

Criterion 2020 Round 4

<https://toph.co/c/criterion-2020-round-4>



Schedule

The contest will run for **2h30m0s**.

Authors

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Rules

This contest is formatted as per the official rules of ICPC Regional Programming Contests.

You can use Bash 5.0, Brainf*ck, C# Mono 6.0, C++11 GCC 7.4, C++14 GCC 8.3, C++17 GCC 9.2, C11 GCC 9.2, Free Pascal 3.0, Go 1.13, Haskell 8.6, Java 1.8, Kotlin 1.1, Node.js 10.16, Perl 5.30, PHP 7.2, PyPy 7.1 (2.7), PyPy 7.1 (3.6), Python 2.7, Python 3.7, and Ruby 2.6 in this contest.

Be fair, be honest. Plagiarism will result in disqualification. Judges' decisions will be final.

Notes

There are 5 challenges in this contest.

Please make sure this booklet contains all of the pages.

If you find any discrepancies between the printed copy and the problem statements in Toph Arena, please rely on the later.

A. Dabbu the Entrepreneur

Dabbu is back from Cox's Bazar with an obsession with Coconut. Nowadays he is so obsessed with coconut that he has bought a coconut tree. Because He has a plan to eat more coconut water as it is very good for health and it revives the inner beauty of the skin. He also has a plan to start a business with coconut. In this situation, all of a sudden, his coconut tree was broken by the storm one day. At first, Dabbu became very sad. Seeing him sad, his mother, who is a competitive programmer, suggested a solution. She told Dabbu that if Dabbu can find the length of the broken part, she will give him some money as a reward.

Now, Dabbu is very eager to find the length of the broken part. But he has limited information to retrieve the length. Help Dabbu solve this problem. Because if you help him, he will get the money from his mother and will start a coconut business.

The coconut tree has broken in a way that from the ground point A of the tree, it has broken on point B and the peak of the tree has fallen on the ground on point D creating an angle ABD.

You will be given the length from point D (the peak of the tree that fell on the ground) to point A (the root of the tree) and the angle created on the broken part of the tree. Now help Dabbu become an entrepreneur!

Input

The first line of the input contains an integer T ($1 \leq T \leq 500000$), the number of test cases. Then, for each test case, there will be two real numbers d ($1 \leq d \leq 5000$), a ($0 < a \leq 45$) the distance from D to A and the angle ABD respectively.

Output

In the output, print the length of the tree. Errors less than 10^{-4} will be ignored.

Samples

<u>Input</u>	<u>Output</u>
1 10 30	37.320508

B. Revisiting Metro Rail Blocks

The city of Dhaka is experiencing the construction of metro rails. Imagine one such metro rail spans from Gulshan to Mirpur. There will be N blocks in total that will serve as the holding structure for the rail lines. The first block is numbered as 1 and the final block is numbered as N . Construction process is fast and each day, one block is being created. But there is a problem.

The blocks are not constructed sequentially. For example, if $N=5$, the blocks can be created in the following order: 2,4,5,3,1. Since the orders are random, the construction company wants to keep track of the progress properly. They want to measure how many contiguous blocks are created from the start after each day's work.

You will be given the order of blocks in which they are going to be constructed. You have to answer after each day, maximum size of contiguous blocks that are made **from the start**. The first block is identified as 1.

For this problem, you need an integer N and a permutation of 1 to N as an array A of size N . the i^{th} integer represents the block constructed on i^{th} day. Since N can be very big, we will provide two integers g and N . Then you will construct the array as $A_i = g^{i-1} \bmod (N+1)$, where $(1 \leq i \leq N)$.

Input

There will be two integers g and N as input.

- $3 \leq N \leq 100000000$
- $2 \leq g < N$

Output

Calculate N integers. The i^{th} integer indicates the number of contiguous blocks are made from the start after the i^{th} day. Now print the XOR value of these integers. If the integers are considered an array B_1, B_2, \dots, B_N , then print $(B_1 \text{ xor } B_2 \dots \text{ xor } B_N)$.

