Assignment 2

Exercise 1

Accompanying this assignment you will find a C source code file `sieve_of_erathostenes.c`. This file contains a partial implementation of a C program that computes all prime numbers up to a user-provided number n, using the *Sieve of Erathostenes* approach; the approach consists of:

1. construct the sequence $2, 3, \ldots, n$ of all natural numbers between 2 and n,
2. pick the first "untreated" element i in the sequence (initially, 2).
3. mark i as a prime number.
4. Mark all multiples of i as composite (non-prime).
5. Repeat steps 2-4 until all elements have been treated.

Your task is to complete this implementation, using an array of integers to store the results of treating the numbers in the sequence. We suggest to use 0 to indicate that the number (the index) has not been treated yet, a negative number to indicate that the corresponding number is composite, and a positive number to indicate the number is a prime number. The program must print the resulting numbers using color codes: green for prime numbers, red for non-prime numbers, separating the numbers in the sequence with commas.

Exercise 2

Accompanying this assignment you will find a C source code file `caesar_encrypt.c`. This file contains a partial implementation of a program in C, that receives as input from standard input, a string of characters. The program then:

- Computes a number n by adding up all the ASCII codes of the first line of the input (excluding the new line characteri terminating the first line). If the line has more than 80 characters long, the number n will be composed by the adding up all the ASCII codes of the first 80 characters.
- The number n is used as the seed to generate a pseudo-random number x, in the interval $[0, 255]$.
- The program outputs a string of characters where each character c from the input, whose ASCII code is a, is replaced by the character with ASCII code $(a + x)\%128$.
- After the text, the program outputs the number n, using the following format: `<seed>n</seed>`. For instance, if the number n is 7, the program must output as the last line, after the encoded text, the line `<seed>7</seed>`.