Hong Kong Olympiad in Informatics 2014/15 Junior Group

Task Overview

Task	CPU time limit	Max Points
Enumeration	1 second	50
Inverse Problem	1 second	100
Royal Bodyguard	1 second	100
Insert Delete	1 second	100
Father's Will	1 second	100

Notice:

Unless otherwise specified, inputs and outputs shall follow the format below:
- One space between a number and another number or character in the same line.
- No space between characters in the same line.
- Each string shall be placed in its own separate line.
- No trailing space(s) in each line.
- No empty lines, except that the input and output should end with the endline character.

C++ programmers should be aware that using C++ streams (cin / cout)
may lead to I/O bottlenecks and substantially slower performance.

For some problems 64-bit integers may be required. In Pascal it is `int64`. In C/C++ it is `long long int`.

Enumeration

Problem

Write a program to read an integer N and output N^2 integers in the format specified below.

Input

The input contains an integer N ($1 \leq N \leq 10$).

Output

The output consists of N lines, each contains N integers.
Other than that the first integer in the first line is 1, the first integer in each of the next $N-1$ lines equals the last integer in the line above.
Each of the next $N-1$ integers in each line is greater than the integer on its left by 4.

Sample test

Input	Output
4	1 5 9 13
	13 17 21 25
	25 29 33 37
	37 41 45 49

Hint

The last integer in the last line is $(2N-1)^2$.

Inverse Problem

Problem

Alice participated in a programming course. In the first lesson, Alice learned how to do simple calculation such as 'add', 'minus' and 'modulo' using a program. After she had been familiar with these functions, the teacher, Dr. Jones started to teach her logical comparison such as '$\leq$' and '$\geq$'. Alice understood these concepts quickly. She even asked Dr Jones to teach her more challenging materials. As a result, Dr Jones started to teach Alice the concept of loops and other more complicated techniques. Now, Alice is a skillful programmer.

In order to test if Alice is really familiar with programming, Dr. Jones asked Alice to complete the following question: find the sum of the given integers. Undoubtedly, Alice found this question too simple and requested for a more challenging question: solve the inverse question! That is, find a set of integers such that their sum equals to a given integer.

More precisely, Alice is given integers N and M. She has to find a set of N integers such that the sum of the N integers equals M. In order to make the question more challenging, Dr. Jones requests that the integers in the set must be **distinct** and lie in the range between -2^{31} and $2^{31}-1$, inclusively. Can you solve this task as well?

Input

The input contains 2 integers N and M in a single line.

Output

Output N distinct integers in a single line, a set that conforms to the requirements above. If there are more than one valid sets, you can output any of them.

Sample tests

Input	Output
3 6	1 2 3

Input	Output
4 8	3 -1 4 2

Subtasks

Subtask	Max Points	N	M
1	30	$1 \leq N \leq 3$	$1 \leq M \leq 100$
2	30	$1 \leq N \leq 100$	$-100000 \leq M \leq 100000$
3	40	$1 \leq N \leq 500000$	$-2^{31} \leq M \leq 2^{31}-1$

Royal Bodyguard

Problem

Today is Princess Snow White's Birthday! The whole kingdom is celebrating this event. As Snow White is the most beautiful girl, only the most powerful men can protect her. Now, Snow White is going to recruit royal bodyguards.

Though protecting Snow White is the dream job of many, it is not easy to have the honor of being a royal bodyguard. One needs to be physically fit, be observant, and most importantly, be a distinguished contestant of HKOI. Not long after the announcement, many people have applied for this honorable job.

Snow White puts N criteria into consideration. For the j^{th} criteria, each applicant has an outcome x_j which is either "`0`" or "`1`". "`0`" and "`1`" represent "no" and "yes" respectively.
Snow White considers the criteria in a specific permutation (order). Let the permutation of $(1, 2, \ldots, N)$ be $(p_1, p_2, \ldots, p_N)$. She will first consider criterion numbered p_1, then p_2 and so on.

