Codeforces Round #591 (Div. 1, based on Technocup 2020 Elimination Round 1)

A. Save the Nature

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are an environmental activist at heart but the reality is harsh and you are just a cashier in a cinema. But you can still do something!

You have n tickets to sell. The price of the i-th ticket is p_i. As a teller, you have a possibility to select the order in which the tickets will be sold (i.e. a permutation of the tickets). You know that the cinema participates in two ecological restoration programs applying them **to the order you chose**:

- The $x\%$ of the price of each the a-th sold ticket (a-th, $2a$-th, $3a$-th and so on) *in the order you chose* is aimed for research and spreading of renewable energy sources.
- The $y\%$ of the price of each the b-th sold ticket (b-th, $2b$-th, $3b$-th and so on) *in the order you chose* is aimed for pollution abatement.

If the ticket is in both programs then the $(x + y)\%$ are used for environmental activities. Also, it's known that all prices are multiples of 100, so there is no need in any rounding.

For example, if you'd like to sell tickets with prices $[400, 100, 300, 200]$ and the cinema pays 10% of each 2-nd sold ticket and 20% of each 3-rd sold ticket, then arranging them in order $[100, 200, 300, 400]$ will lead to contribution equal to $100 \cdot 0 + 200 \cdot 0.1 + 300 \cdot 0.2 + 400 \cdot 0.1 = 120$. But arranging them in order $[100, 300, 400, 200]$ will lead to $100 \cdot 0 + 300 \cdot 0.1 + 400 \cdot 0.2 + 200 \cdot 0.1 = 130$.

Nature can't wait, so you decided to change the order of tickets in such a way, so that the **total** contribution to programs will reach at least k in **minimum** number of sold tickets. Or say that it's impossible to do so. In other words, find the minimum number of tickets which are needed to be sold in order to earn at least k.

Input

The first line contains a single integer q ($1 \le q \le 100$) — the number of independent queries. Each query consists of 5 lines.

The first line of each query contains a single integer n ($1 \le n \le 2 \cdot 10^5$) — the number of tickets.

The second line contains n integers $p_1, p_2, \dots, p_n$ ($100 \le p_i \le 10^9$, $p_i \bmod 100 = 0$) — the corresponding prices of tickets.

The third line contains two integers x and a ($1 \le x \le 100$, $x + y \le 100$, $1 \le a \le n$) — the parameters of the first program.

The fourth line contains two integers y and b ($1 \le y \le 100$, $x + y \le 100$, $1 \le b \le n$) — the parameters of the second program.

The fifth line contains single integer k ($1 \le k \le 10^{14}$) — the required total contribution.

It's guaranteed that the total number of tickets per test doesn't exceed $2 \cdot 10^5$.

Output

Print q integers — one per query.

For each query, print the minimum number of tickets you need to sell to make the total ecological contribution of at least k if you can sell tickets in any order.

If the total contribution can not be achieved selling all the tickets, print -1.

Example

input

```
4
1
100
50 1
49 1
100
8
100 200 100 200 100 200 100 100
10 2
15 3
107
3
1000000000 1000000000 1000000000
50 1
50 1
3000000000
```

```
5
200 100 100 100 100
69 5
31 2
90
```

output

```
-1
6
3
4
```

Note

In the first query the total contribution is equal to $50 + 49 = 99 < 100$, so it's impossible to gather enough money.

In the second query you can rearrange tickets in a following way: $[100, 100, 200, 200, 100, 200, 100, 100]$ and the total contribution from the first 6 tickets is equal to $100 \cdot 0 + 100 \cdot 0.1 + 200 \cdot 0.15 + 200 \cdot 0.1 + 100 \cdot 0 + 200 \cdot 0.25 = 10 + 30 + 20 + 50 = 110$.

In the third query the full price of each ticket goes to the environmental activities.

In the fourth query you can rearrange tickets as $[100, 200, 100, 100, 100]$ and the total contribution from the first 4 tickets is $100 \cdot 0 + 200 \cdot 0.31 + 100 \cdot 0 + 100 \cdot 0.31 = 62 + 31 = 93$.

B. Sequence Sorting

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given a sequence $a_1, a_2, \dots, a_n$, consisting of integers.

You can apply the following operation to this sequence: choose some integer x and move **all** elements equal to x either to the beginning, or to the end of a. Note that you have to move all these elements in **one** direction in **one** operation.

