A - Sqrt Bo

Let's define the function $f(n) = \lfloor \sqrt{n} \rfloor$.

Bo wanted to know the minimum number y which satisfies $f^y(n) = 1$.

note: $f^1(n) = f(n), f^y(n) = f(f^{y-1}(n))$

It is a pity that Bo can only use 1 unit of time to calculate this function each time.

And Bo is impatient, he cannot stand waiting for longer than 5 units of time.

So Bo wants to know if he can solve this problem in 5 units of time.

Input

This problem has multi test cases(no more than 120).

Each test case contains a non-negative integer $n(n < 10^{100})$.

Output

For each test case print a integer - the answer y or a string "TAT" - Bo can't solve this problem.

Sample Input

```
233
23333333333333333333333333333333333333333333333333333333333333333
```

Sample Output

```
3
TAT
```

B - Permutation Bo

There are two sequences $h_1 \sim h_n$ and $c_1 \sim c_n$. $h_1 \sim h_n$ is a permutation of $1 \sim n$. particularly, $h_0 = h_{n+1} = 0$.

We define the expression $[condition]$ is 1 when $condition$ is True, is 0 when $condition$ is False.

Define the function $f(h) = \sum_{i=1}^{n} c_i[h_i > h_{i-1} \ and \ h_i > h_{i+1}]$

Bo have gotten the value of $c_1 \sim c_n$, and he wants to know the expected value of $f(h)$.

Input

This problem has multi test cases(no more than 12).

For each test case, the first line contains a non-negative integer $n(1 \leq n \leq 1000)$, second line contains n non-negative integer $c_i(0 \leq c_i \leq 1000)$.

Output

For each test cases print a decimal - the expectation of $f(h)$.

If the absolute error between your answer and the standard answer is no more than 10^{-4}, your solution will be accepted.

Sample Input

```
4
3 2 4 5
5
3 5 99 32 12
```

Sample Output

```
6.000000
52.833333
```

C - Life Winner Bo

Bo is a "Life Winner". He likes playing chessboard games with his girlfriend G.

The size of the chessboard is $N \times M$. The top left corner is numbered $(1,1)$ and the lower right corner is numberd (N,M).

For each game, Bo and G take turns moving a chesspiece (Bo first). At first, the chesspiece is located at $(1,1)$. And the winner is the person who first moves the chesspiece to (N,M). At one point, if the chess can't be moved and it isn't located at (N,M), they end in a draw.

In general, the chesspiece can only be moved right or down. Formally, suppose it is located at (x,y), it can be moved to the next point (x',y') only if $x' \geq x$ and $y' \geq y$. Also it can't be moved to the outside of chessboard.

Besides, There are four kinds of chess (They have movement rules respectively).

1. king.

2. rook (castle).

3. knight.

4. queen.

(The movement rule is as same as the chess.)

For each type of chess, you should find out that who will win the game if they both play in an optimal strategy.

Print the winner's name ("B" or "G") or "D" if nobody wins the game.

Input

In the first line, there is a number T as a case number.

In the next T lines, there are three numbers type, N and M.

"type" means the kind of the chess.

$T \leq 1000, 2 \leq N, M \leq 1000, 1 \leq type \leq 4$

Output

For each question, print the answer.

Sample Input

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

Sample Output

```
G
G
D
B
```

D - Gambler Bo

HDU - 5755

Gambler Bo is very proficient in a matrix game.

You have a $N \times M$ matrix, every cell has a value in $\{0,1,2\}$.

In this game, you can choose a cell in the matrix, plus 2 to this cell, and plus 1 to all the adjacent cells.

for example, you choose the cell (x,y), the value of (x,y) will be plused 2, and the value of $(x-1,y)(x+1,y)(x,y-1)(x,y+1)$ will be plused 1.

if you choose the cell $(1,2)$, the cell $(1,2)$ will be plused 2, and the cell $(2,2)(1,1)(1,3)$ will be plused 1, the cell $(0,2)$ won't be changed because it's out of the matrix.

If the values of some cells is exceed 2, then these values will be modulo 3.

Gambler Bo gives you such a matrix, your task is making all value of this matrix to 0 by doing above operations no more than $2NM$ times.

Input

First line, an integer T. There are T test cases.

In each test, first line is two integers N,M, and following N lines describe the matrix of this test case.

