A. Olympiad

You are one of the competitors of the Olympiad in numbers. The problem of this year relates to beatiful numbers. One integer is called beautiful if and only if all of its digitals are different (i.e. 12345 is beautiful, 11 is not beautiful and 100 is not beautiful). Every time you are asked to count how many beautiful numbers there are in the interval $[a, b]$ $(a \leq b)$. Please be fast to get the gold medal!

Input

The first line of the input is a single integer T $(T \leq 1000)$, indicating the number of testcases.

For each test case, there are two numbers a and b, as described in the statement. It is guaranteed that $1 \leq a \leq b \leq 100000$.

Output

For each testcase, print one line indicating the answer.

Sample Input

```
2
1 10
1 1000
```

Sample Output

```
10
738
```

B. Problem Killer

You are a "Problem Killer", you want to solve many problems.
Now you have n problems, the i-th problem's difficulty is represented by an integer a_i ($1 \leq a_i \leq 10^9$).
For some strange reason, you must choose some integer l and r ($1 \leq l \leq r \leq n$), and solve the problems between the l-th and the r-th, and these problems' difficulties must form an AP (Arithmetic Progression) or a GP (Geometric Progression).
So how many problems can you solve at most?

You can find the definitions of AP and GP by the following links:
https://en.wikipedia.org/wiki/Arithmetic_progression
https://en.wikipedia.org/wiki/Geometric_progression

Input

The first line contains a single integer T, indicating the number of cases.
For each test case, the first line contains a single integer n, the second line contains n integers $a_1, a_2, \cdots, a_n$.

$T \leq 10^4, \sum n \leq 10^6$

Output

For each test case, output one line with a single integer, representing the answer.

Sample Input

```
2
5
1 2 3 4 6
10
1 1 1 1 1 1 2 3 4 5
```

Sample Output

```
4
6
```

C. Question for the Leader

JRY is the leader of a village. He has n lands, and there are n roads connecting them. There is at most one road connecting two lands and all lands are connected.

Now, JRY wants to divided the n lands into k disjoint sets of equal size, satisfying that one can move between any two lands belonging to the same set passing only through lands frome this set.

Furthermore, he wants to know how many $k(1 \leq k \leq n)$ he can choose.

Input

There are multiple testcases, the sum of n is less then 10^6 .

For each test case, the first line contains one integer $n(1 \leq n \leq 10^5)$.

The next line contains n integers, the i-th integer a_i means that there is an edge between i and a_i . It is guaranteed that the graph doesn't contain self loops and multiple edges.

Output

For each testcase print a single integer - the number of ways to choose the integer k .

Sample Input

```
6
2 3 4 5 6 1
6
2 4 2 3 4 3
```

Sample Output

```
4
3
```

D. Route Statistics

JRY is so rich that he creates an m demensional space and n sight spots inside. Because of special technical problem, all the coordinates are integers between $[0, 2]$. The roads in this space are all parallel to the axis, so the distance between two sight spots is their Manhattan distance. More specifically, if the coordinate of one sight spot is $(x_1, x_2, \ldots, x_m)$, and that of another sight spot is $(y_1, y_2, \ldots, y_m)$, then their distance is $\sum_{i=1}^{m} |x_i - y_i|$. JRY wants to establish some bus routes between two sight spots, so he needs to do some research first. For you, the problem is to find the total number of pairs (x, y) for each k, that the distance between (x, y) is k. Please be aware: 1. (x, x) does not count; 2. (x, y) and (y, x) are identical, so that it is only one pair; 3. different sight spots may have same coordinates.

Input

The first line of the input is a single integer T $(T = 11)$, indicating the number of testcases.

For each testcase, the first line contains two integers n and m. Each of the following n lines contains one string of length m, which consists three types of characters $0, 1, 2$, and the j-th character of the i-th string means the j-th coordinate of the i-th spot. It is guaranteed that the m of the i-th testcase is i, and for all testcases $\sum n \leq 300000$.

Output

For each testcase, print $2m + 1$ lines. The single number in the i-th line of the output indicates the number of pairs of sight spots with distance $i - 1$

Sample Input

```
2
2 1
0
1
6 2
00
01
10
11
02
00
```

Sample Output

```
0
1
0
1
7
6
1
0
```

E. Simple Problem

As we know, Rikka is poor at math. Yuta is worrying about this situation. He's given Rikka many math tasks to practice but she hasn't solved any of them. So, today he comes up with a simple problem to help her build up confidence:

Here is a tree with m nodes, you can delete some of the nodes on the tree and there mustn't be any edges connecting two remained nodes. You need to maximize the number of the points remained.