Samples

<u>Input</u>	<u>Output</u>
3 6	2

<u>Input</u>	<u>Output</u>
8 10	9

For the first sample, the array $A = [1\ 3\ 2\ 6\ 4\ 5]$

On the 1st day, Block 1 is built. So, the size from the start, $B_1 = 1$.

On the 2nd day, Block 3 is built. So, the size from the start, $B_2 = 1$. (1 and 3 are not connected)

On the 3rd day, Block 2 is built. $B_3 = 3$.

On the 4th day, Block 6 is built. $B_4 = 3$.

On the 5th day, Block 4 is built. $B_5 = 4$.

On the 6th day, Block 5 is built. $B_6 = 6$.

So, the XOR of all the values is 2.

C. Naming Convention

Tony works in a multinational technology company named Voogle LLC. The employees of Voogle follow certain rules to name a function. They have a list of **unique** function names and each name contains lowercase letters. But they will choose names which consisted entirely of **at least two names** from the list. Suppose if the list contains function names such as "sum", "add", "addsum", they will choose "addsum" name because it is made of concatenation of "add" and "sum".

So you are given a list of words. You have to find out words which are made of concatenation of at least two words from the list. Print the words so that their relative order is maintained from the input list. If no words are found, then print **"No solution"**.

Input

Input starts with an integer **N**, the number of names the list contains. In the next line there are **N** words, each character of the word contain lowercase letters.

$1 \leq N \leq 1000$

$1 \leq \text{Each string length} \leq 100$

Output

Output list of words which follows Voogle's function naming convention or **"No solution"**.

Samples

<u>Input</u>	<u>Output</u>
5 a ab ac aa acab	aa acab

aa contains a twice and **acab** contains ac and ab.

D. Maximum Meetings

I am the boss of my company. I have n employees. The office time of my company starts at 1. Every employee has his own working period. From the starting of the office time, whenever at a time, exactly k employees have at least t unit time (inclusive) common to their working periods, they immediately start a meeting and an employee can participate in at most 1 meeting. A meeting doesn't need a time interval. So, common time interval t is only for the criteria to start a meeting.

Now, I wonder what is the maximum number of meetings that can be held by all the employees. So, I hired you to do this task.

Input

Input starts with three integers n, k, t ($1 \leq n, k, t \leq 2 \cdot 10^5$), denoting the number of employees, the number of employees needed for a meeting and the minimum length of a meeting.

Each of the following n lines contains two integers l and r ($1 \leq l \leq r \leq 2 \cdot 10^5$), denoting the time interval of the working period of an employee (inclusive).

Output

Print a single integer, denoting the maximum number of meetings that can be held by the employees.

Samples

<u>Input</u>	<u>Output</u>
5 2 2 1 3 2 4 1 5 2 9 7 9	2

When we are at time 2, there are 2 employees available.

1 - 5

1 - 3

Participant 1,3 start a meeting.

When we are at time 3, there are 2 more employees available for a meeting.

2 - 4

2 - 9

Participant 2,4 start a meeting.

Participant 5 can not attend any meeting.

E. Story of Totient Function

Euler's totient function counts the number of positive integers up to a given integer N that are relatively prime to N . Formally, it is the count of integers K in range $1 \leq K \leq N$ for which the greatest common divisor $\gcd(N, K)$ equal to 1. It is denoted as $\phi(N)$.

Ahsan has an integer A . He wants to find an integer B such that B is greater than A and $\phi(B) > \phi(A)$. There can be many such integers that satisfy the conditions. So he wants to find the smallest such B .

Input

First line contains an integer $T(1 \leq T \leq 10)$, denoting the number of test cases.

Each of the next T lines contain a single integer $A(1 \leq A \leq 10^{18})$.

It is guaranteed that the product of all given A will not exceed 10^{18} .

Output

For each test case, print the smallest B that satisfies the conditions.

Samples

<u>Input</u>	<u>Output</u>
10	3
1	3
2	5
3	5
4	7
5	7
6	11
7	9
8	11
9	11
10	11