out.println(check(new int[] {1,2,4,2,1}));
    }
}
```

What will the program print when it is executed? (4p)

2. In this task we do simple array processing:

- Implement the method:

```
public static int localMaximum(int[] a)
```

which receives in the array `a` a sequence of integers. The method should return the index of the first local maximum in the sequence. A local maximum is a number which is greater than both its predecessor and its successor. For example if the method is called with the array `{2,0,1,6,0,4,0,5}` then it should return 3 since at index 3 is the number 6 where $6 > 1$ and $6 > 0$. The first number in the sequence doesn't have a predecessor while the last doesn't have a successor. This means that they cannot be maximums. If there is no maximum at all in the sequence then the method should return -1. (4p)

- Implement a class `Question2` which can be used to test the method `localMaximum`. The class should be possible to run like this:

```
> java Question2 2 0 1 6 0 4 0 5
3
```

i.e. it takes the sequence of numbers from the command line arguments and prints the index of the local maximum. (4p)

3. In this task you should implement a model class `EditorModel` for a simple text editor. To make things simpler we will assume that the editor can edit only a single line of text which is always `n` characters long. Implement the following parts:

- An instance variable of type `char[]` and a constructor:

```
public EditorModel(int n)
```

which initializes the instance variable to be an array of size `n` filled in with spaces.

- a method:

```
public void insert(int i, char c)
```

which inserts the character `c` at position `i`. This means that all characters after this position should be shifted with one position. The last character is simply removed so the final state of the array is still of size `n`.

(8p)

4. A monotonically increasing sequence is a sequence of numbers where each number in the sequence is greater or equal to its predecessor. Every sequence of numbers contains a sub-sequence which is increasing. Implement the static method:

```
public static void findMaxSeq(int[] a);
```

which takes as input the sequence in the array `a` and prints the start and the end index of the longest increasing sub-sequence. For example:

```
findMaxSeq(new int[] {5,1,2,5,0,1,2,3,4,5,0})
```

should print `4 9`. There are two increasing sub-sequences: `1,2,5` and `0,1,2,3,4,5` but the second one is longer and it starts from position 4 and ends at position 9. (10p)

5. The file `reservations.txt` contains information about people who have reserved books in the library. The following is an example for the file content:

```
John 2 B1 B5
Mary 3 B3 H8 K2
Erik 1 K3
```

Every line starts with the person's name, followed by the number of books that he/she has reserved. After that there is one reference code for every reserved book. You can assume that the person's name is just a single word, the number of books is always a valid number and each of the reference codes is also a single word. This means that parsing the file is possible by using `next()` and `nextInt()` from `Scanner`.

Implement the method:

```
public static List getReservations(String name)
    throws FileNotFoundException
```

which takes a person name and returns the list of books which he/she has reserved.

(10p)