Rikka thinks this task is too simple, so she comes up with a new problem:

At first there is a tree with only one node. And then each time she links a new node to the tree. After each operation, you need to tell her the maximum number of the points remained (as described above).

This problem is too difficult for Rikka to solve. Can you help her?

Input

There are no more than 100 testcases and there are no more than 3 testcases with $n > 10^3$.

For each testcase, the first line contains a number n $(1 \leq n \leq 10^5)$.

Then $n-1$ lines follow. The ith line contains a single number f_i $(0 \leq f_i < i)$, which means that after the ith operation there is a new node numbered i and there is an edge between node i and node f_i.

Output

For each operation you need to print a single line with a single number - the answer after this operation.

Sample Input

```
4
0
0
1
```

Sample Output

```
1
2
2
```

F. Test for Rikka

As we know, Rikka is poor at math. At the test, Rikka finds that she cannot even do a single problem. There is one of the insane problems:

Given an integer K, she needs to come up with an $n \times n$ 01 matrix A and an integer m which meet $B_{1,n} = K$, where $B = A^m$.

It is too difficult for Rikka. Can you help her?

Input

The first line of the input is a single integer T $(T = 40)$, indicating the number of testcases.

Each of the next T lines contains one integer K $(0 \leq K \leq 10^{18})$.

Output

For each testcase, the first line contains two space-separated integers n, m $(1 \leq n, m \leq 30)$.

In each of following n lines print n characters (0 or 1) - the matrix A you find.

Sample Input

```
1
4
```

Sample Output

```
2 4
11
01
```

G. Undirected Graph

As we know, Rikka is poor at math. Yuta is worrying about this situation, so he gives Rikka some math tasks to practice. There is one of them:

There is an undirected graph with n vertices and m edges. Then Yuta does q operations on this graph. Each operation is described by two integers $L, R\ (1 \leq L \leq R \leq n)$ and can be split into three steps:

1. Delete all the edges which have at least one vertice outside the range $[L, R]$.

2. Yuta wants you to tell him the number of connected component of the graph.

3. Restore the graph.

This task is too hard for Rikka to solve. Can you help her?

Input

There are at most 100 testcases and there are at least 97 testcases with $n, m, q \leq 1000$.

For each testcase, the first line contains three numbers $n, m, q\ (n, q \leq 10^5, m \leq 2 \times 10^5)$.

Then m lines follow. Each line contains two numbers $u_i, v_i\ (1 \leq u_i, v_i \leq 10^5)$ which describe an edge of the graph.

Then q lines follows. Each line contains two numbers $L_i, R_i\ (1 \leq L \leq R \leq n)$ which describe an operation.

Output

For each operation you need print a single line with a single number - the answer of this operation.

Sample Input

```
3 3 2
1 2
1 3
2 3
1 2
1 3
```

Sample Output

```
2
1
```

H. Virtual Participation

As we know, Rikka is poor at math. Yuta is worrying about this situation, so he asks rikka to have some practice on codeforces. Then she opens the problem B:

Given an integer K, she needs to come up with an sequence of integers A satisfying that the number of different continuous subsequence of A is equal to k.

Two continuous subsequences $a,\ b$ are different if and only if one of the following conditions is satisfied:

1. The length of a is not equal to the length of b.

2. There is at least one t that $a_t \neq b_t$, where a_t means the t-th element of a and b_t means the t-th element of b.

Unfortunately, it is too difficult for Rikka. Can you help her?

Input

There are at most 20 testcases，each testcase only contains a single integer $K\ (1 \leq K \leq 10^9)$

Output

For each testcase print two lines.

The first line contains one integers $n\ (n \leq \min(K, 10^5))$.

The second line contains n space-separated integer $A_i\ (1 \leq A_i \leq n)$ - the sequence you find.

Sample Input

```
10
```

Sample Output

```
4
1 2 3 4
```

I. Walk Out

In an $n * m$ maze, the right-bottom corner is the exit (position (n, m) is the exit). In every position of this maze, there is either a 0 or a 1 written on it.

An explorer gets lost in this grid. His position now is $(1, 1)$, and he wants to go to the exit. Since to arrive at the exit is easy for him, he wants to do something more difficult. At first, he'll write down the number on position $(1, 1)$. Every time, he could make a move to one adjacent position (two positions are adjacent if and only if they share an edge). While walking, he will write down the number on the position he's on to the end of his number. When finished, he will get a binary number. Please determine the minimum value of this number in binary system.

Input

The first line of the input is a single integer T $(T = 10)$, indicating the number of testcases.

For each testcase, the first line contains two integers n and m $(1 \leq n, m \leq 1000)$. The i-th line of the next n lines contains one 01 string of length m, which represents i-th row of the maze.