When considering criterion $p_i (1 \leq i < N)$, Snow White has defined a decision value d_i and an acceptance value a_i. Each of d_i and a_i is either "0" or "1". Recalling that x_{p_i} is the applicant's outcome for criterion p_i, if x_{p_i} equals d_i, Snow White does one of the following:

- Immediately accept the applicant if $a_i = 1$, or
- Immediately reject the applicant if $a_i = 0$

If x_{p_i} is not equal to d_i, Snow White will consider the next criterion p_{i+1}. For the last criterion p_N, Snow White defines only d_N but not a_N. If x_{p_N} equals d_N, she accepts the applicant and otherwise rejects it.

As a loyal citizen of the kingdom, you want to apply for this job. To be successful, you have to know your enemy and know yourself. You have gathered a list of 2^N applicants. For each applicant, you know his criteria outcomes $x_j (1 \leq j \leq N)$ and whether he is finally accepted. Coincidentally, no two applicants have the same outcomes for all criteria. Now, you are going to determine the value of p_i, d_i and a_i.

Input

The first line contains integer N.
In the following 2×2^N lines, every two lines describe an applicant and among the two lines, the first line contains a string x of length N and the second line contains an integer s. The j^{th} character in x is x_j.
If $s =$ `0`, the applicant is rejected. If $s =$ `1`, the applicant is accepted.

Output

Output N lines. Except the last line, the i^{th} line contains three integers p_i, d_i and a_i. The last line contains two integers p_n and d_n.
If multiple solutions exist, you may output any one of them. If there is no possible solution, output "Impossible" (without quotes).

Sample test

Input	Output	Another correct output
3 100 1 001 1 010 1 011 0 000 1 101 1 110 0 111 0	2 0 1 1 1 0 3 0	2 0 1 3 1 0 1 0

Subtasks

Subtask	Max Points	N	Condition
1	30	$1 \leq N \leq 16$	Snow White considers the criteria with order $p_j = j$. You may still output any other valid solution.
2	70	$1 \leq N \leq 16$	

Scoring

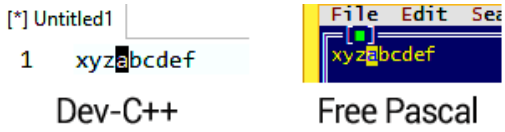
For those test cases that the outputs are "`Impossible`", such cases' points will be further multiplied by the points *percentage* you got from the *other* test cases.

Insert Delete

Problem

Ever wondered what this button does? It switches the editor's input mode between Insert mode and Overtype mode. In Overtype mode, the characters in a document will get replaced as you type. Let's try it together!

First, open up your IDE (Free Pascal or Dev-C++). Create a new file. Type something there, say, `abcdef`. Then move the cursor back to the beginning by pressing left button 6 times or Home. Initially, the editor is in Insert mode. So if you type `xyz`, the document becomes `xyzabcdef`. Now press Insert once, the shape of the cursor changes from a line into a block. This indicates that Overtype mode becomes active.



If you type `123` now, the document becomes `xyz123def`. Let's press Insert once more, reverting back to Insert mode. Typing `456` will change the document to `xyz123456def`. Finally, pressing delete 1 time will delete `d`. The above sequence of key presses can be represented as `xyzI123I456D` and the final content in the editor is `xyz123456ef`.

Your task is to simulate a key press sequence just like the one above and output the final content of the document. The original text in the file has only one line of lowercase letters and numbers. The key press sequence consists of lowercase letters, numbers and `I` (for Insert) and `D` (for Delete) only. Initially the cursor is at the beginning of the line.

You may study the behavior of the Insert and Delete keys in detail on your own as required.

Input

The input consists of two lines. The first line is the original content in the editor. The second line is the sequence of key presses.

Output

Output the contents of the file after the key presses. There is no need to indicate the final cursor position.

