BRACU জয়যাত্রা’50 Techfest Inter University Individual Programming Contest

BRAC University

https://toph.co/c/bracu-joyjatra-50-techfest-inter-university

Toph

Schedule

The contest will run for **4h0m0s**.

The standings will be frozen for the last **30m0s** of the contest.

Authors

The authors of this contest are Aashiq, Arghya, imAnik, masrur, tbs_sajal15, and upobir.

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, Common Lisp SBCL 2.0, Erlang 22.3, 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, Python 3.8, Ruby 2.6, Swift 5.3, and Whitespace in this contest.

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

Notes

There are 9 challenges in this contest.

Please make sure this booklet contains all of the pages.

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

A. Jini and the One

Limits 1s, 512 MB

Jini's favorite number is one. She always looks for one in any number and if she finds the digit 1 in a number then she considers that this is a lucky number. Now counting till a large number while finding numbers that have digit 1 at least once in them can be hard for her. Thus she needs your help.

Given N can you find her how many numbers from 1 to N contain digit 1 **at least once**?

Input

The input contains a single integer N where $1 \leq \mathrm{N} \leq 10^6$

Output

Print an Integer that indicates number of integers that has digit 1 at least once.

Samples

Input	Output
19	11

Input	Output
23	12

In the first example, $\mathrm{N} = 19$ so the answer will be 11 since $1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19$ are the numbers that have digit 1 in them **at least once**.

B. No More Shortest Path

Limits 3s, 512 MB

You are given a weighted directed graph with n nodes and m edges. Node S is marked as the source node and each edge has a positive weight. So the shortest path from source to each node is defined(shortest path to nodes which are not reachable from the source node is also considered defined and cost of shortest path to those nodes is infinity). But you want to make it undefined.
Shortest path from one node to another is undefined if you can make the cost of the shortest path arbitrarily small.

To do that you can do the following operation any number of times:

- Choose any edge and decrease its weight by 1.

Now you want to maximize the number of nodes such that the shortest path from source S to those nodes are undefined and you have to do it at the minimum number of operations.

Input

In the first line you are given an integer $T\,(1 \le T \ \le 10)$, the number of test cases. In the first line of each test case there are three integers $n(1 \le n \le 1000), m(0 \le m \le 5000)$ and $S(1 \le S \le n)$. Next m lines each contains three space separated integers $u \ v \ c \ (1 \le u, v \le n, u \ne v, 1 \le c \le 10^9)$ which denotes that there is a directed edge from node u to node v with weight c.
Sum of n over all test cases does not exceed 5000 and sum of m over all test cases does not exceed 25000.
Note: There could be multiple edges but no self loops.

Output

Print T lines.
For each test case, print two space separated integers, maximum possible number of nodes such that the shortest path from S to them are undefined and the minimum number of operations required to do that respectively.

Samples

Input	Output
2 3 3 1 1 2 4 2 1 5 2 3 3 4 5 1 1 2 5 1 3 5 3 4 3 4 3 3 3 2 1	3 10 3 7

C. Maximize Mismatch

Limits 1s, 512 MB · Custom Checker

You are given a permutation P of number $1, \cdots, n$ (I.E. each number occurs exactly once). Now you want to introduce some chaos to this permutation. To introduce chaos, you can perform at most k swaps between adjacent positions. The chaosness of the final permutation is calculated as the count of the mismatches I.E. the number of indices i such that $P[i] \neq i$ (the indices are 1-indexed). Output the maximum number of mismatch you can make and also output such a sequence of swaps.

Input

There will be T testcases.

Each testcase begins with a line containing space separated numbers n, k. Next line contains n space separated numbers representing the initial permutation.

$1 \leq T \leq 10^5$
$3 \leq n \leq 10^5$
$0 \leq k \leq n$
sum of n over all testcases $\leq 10^5$

Output

For each testcase first output one number s in a line, s is the number of swaps you will perform. In the next s lines, output the swaps to be performed. To swap positions x and y output the numbers x and y. Note that the swaps you perform should be between adjacent positions.

In case of multiple answer, you can output any.

Samples

Input	Output
2 4 2 1 4 2 3 10 2 1 2 3 4 5 6 7 8 9 10	1 1 2 2 1 2 9 10

D. Matrix Construction

Limits 1s, 512 MB · Custom Checker

Construct a square matrix a of size $n \times n$ satisfying the following conditions,

1. Each row of the matrix is a permutation of size n
2. Each column of the matrix is a permutation of size n
3. The matrix is symmetric, that means $a[i][j] = a[j][i]$ for all possible i, j $(1 \le i, j \le n)$
4. The matrix satisfies $a[i][i] = i$ for all i $(1 \le i \le n)$

If it is possible to build such a matrix, print the matrix otherwise print -1.

Input

First line of input consists of a single integer T, the number of test cases $(1 \le T \le 5)$
Each test case consists of one line. First and only line of the test case contains n, the dimension of the matrix. $(1 \le n \le 1000)$.

Output

Print the matrix if possible, otherwise print -1. If there are multiple possible answers, anyone would be acceptable.