$T \leq 10, 1 \leq N,M \leq 30$, the matrix is random and guarantee that there is at least one operation solution.

Output

For each test, first line contains an integer $num(0 \leq num \leq 2NM)$ describing the operation times.

Following num lines, each line contains two integers $x,y(1 \leq x \leq N, 1 \leq y \leq M)$ describing the operation cell.

The answer may not be unique, you can output any one.

Sample Input

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

Sample Output

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

E - Boss Bo

There is a tree with N nodes, whose root is 1.

There are Q queries for you, for each query, we will give K numbers, which are $A_1, A_2, \ldots, A_K$.

For every node $x \in [1, N]$ in the tree, we assume it's good if there is not a node $y \in A$, such that y is the ancient of x or $y = x$

And we will give two numbers T, P to show the property of each query.

1. when $T = 1$, you should output the sum of the distance between every good node and P.

2. when $T = 2$, you should output the minimum distance between every good node and P.

3. when $T = 3$, you should output the maximum distance between every good node and P.

Let the distance between nodes in the tree be the shortest path between these two nodes. And we assume the length of each edge is 1.

Specially, the distance between two same nodes is 0.

For each query, if there is no nodes that is good, just output -1.

Input

There are several test cases.

For each test case, the first line contains two numbers N and Q.

For the following $N-1$ lines, each line contains two numbers u and v, indicating there is a edge between u and v in tree.

For the following Q lines, each line contains some numbers, which are $K, P', T, A_1, A_2, \ldots, A_K$ in order.

Let the answer of last query be $lastans$, then $P = (P' + lastAns) \mod N + 1$.

If the answer of last query is -1 or it's the first query, then $lastans = 0$.

Let the number of test cases be T, we guarantee $T = 30$.

80% test cases satisfy $N, K, Q \leq 10000$, $\sum K \leq 20000$.

100% test cases satisfy ~$P, N, K \leq 50000, Q \leq 100000, \sum K \leq 200000$.

Output

You should output Q lines in total, each line contains a number indicating the answer of each query.

Sample Input

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

```
3 3 3
6 5 3
```

Sample Output

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

F - Product Bo

Given N real numbers $a_1, a_2, \ldots, a_N$. Consider a subsequence of a: $1 \le s_1 < s_2 < \ldots < s_M \le N$. Define $f(s) = \prod_{i=1}^{M} a_{s_i}$. Your task is to figure out the K-th largest value of $f(s)$ among all the $\binom{N}{M}$ subsequences of length M (same values count multiple times).

It is known to all that multiplication of big numbers is troublesome. Therefore, we represent numbers in this format: first, a character '+', '-' or '0', indicating positive, negative, or zero respectively. If it's nonzero, then there follows a space and an integer in $[-10^9, +10^9]$, indicating the logarithm of the absolute value of this number to some fixed base which ≥ 1.

Input

Multiple test cases. For each test case, the first line contains three integers N, M, K. Then follows N lines, the i-th of which indicates a_i in the format described above. The input ends with a line $0\ 0\ 0$. It is guaranteed that $1 \le M \le N$, $1 \le K \le \binom{N}{M}$, $N, K \le 2 \times 10^5$.

Output

For each test case print the answer in the format described above.

Sample Input

```
3 2 2
+ 3
+ 7
- 2
3 2 2
+ -1
0
0
0 0 0
```

Sample Output

```
- 5
0
```

G - Explorer Bo

Explorer Bo likes exploring mazes around the world. Now he wants to explore a new maze.

The maze has N rooms connected with $N-1$ roads of length 1 so that the maze looks like a tree.

Explorer Bo can transfer to a room immediately or walk along a road which is not the one he walked just now.

Because the transfer costs too much, Mr Bo will minimum the transfer using times firstly.

Mr Bo wants to walk along all the roads at least once, but he is lazy and he wants to minimum the total length he walked.

Please help him!

Initial point can be arbitrarily selected

Input

The first line of input contains only one integer $T(=20)$, the number of test cases.

For each case, the first line contains 1 integers, $N(\leq 100000)$ as described before. The following $N-1$ lines describe the path. Each line has 2 integers, $X,Y(1<=X,Y<=N)$, that there is a road between X and Y.

Output

Each output should occupy one line. For each case, just output the minimum length to explore all roads.