Sample tests

Input	Output
heat fDiDnDaDl	final

Input	Output
senior Iju	junior

Input	Output
remember 6thDdIeIcD	6thdecember

Subtasks

Let N be the length of the original content and M be the length of the key press sequence.

Subtask	Max Points	N, M	Condition
1	30	$1 \leq N, M \leq 100$	There are no `I` (Insert) key presses
2	30	$1 \leq N, M \leq 100$	There are no `D` (Delete) key presses
3	40	$1 \leq N, M \leq 100000$	

Father's Will

Problem

In Byteland, the obsession of property possession is very serious. Buying King's Garden, the most expensive house among the kingdom, has always been the lifetime goal of most citizens. Spending all of their lives purchasing and selling different houses is common in Byteland. Your father is one of them. No matter how hard you tried to persuade him that housing is not as important as he thought, he still refused to listen to you.

Before he passed away, he left you his sole legacy: M unit of money and the cheapest house among the Byteland. His last wish was that one day you would fulfill his unfinished business: purchase the King's Garden. You want to fulfill his wish, but you do not want to spend all your life on the mission. Therefore, you would like to buy the King's Garden as soon as possible.

There are N houses in total in Byteland (including your cheapest house, namely house 1 and the King's Garden, namely house N). The i^{th} house has *base price* H_i. In addition, the bases prices are non-decreasing. Therefore, we have $H_i \leq H_{i+1}$,$(1 \leq i < N)$. Most importantly, you observed that there is a pattern between the economy and the property prices:

Byteland has an infinite economic cycle with length exactly four years, and the houses' price will change according to the phase in the cycle:

Year in the cycle	Phase	House Price
1	Trough	H_i
2	Recovery	$2H_i$
3	Peak	$3H_i$
4	Recession	$2H_i$

This pattern will repeat every four years infinitely. Currently, the economy is at the Trough phase. Therefore, the i^{th} houses will have value equals to the base price H_i.

By the property law in Byteland, you must own exactly one house at any moment of time. You are going to achieve the goal by buying and selling houses at the right time. You can assume the operations (buying and selling) only take negligible time, which can be seen as operable immediately.

Given all base prices of N houses, calculate the earliest time for you to buy the King's Garden.

Input

The first line contains two integer N and M, the number of houses in Byteland and the initial money you have.
The second line contains N integers $H_1, H_2, \ldots, H_N$, separated by spaces. H_1 is the base price of the house you are owning and H_N is the base price of King's Garden.
Please be reminded that $H_1 \leq H_2 \leq \ldots \leq H_N$.

Output

If it is possible to buy King's Garden, print the earliest time (in years) you can do so.
Otherwise, print "`Impossible`" (without quotes).

Sample tests

Input	Output
3 4 2 5 10	4

Input	Output
2 96 1 100	Impossible

Explanation

Year	House 1	House 2	House 3	Action	Cash
0	2	5	10	Sell house 1 and buy house 2	1
1	4	10	20		1
2	6	15	30	Sell house 2 and buy house 1	10
3	4	10	20		10
4	2	5	10	Sell house 1 and buy house 3	2

Subtasks

Subtask	Max Points	N	H_i	M
1	30	$2 \leq N \leq 100$	$1 \leq H_i \leq 10000$	$0 \leq M \leq 10000$
2	15	$2 \leq N \leq 1000$	$1 \leq H_i \leq 10^6$	$0 \leq M \leq 10^6$
3	15	$2 \leq N \leq 1000$	$1 \leq H_i \leq 10^{14}$	$0 \leq M \leq 10^{14}$
4	40	$2 \leq N \leq 100000$	$1 \leq H_i \leq 10^{14}$	$0 \leq M \leq 10^{14}$

Scoring

For those test cases that the outputs are "`Impossible`", such cases' points will be further multiplied by the points *percentage* you got from the *other* test cases.

Hint

64-bit integer types is needed.