Samples

Input	Output
2 2 3	-1 1 3 2 3 2 1 2 1 3

We call a sequence of integers A permutation if every integer from 1 to |A| appears **exactly once** in the sequence, where $|A|$ denotes the length of the sequence.

E. Dancing Tuples

Limits 3s, 512 MB

Given an array A of size n, find how many tuple (i, j, k) are there such that $1 \leq i < j < k \leq n$ and $A_j \leq A_i \leq A_k$.

Input

The first line contains an integer n which represents the length of the array. The second line contains a sequence of n integers A_i.

$1 \leq n \leq 10^6$
$1 \leq A_i \leq n$

Output

Print one integer — the number of valid tuples.

Samples

Input	Output
5 4 1 3 5 2	2

Input	Output
6 2 5 3 2 5 6	9

Input	Output
5 1 2 3 4 5	0

F. String Sorting

Limits 2s, 512 MB

You'll be given a string $s = s_1 s_2 .....s_n$ of length n consisting of lowercase english letters and q queries. In each query you'll be given two integers l and r, you've to report the minimum number of operations you need to make in order to sort the substring $s_l s_{l+1} .....s_r$. In one operation you can take two adjacent indices and swap the characters.

Input

First line of input contains the string $s (1 \le |s| \le 10^6)$
Second line of input contains the number of queries $q (1 \le q \le 10^6)$.
Next q lines contain two integer $l, r (1 \le l \le r \le |s|)$.

Output

For each query output one integer, the minimum number of operations you need to make.

Samples

Input	Output
bcab 3 1 2 2 3 1 4	0 1 3

Note that, you just have to answer how many operation it takes to sort the substring, you are not making any operation in the string. So the original string doesn't change over queries.

G. Caching Combinatorics

Limits 2s, 512 MB

Recently Arya the little panda got a permutation of size A as a birthday present from his parents. Being a crazy little panda, he decided to make some operations on it. In each operation he chooses some index $i(1 \le i \le n)$ and moves A_i to the front of the permutation.

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Let's say the initial permutation is ( 3, 5, 4, 1, 6, 2 ) and the sequence of
operations is ( 3, 2, 5).
So after the 1st operation, the permutation becomes,
                                     ( 4, 3, 5, 1, 6, 2 )
After the 2nd operation, the permutation becomes,
                                     ( 3, 4, 5, 1, 6, 2 )
After the 3rd operation, the permutation becomes,
                                     ( 6, 3, 4, 5, 1, 2 )
```

Arya has the initial permutation and the final permutation, he also remembers how many operations were made but he forgot the sequence of operations. Now he wonders, how many sequence of operations could there be? As the number can be quite large, output it modulo **998244353**.

Input

First line of input consists of a single integer T, the number of test cases $(1 \le T \le 10)$
Each test case consists of two lines as follows :
First line of the test case contains n, the length of permutation and m, the length of operation sequence ($1 \le n, m \le 5000$).
Second line contains n space-separated distinct integers, denoting the initial permutation A($1 \le A_i \le n$).
Third line contains n space-separated distinct integers, denoting the final permutation B($1 \le B_i \le n$).

Output

For each testcase print one integer, the possible number of operation sequences of length m modulo **998244353** . Two sequences are considered different if there is atleast one index where they differ.

Samples

Input	Output
1 4 2 3 2 4 1 1 3 2 4	2

We call a sequence of integers A permutation if every integer from 1 to $|\mathrm{A}|$ appears **exactly once** in the sequence, where $|\mathrm{A}|$ denotes the length of the sequence.

H. AND Maximum Spanning Tree

Limits 1s, 256 MB

You have a weighted undirected complete graph of N nodes numbered from 0 to $N-1$.
The weight of the edge between node A and B is defined as $A\&B$ (where & denotes bitwise AND operation).
Can you find the cost of the maximum spanning tree of this graph ?

Input

First line of input consists of a single integer T, the number of test cases.
Each test case consists of one line. First and only line of each test case contains N, the number of nodes.

$1 \le T \le 10$
$1 \le N \le 2 * 10^5$

Output

For each test case, print one integer — cost of the maximum spanning tree of the graph.

Samples

Input	Output
4 3 6 11 8	0 8 39 21

A complete graph is a simple undirected graph in which every pair of distinct vertices is connected by a unique edge.

I. The Answer to Everything

Limits 1s, 512 MB

What is the answer to the ultimate question of Life, the universe, and everything?

It is

$$\left\lfloor \left(\sqrt{n} + \sqrt{n+1}\right)^{2k} \right\rfloor \mod m$$

You will be given n, k, m, you have to output the answer to everything..

Input

There will be T testcases.

In each testcase, the numbers n, k, m will be given in one line, separeated by spaces.

$1 \leq T \leq 1000$
$1 \leq n \leq 10^9$
$1 \leq k \leq 10^9$
$1 \leq m \leq 10^9$

Output

For each testcase, output the answer in a line.

Samples

Input	Output
2 2 1 10 5 3 15	9 6

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