

## Project - Longest Word

### Part I

In this game, two players compete to find the longest word using randomly drawn letters (consonants and vowels).

#### Game principle

- The two players take turns to choose the number of vowels they wish to have in the letter draw.
- 10 letters are then drawn randomly.
- The goal is then to find the longest word possible using the drawn letters.

#### Example 1

RANDOMLY DRAWN LETTERS Consonants & Vowels	LONGEST WORD(s) Displaying one word
C O E T G O L Y H N	TECHNOLOGY   10-Letter Word

#### Example 2

RANDOMLY DRAWN LETTERS Consonants & Vowels	LONGEST WORD(s) Displaying one word
I M A H G O T T L R	ALGORITHM   9-Letter Word

#### Assigned work

Starting from a randomly drawn string of 10 letters (called `drawn_letters`), we seek to find all possible combinations (strings) of 10, then of 9, 8, 7, 6, 5, 4, 3, and finally 2 letters that can be obtained using the letters in the string `drawn_letters`.

For example, with a string of 3 letters "ABC", we will obtain the following combinations of 3 and 2 letters:

- ABC, ACB, BAC, BCA, CAB, CBA
- AB, BA, AC, CA, BC, CB

### Steps to follow

- A string is in minimal alphabetical order if its letters satisfy the relationship:  $s[i] \leq s[i+1]$

For instance, the string "ABC" is in minimal alphabetical order.

- A string is in maximal alphabetical order if its letters satisfy the relationship:  $s[i] \geq s[i+1]$

For example, "CBA" is in maximal alphabetical order.

- Consider the following procedure:
  - 1) Starting from a given string, find the largest terminal substring that is in maximal order. Let  $i$  be the index of the letter that is to the left of this substring.
  - 2) Find in the terminal substring located to the right of the  $i$ th letter, the closest to this  $i$ th letter among those which are superior to it. Let  $j$  be its index.
  - 3) Swap the  $i$ th letter and the  $j$ th letter.
  - 4) Rearrange the substring to the right of the  $i$ th letter so that it is in minimal order.

You have to start with a string in minimal order.

We stop when we obtain a string in maximal order.

**Note:** In the second part of the project, the aim is to integrate the search in a dictionary (planar tree) to find the longest word (or all the words of  $n$  letters).