Sample Input

```
2
3
1 2
2 3
7
1 2
1 3
2 4
2 5
3 6
3 7
```

Sample Output

```
2
8
```

H - Gardener Bo

Gardener Bo loves Trees. Now he asks you to help him take care of his lovely tree.

A rooted tree with root=1 is given. Every node on the tree has a value w_i. Let $fa[u]$ be the father of

u.

Let $LCA(u,v)$ be the least common ancestor of u and v. The expression $[condition]$ is 1 when $condition$ is True, is 0 when $condition$ is False.

Define

$$f(u)=\sum_{i=1}^{n}\sum_{j=i}^{n}(w_i+w_j)*[LCA(i,j)=u]$$

Now there are Q events happening. Each event has one of two types:

$1\ u\ x$: pick out all v that satisfies $v=u$ or $fa[v]=u$ or $fa[fa[v]]=u$, and add x to w_v.

$2\ u$: query $f(u) \bmod 2^{32}$.

Input

There are several test cases.

The first line contains two integers n, Q.

The second line contains $n-1$ integers, i-th indicates $fa[i+1]$.

The third line contains n integers, the i-th indicates the initial w_i.

Following Q lines each describes an event.

$1 \le n, Q \le 3 \times 10^5, |w_i|, |x| < 10^9$

Output

For every event with type 2, you should print a number indicating the answer.

Sample Input

```
5 3
1 1 3 3
-5 2 0 7 -6
1 5 2
2 3
2 2
10 5
1 2 3 3 1 2 6 2 2
-2 5 8 -6 0 -4 6 6 8 9
2 10
1 3 4
1 6 -2
2 9
2 4
```

Sample Output

```
6
4
18
16
4294967292
```

I - Palindrome Bo

There is an array with n elements named a. If seq is a palindrome subsequence of a, whose elements are increasing from the middle to both ends, then we call it a BoBo sequence.

Two BoBo sequence are considered different if and only if they have different length or there is at least one position has a different number.

Your task is to calculate how many different longest BoBo sequence are there in a.

Input

There are several test cases.

The first line contains an integer n.

The second contains n numbers indicating a_i.

$1 \leq n \leq 5000, 1 \leq a_i \leq 20000$

Output

One line two number indicating the length of the longest BoBo sequence and the quantity of them.

answer mod 10^9+7

Sample Input

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

Sample Output

```
5 1
4 1
```

J - Rower Bo

There is a river on the Cartesian coordinate system, the river is flowing along the x-axis direction.

Rower Bo is placed at $(0,a)$ at first. He wants to get to origin $(0,0)$ by boat. Boat speed relative to water is v_1, and the speed of the water flow is v_2. He will adjust the direction of v_1 to origin all the time.

Your task is to calculate how much time he will use to get to origin. Your answer should be rounded to four decimal places.

If he can't arrive origin anyway, print"Infinity"(without quotation marks).

Input

There are several test cases. (no more than 1000)

For each test case, there is only one line containing three integers a, v_1, v_2.

$0 \leq a \leq 100,\ \ 0 \leq v_1, v_2, \leq 100,\ \ a, v_1, v_2$ are integers

Output

For each test case, print a string or a real number.

If the absolute error between your answer and the standard answer is no more than 10^{-4}, your solution will be accepted.

Sample Input

```
2 3 3
2 4 3
```

Sample Output

```
Infinity
1.1428571429
```

K - Teacher Bo

Teacher BoBo is a geography teacher in the school. One day in his class, he marked N points in the map, the i-th point is at (X_i, Y_i). He wonders, whether there is a tetrad $(A, B, C, D)(A < B, C < D, A \neq C or B \neq D)$ such that the manhattan distance between A and B is equal to the manhattan distance between C and D.

If there exists such tetrad, print "YES", else print "NO".

Input

First line, an integer T. There are T test cases. $(T \leq 50)$

In each test case, the first line contains two intergers, N, M, means the number of points and the range of the coordinates. $(N, M \leq 10^5)$.

Next N lines, the i-th line shows the coordinate of the i-th point. $(X_i, Y_i)(0 \leq X_i, Y_i \leq M)$.

Output

T lines, each line is "YES" or "NO".

Sample Input

```
2
3 10
1 1
2 2
3 3
4 10
8 8
2 3
3 3
4 4
```

Sample Output

```
YES
NO
```