C# Advanced Lab - Algorithms

This document defines **algorithmic problems** from the "Advanced C#" Course @ Software University. You are presented with some problems and certain steps you need to take in order to accomplish the tasks.

Problem 1. Prime Factorization

Fun fact: did you know int.MaxValue (2^{31} – 1) is a prime?

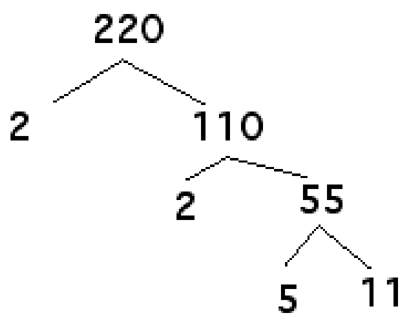
Prime factorization of a number N is the process of finding a set of prime numbers that multiply together to produce N. E.g. 12 can be represented as 2 * 2 * 3; 534543 = 3 * 23 * 61 * 127.

There are useful online calculators you can use to check the prime factorization of a number, like this one.

The task: Write a program that takes as input an **integer number N (N >= 2)** and represents it as a multiple of prime numbers in format: **"[number] = [prime factor 1] * [prime factor 2] * … * [prime factor n]"**.

Examples:

Input	Output
2	2 = 2
12	12 = 2 * 2 * 3
220	220 = 2 * 2 * 5 * 11
534543	534543 = 3 * 23 * 61 * 127



One **possible** approach:

1. Create a **list** to hold each prime multiple.
2. Set a variable **divisor** to 2 (the first prime number).
3. Check if N can be divided by divisor:
   a. If you can divide N by divisor without remainder, add divisor to the list and divide N by divisor. Repeat this step.
   b. If you cannot divide N by divisor without remainder, increment divisor and repeat step 3.
4. End the process when N equals 1.
5. Print the result in the specified format.

Restrictions

- The number N will always be a positive integer in the range [2 … 2 000 000 000]. There is no need to check it explicitly.
- The prime factors of the number should be sorted in ascending order.
- Allowed working time for your program: 0.9 seconds.
- Allowed memory: 16 MB.