Northwestern European Regional Contest 2016

NWERC 2016 Practice

Bath, November 19

Problems

A Atrium
B Blackboard Reconstruction
C Caesar Word Salad

Do not open before the contest has started.

IBM J.P.Morgan

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Problem A
Atrium

The *atrium* of a traditional Roman *dormus*, much like the atria of today, is a perfectly square room designed for residents and guests to congregate in and to enjoy the sunlight streaming in from above. Or, in the case of Britannia, the rain streaming in from above.

British weather. Photo by Nic McPhee

A major problem with traditional Roman architecture, particularly in modern times, is the absence of any kind of effective walls between rooms. You have arrived in Italy and now you are going to helpfully rebuild the walls on behalf of the authorities, starting with the atrium of a particularly derelict building you found.

What length of prefabricated wall section must you bring with you to fully enclose the atrium of the building?

Input

The input consists of a single integer a ($1 \leq a \leq 10^{18}$), the area in square meters of the Atrium.

Output

Output the total length of walling needed for the atrium, in metres. The length should be accurate to an absolute or relative error of at most 10^{-6}.

Sample Input 1	Sample Output 1
64	32.0

Sample Input 2	Sample Output 2
1234	140.51334456

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Problem B
Blackboard Reconstruction

Harry is a mathematician who likes to play with graphs. He has drawn a weighted undirected graph on the blackboard, and computed that the length of the shortest path between two nodes is s. Unfortunately he has to leave the room, therefore he quickly writes down s and the weights of all edges on a piece of paper, and he wipes the blackboard. Then it dawns on him: this information is not enough to reconstruct his beautiful graph!

A graph with 0 edges and 0 vertices. Picture by geralt

Write a program that constructs some graph matching the information that Harry wrote down.

Input

The input consists of:

- one line with two integers s and e ($1 \leq s \leq 10^4$, $1 \leq e \leq 1\,000$), the length of the shortest path and the number of edges;
- e lines, each with an integer w ($0 \leq w \leq 10^4$), the length of an edge.

Output

Output a graph consisting of a number of 1-indexed nodes and exactly e edges, such that the edge lengths correspond to the lengths in the input, and the length of the shortest path between nodes 1 and 2 is s. The graph must be connected, must not contain self-loops and can have at most one edge between each pair of nodes. You may assume that such a graph exists.

The output must consist of:

- one line with an integer n ($2 \leq n \leq e + 1$), the number of nodes;
- e lines, each with three integers a, b and w ($1 \leq a, b \leq n$), describing an edge between nodes a and b with length w.

If there are multiple correct answers, you may give any of them.

Sample Input 1	Sample Output 1
4 5 1 5 3 2 2	4 1 3 1 1 4 2 4 2 2 3 2 3 3 4 5

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Problem C
Caesar Word Salad

Julius Cæ sar. Photo by John Cassell.

The year is 46, B.C. Gaius Julius Caesar is the most powerful ruler in the world.

The newly named "imperator", busy consolidating his power in Rome and waging wars abroad, needs a secure way to send messages to his representatives around the Roman world.

The now world-famous solution to this problem is the eponymous Caesar cipher, an encoding in which every letter from the plaintext is rotated through the alphabet by a fixed *shift distance*. For example, when encoded using a shift distance of 3, `alexandra` becomes `dohadqgud`.

Caesar is a master of strategy—he knows the value of an effective double-bluff and will not hesitate to use one. In fact, when possible, he will even send some messages with a shift distance of 0 to really confuse his enemies.

However, after a run in with the soothsayer Spurina, Caesar has become a worried man. He will hear no talk of any "`i`"s of March and so, wants to send only messages where the ciphertext contains no "`i`"s!

Given the plaintext of a message, how many distinct "i-free" shifts could be used for the encoding?

Input

The input consists of:

- one line containing the plaintext w. w will be at least one character long and no more than 100 characters in length. It will contain only lower-case letters.

Output

If at least one "i-free" shift of w can be found, output the number of distinct shift distances that could be used.

Otherwise, output `impossible`.

You may consider 0 as a valid shift distance provided it does not lead to any "`i`"s.

Sample Input 1	Sample Output 1
erratum	20

Sample Input 2	Sample Output 2
agricola	19

Sample Input 3	Sample Output 3
thequickbrownfoxjumpsoverthelazydog	impossible