Algorithmics	Student information	Date	Number of session
	UO: 270534	4/6/2021	8
	Surname: Iglesias Préstamo		
	Name: Ángel		

Escuela de Ingeniería Informática
Universidad de Oviedo

Universidad de Oviedo
Universidá d'Uviéu
University of Oviedo

Activity 1. [Validation results]

1. Task 1 – Calculating the complexity of the algorithm.

Following what we have learned in the topics regarding Divide and Conquer algorithms. First, I must say that the technique used for this algorithm is: D&C by subtraction, according to the fact that in each recursive call we increase the number of the pointer by 1, we dig one step into the list. Moreover, we also need to find the values of both: a, b, and k. Which they are:

- a >> the number of recursive calls.
- b >> the size of the subproblems, the factor by which we reduce the size of them.
- k >> the complexity of the rest of the code, without having into account the recursive calls.

With that said, we can calculate the complexity according to:

- a >> *we perform 3 recursive calls* so: $a = 3$.
- b >> *we reduce the size of subproblems by 1*, as we move 1 step into the songs list: $b = 1$.
- k >> *the complexity of the rest of the code is constant*, even if we perform a traditional for loop, what we are doing is to perform a fixed number of iterations: 3, as there are 3 possibilities: do nothing, insert the song in the A block, or do the whole same thing in the B block. So: $k = 0$. Even though, we do not care about the value of k, as *a* is greater than 0.

Having that said, we need to substitute in the following formula: $O(n) = a^{\frac{n}{b}} = 3^n$.

However, we can consider another approach: the degree of the problem is 3, given that we can make 3 different decisions: inserting the song on A, inserting it on B, or not inserting it. This will lead us to some sort of ternary decision tree, where each node has 3 possible sons. According to this, the number of generated nodes is: $t(n) = 3^1 + 3^2 + 3^3 + \cdots + 3^{n-1} + 3^n$. So, we will end up with a complexity of $O(n) = 3^n$.

2. Task 2 – Solution for the problem: `BestListlist01.txt 20`.

```
Number of songs: 10

List of songs:
id: 3ld4R7 seconds: 4:27 score: 3475
```

```
id: 8j4gE3 seconds: 5:22 score: 2834
id: 0fmvy3 seconds: 4:40 score: 3842
id: 8id4R7 seconds: 4:27 score: 3475
id: 9u4gE3 seconds: 6:59 score: 2834
id: 2lsdf9 seconds: 3:22 score: 3842
id: 3j4yQ6 seconds: 5:02 score: 2834
id: 06rwq3 seconds: 4:48 score: 3842
id: 87UKo2 seconds: 3:27 score: 3475
id: 5rtZe9 seconds: 4:44 score: 2834

Length of the blocks: 20
Total score: 27619
Total counter: 47246

Best block A:
id: 3ld4R7 seconds: 4:27 score: 3475
id: 0fmvy3 seconds: 4:40 score: 3842
id: 8id4R7 seconds: 4:27 score: 3475
id: 2lsdf9 seconds: 3:22 score: 3842

Best block B:
id: 3j4yQ6 seconds: 5:02 score: 2834
id: 06rwq3 seconds: 4:48 score: 3842
id: 87UKo2 seconds: 3:27 score: 3475
id: 5rtZe9 seconds: 4:44 score: 2834
```