Problem F – Fuzzy Factorization

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Finding the prime factorization of big numbers is a challenging task. It is so difficult that the security of almost our entire digital world, from online banking to private messages, is built upon how hard it is. In this problem, you are asked to perform such a factorization, but some relative error is allowed in your answer.

More formally, you are given an integer X, and you have to provide the prime factorization of any number $Y = p_1^{e_1} \cdot p_2^{e_2} \cdots p_k^{e_k}$ such that

- the relative error of the factorization does not exceed 10^{-9} (that is, $\frac{|X-Y|}{X} \leq 10^{-9}$), and
- each prime factor p_i of Y does not exceed 10^{18} (that is, $p_i \leq 10^{18}$ for $i = 1, 2, \ldots, k$).

Input

The input consists of a single line that contains an integer X ($2 \leq X \leq 10^{1000}$).

Output

The first line must contain a positive integer k indicating the number of different prime factors in the prime factorization of $Y = p_1^{e_1} \cdot p_2^{e_2} \cdots p_k^{e_k}$.

The i-th of the next k lines must contain the two positive integers p_i and e_i, representing that p_i is a prime factor of Y with multiplicity e_i.

It can be proven that a valid answer exists under the given constraints. If there are multiple solutions, output any of them.

Sample input 1	**Sample output 1**
520	3 5 1 2 3 13 1

Sample input 2	**Sample output 2**
1073741825	1 2 30

Explanation of sample 2:

$X = 1073741825$, $Y = 2^{30} = 1073741824$, and the relative error is $\frac{|X-Y|}{X} = \frac{1}{1073741825} \leq 10^{-9}$.
Note that there are other valid solutions for this test case.