Output

For each testcase, print the answer in binary system. Please eliminate all the preceding 0 unless the answer itself is 0 (in this case, print 0 instead).

Sample Input

```
2
2 2
11
11
3 3
001
111
101
```

Sample Output

```
111
101
```

J. XYZ and Drops

XYZ is playing an interesting game called "drops". It is played on a $r * c$ grid. Each grid cell is either empty, or occupied by a waterdrop. Each waterdrop has a property "size". The waterdrop cracks when its size is larger than 4, and produces 4 small drops moving towards 4 different directions (up, down, left and right).

In every second, every small drop moves to the next cell of its direction. It is possible that multiple small drops can be at same cell, and they won't collide. Then for each cell occupied by a waterdrop, the waterdrop's size increases by the number of the small drops in this cell, and these small drops disappears.

You are given a game and a position (x, y), before the first second there is a waterdrop cracking at position (x, y). XYZ wants to know each waterdrop's status after T seconds, can you help him?

$1 \leq r \leq 100$, $1 \leq c \leq 100$, $1 \leq n \leq 100$, $1 \leq T \leq 10000$

Input

The first line contains four integers r, c, n and T. n stands for the numbers of waterdrops at the beginning.
Each line of the following n lines contains three integers x_i, y_i, $size_i$, meaning that the i-th waterdrop is at position (x_i, y_i) and its size is $size_i$. ($1 \leq size_i \leq 4$)
The next line contains two integers x, y.

It is guaranteed that all the positions in the input are distinct.

Multiple test cases (about 100 cases), please read until EOF (End Of File).

Output

n lines. Each line contains two integers A_i, B_i:
If the i-th waterdrop cracks in T seconds, $A_i = 0$, $B_i =$ the time when it cracked.
If the i-th waterdrop doesn't crack in T seconds, $A_i = 1$, $B_i =$ its size after T seconds.

Sample Input

```
4 4 5 10
2 1 4
2 3 3
2 4 4
3 1 2
4 3 4
4 4
```

Sample Output

```
0 5
0 3
0 2
1 3
0 1
```

K. Yet Another XYZ Problem

You have two strings A and B which consist of x, y, z. Every time, you can do one of the following three operations:

1. Change all the x in A into y. This operation costs $Cost0$.
2. Change all the y in A into z. This operation costs $Cost1$.
3. Change all the z in A into x. This operation costs $Cost2$.

One extra restriction is that when you operate any of these operations, the string A needs to be changed. More specifically, when you operate the first operation, there should be at least one x in string A, etc. Please calculate how many different ways there are to change the string A into string B, while using not more than $macCost$ total cost. The answer could be very large, so please print the actual answer module $10^9 + 7$.

Input

The first line of the input is a single integer T $(T \leq 1000)$, indicating the number of testcases.

For each of the testcases, the first line contains four integers $Cost0, Cost1, Cost2, maxCost (1 \leq Cost0, Cost1, Cost2 \leq 1e18, 0 \leq ma$
The second line contains the string A, and the third line contains the string B. It is guaranteed that the length of A is the same with that of B.

The size of the input file is less than 50 KB.

Output

For each testcase, print one integer indicating the answer.

Sample Input

```
3
1 1 1 0
x
x
1 1 1 0
x
y
1 1 1 10
x
x
```

Sample Output

```
1
0
4
```

L. ZZX and Permutations

ZZX likes permutations.

ZZX knows that a permutation can be decomposed into disjoint cycles(see https://en.wikipedia.org/wiki/Permutation#Cycle_notation). For example:
145632=(1)(35)(462)=(462)(1)(35)=(35)(1)(462)=(246)(1)(53)=(624)(1)(53)……
Note that there are many ways to rewrite it, but they are all equivalent.
A cycle with only one element is also written in the decomposition, like (1) in the example above.

Now, we remove all the parentheses in the decomposition. So the decomposition of 145632 can be 135462,462135,351462,246153,624153……

Now you are given the decomposition of a permutation after removing all the parentheses (itself is also a permutation). You should recover the original permutation. There are many ways to recover, so you should find the one with largest lexicographic order.

Input

First line contains an integer t, the number of test cases.
Then t testcases follow. In each testcase:
First line contains an integer n, the size of the permutation.
Second line contains n space-separated integers, the decomposition after removing parentheses.

$n \leq 10^5$. There are 10 testcases satisfying $n \leq 10^5$, 200 testcases satisfying $n \leq 1000$.

Output

Output n space-separated numbers in a line for each testcase.
Don't output space after the last number of a line.

Sample Input

```
2
6
1 4 5 6 3 2
2
1 2
```

Sample Output

```
4 6 2 5 1 3
2 1
```