# C# Advanced Lab - Algorithms

This document defines **algorithmic problems** from the ["Advanced C#" Course @ Software University](http://softuni.bg/courses/advanced-csharp/). You are presented with some problems and certain steps you need to take in order to accomplish the tasks.

## The Sieve of Eratosthenes

There are various methods for finding prime numbers. The [sieve of Eratosthenes](https://en.wikipedia.org/wiki/Sieve_of_Eratosthenes) is one of the oldest and most popular algorithms for finding the primes in a given range. A picture is worth a thousand words, so this [animation](https://upload.wikimedia.org/wikipedia/commons/b/b9/Sieve_of_Eratosthenes_animation.gif) will probably be helpful.

This is the general description of the process:

1. Create a list/array of consecutive integers from 2 through N: (2, 3, 4, ..., N). For convenience, you may look into the [Enumerable.Range()](https://msdn.microsoft.com/en-us/library/system.linq.enumerable.range%28v%3Dvs.100%29.aspx) method in C#. *Hint: You may also start the sequence from 0 to keep a correlation between any given number and its index in the array.*
2. Initially, let **p** equal 2, the first prime number.
3. Starting from p, enumerate (iterate) its multiples by counting to N in increments of p, and mark them in the list (these will be 2 \* p, 3 \* p, 4\* p, etc.). The number p itself should not be marked. You may use any suitable value to mark the number that are not prime (e.g. -1, 0, 1 make sense, but a positive number greater than 1 does not).
4. Find the first number greater than p in the list that is not marked. If there was no such number, stop. Otherwise, let p now equal this new number (which is the next prime), and repeat from step 3.

### Input

On the only input line you will receive a natural number N. N will be in the range [2 … 50 000].

### Output

On a single line on the console, print all prime numbers in the range [2 … N], separated by a comma and space like in the examples below. You may check online if your program works correctly, e.g. [here](https://primes.utm.edu/lists/small/10000.txt).

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2 | 2 |
| 3 | 2, 3 |
| 77 | 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73 |
| 200 | 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199 |