German University in Cairo
Faculty of Media Engineering
Department of Computer Science
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Analysis and Design of Algorithms, Winter Term 2022
Programming Assignment 2 & 3: Alpha Keys

Due: December 30^{th} *2022*

A) Problem Description. Using the same problem description provided in assignment 1, you are required to solve problems 1 and 2 (listed below) in the **same java file**.

1 Problem 1: *alpha*

Your goal is to use a **Dynamic Programming** approach to tell Bode the combined power of the keys at the even positions in their Alpha form. Your algorithm must run in **O(n)**.

2 Problem 2: *alphaRec*

Your goal is to reconstruct the alpha form of the given keys so that Bode knows where to alter the chain to achieve the alpha form.

Problems 1 & 2 will count towards your Assignment 2 & 3 grades respectively. Good luck moon walking!

B) Deliverables. You are required to submit **one Java** file titled after your team name (example: `awesome_team.java`) containing the following methods.

`public static int alpha (int[] keys)` that implements a dynamic programming approach to finding the combined power of the keys at the even positions after finding the Alpha form and **returns that combined power**.

`public static int[] alphaRec (int[] keys)` that implements the reconstruction of the alpha form by returning an array of size 2, containing the start and the end indices where Bode needs to cut at in order to achieve the alpha form.

Note that you must follow the below guidelines. Failure to do so will give you an automatic Zero.

1. Keep your file in the **default** package, so that there will be no package definition in the file.
2. Your **file name** must be the same as your **team name** and **class name**.
3. Make sure you submit a **.java file**, not a zip folder.

C) Sample Input/Output

```
keys=[3]
Output alpha: 3
Output alphaRec:[-1,-1]

keys=[3,1,2,1]
Output alpha: 5
Output alphaRec:[-1,-1]

keys=[1,7,3,4,7,6,2,9]
Output alpha: 26
Output alphaRec:[0,7]
```

D) Teams Submission (You need to submit your team again even if you will continue with your team from assignment 1).

a) This assignment is to be done in teams of **three**.

b) The deadline for team submission is 13^{th} of December.

c) You must submit your team name and the IDs of the members using the following form: `https://forms.gle/sUDB764rZyu1UShZ7`.

E) Submission Guidelines.

a) Your assignment will be auto-tested. For this reason, you have to stick to the method signatures and the output format. However, you are allowed to use any helper methods you need.

b) You must use this link for submission: `https://forms.gle/QGXtZtihgdrWssaw9`