For example, if $a = [2, 1, 3, 1, 1, 3, 2]$, you can get the following sequences in one operation (for convenience, denote elements equal to x as x-elements):

- $[1, 1, 1, 2, 3, 3, 2]$ if you move all 1-elements to the beginning;
- $[2, 3, 3, 2, 1, 1, 1]$ if you move all 1-elements to the end;
- $[2, 2, 1, 3, 1, 1, 3]$ if you move all 2-elements to the beginning;
- $[1, 3, 1, 1, 3, 2, 2]$ if you move all 2-elements to the end;
- $[3, 3, 2, 1, 1, 1, 2]$ if you move all 3-elements to the beginning;
- $[2, 1, 1, 1, 2, 3, 3]$ if you move all 3-elements to the end;

You have to determine the minimum number of such operations so that the sequence a becomes sorted in non-descending order. Non-descending order means that for all i from 2 to n, the condition $a_{i-1} \le a_i$ is satisfied.

Note that you have to answer q independent queries.

Input

The first line contains one integer q ($1 \le q \le 3 \cdot 10^5$) — the number of the queries. Each query is represented by two consecutive lines.

The first line of each query contains one integer n ($1 \le n \le 3 \cdot 10^5$) — the number of elements.

The second line of each query contains n integers $a_1, a_2, \dots, a_n$ ($1 \le a_i \le n$) — the elements.

It is guaranteed that the sum of all n does not exceed $3 \cdot 10^5$.

Output

For each query print one integer — the minimum number of operation for sorting sequence a in non-descending order.

Example

input

```
3
7
3 1 6 6 3 1 1
8
1 1 4 4 4 7 8 8
7
4 2 5 2 6 2 7
```

output

```
2
0
1
```

Note

In the first query, you can move all 1-elements to the beginning (after that sequence turn into $[1, 1, 1, 3, 6, 6, 3]$) and then move all 6-elements to the end.

In the second query, the sequence is sorted initially, so the answer is zero.

In the third query, you have to move all 2-elements to the beginning.

C. Paint the Tree

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given a weighted tree consisting of n vertices. Recall that a tree is a connected graph without cycles. Vertices u_i and v_i are connected by an edge with weight w_i.

Let's define the k-coloring of the tree as an assignment of exactly k colors to **each** vertex, so that each color is used no more than two times. You can assume that you have infinitely many colors available. We say that an edge is *saturated* in the given k-coloring if its endpoints share at least one color (i.e. there exists a color that is assigned to both endpoints).

Let's also define the *value* of a k-coloring as the sum of weights of *saturated* edges.

Please calculate the maximum possible *value* of a k-coloring of the given tree.

You have to answer q independent queries.

Input

The first line contains one integer q ($1 \le q \le 5 \cdot 10^5$) – the number of queries.

The first line of each query contains two integers n and k ($1 \le n, k \le 5 \cdot 10^5$) — the number of vertices in the tree and the number of colors to assign to each vertex, respectively.

Each of the next $n-1$ lines describes an edge of the tree. Edge i is denoted by three integers u_i, v_i and w_i ($1 \le u_i, v_i \le n$, $u_i \ne v_i$, $1 \le w_i \le 10^5$) — the labels of vertices it connects and the weight of the edge. It is guaranteed that the given edges form a tree.

It is guaranteed that sum of all n over all queries does not exceed $5 \cdot 10^5$.

Output

For each query print one integer — the maximum *value* of a k-coloring of the given tree.

Example

input

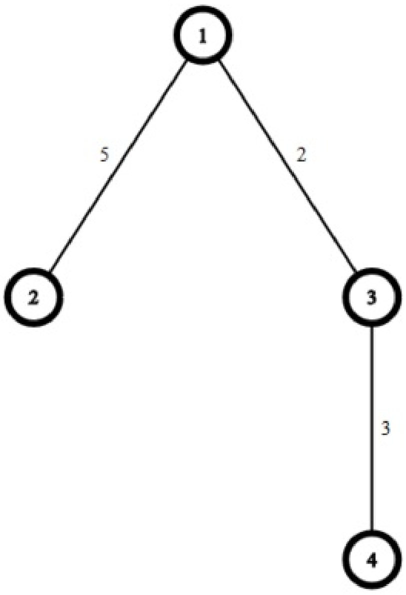
```
2
4 1
1 2 5
3 1 2
3 4 3
7 2
1 2 5
1 3 4
1 4 2
2 5 1
2 6 2
4 7 3
```

output

```
8
14
```

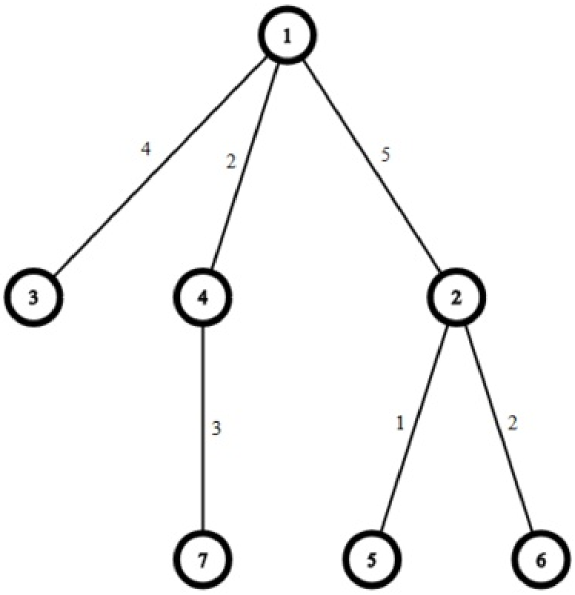
Note

The tree corresponding to the first query in the example:



One of the possible k-colorings in the first example: $(1), (1), (2), (2)$, then the 1-st and the 3-rd edges are saturated and the sum of their weights is 8.

The tree corresponding to the second query in the example:



One of the possible k-colorings in the second example: $(1, 2), (1, 3), (2, 4), (5, 6), (7, 8), (3, 4), (5, 6)$, then the 1-st, 2-nd, 5-th and 6-th edges are saturated and the sum of their weights is 14.

D. Stack Exterminable Arrays

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Let's look at the following process: initially you have an empty stack and an array s of the length l. You are trying to push array elements to the stack in the order $s_1, s_2, s_3, \dots s_l$. Moreover, if the stack is empty or the element at the top of this stack is not equal to the current element, then you just push the current element to the top of the stack. Otherwise, you don't push the current element to the stack and, moreover, pop the top element of the stack.

If after this process the stack remains empty, the array s is considered *stack exterminable*.

There are samples of stack exterminable arrays:

- $[1, 1]$;
- $[2, 1, 1, 2]$;
- $[1, 1, 2, 2]$;
- $[1, 3, 3, 1, 2, 2]$;
- $[3, 1, 3, 3, 1, 3]$;
- $[3, 3, 3, 3, 3, 3]$;
- $[5, 1, 2, 2, 1, 4, 4, 5]$;

Let's consider the changing of stack more details if $s = [5, 1, 2, 2, 1, 4, 4, 5]$ (the top of stack is highlighted).

1. after pushing $s_1 = 5$ the stack turn into $[\mathbf{5}]$;
2. after pushing $s_2 = 1$ the stack turn into $[5, \mathbf{1}]$;
3. after pushing $s_3 = 2$ the stack turn into $[5, 1, \mathbf{2}]$;
4. after pushing $s_4 = 2$ the stack turn into $[5, \mathbf{1}]$;
5. after pushing $s_5 = 1$ the stack turn into $[\mathbf{5}]$;
6. after pushing $s_6 = 4$ the stack turn into $[5, \mathbf{4}]$;
7. after pushing $s_7 = 4$ the stack turn into $[\mathbf{5}]$;
8. after pushing $s_8 = 5$ the stack is empty.

You are given an array $a_1, a_2, \ldots, a_n$. You have to calculate the number of its subarrays which are stack exterminable.

Note, that you have to answer q independent queries.

Input

The first line contains one integer q ($1 \le q \le 3 \cdot 10^5$) — the number of queries.

The first line of each query contains one integer n ($1 \le n \le 3 \cdot 10^5$) — the length of array a.

The second line of each query contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le n$) — the elements.

It is guaranteed that the sum of all n over all queries does not exceed $3 \cdot 10^5$.

Output

For each test case print one integer in single line — the number of stack exterminable subarrays of the array a.

Example

input

```
3
5
2 1 1 2 2
6
1 2 1 1 3 2
9
3 1 2 2 1 6 6 3 3
```

output

```
4
1
8
```

Note

In the first query there are four stack exterminable subarrays: $a_{1\ldots4} = [2, 1, 1, 2], a_{2\ldots3} = [1, 1], a_{2\ldots5} = [1, 1, 2, 2], a_{4\ldots5} = [2, 2]$.

In the second query, only one subarray is exterminable subarray — $a_{3\ldots4}$.

In the third query, there are eight stack exterminable subarrays: $a_{1\ldots8}, a_{2\ldots5}, a_{2\ldots7}, a_{2\ldots9}, a_{3\ldots4}, a_{6\ldots7}, a_{6\ldots9}, a_{8\ldots9}$.

E. Wooden Raft

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Suppose you are stuck on a desert island. The only way to save yourself is to craft a wooden raft and go to the sea. Fortunately, you have a hand-made saw and a forest nearby. Moreover, you've already cut several trees and prepared it to the point that now you have n logs and the i-th log has length a_i.

The wooden raft you'd like to build has the following structure: 2 logs of length x and x logs of length y. Such raft would have the area equal to $x \cdot y$. Both x **and** y **must be integers** since it's the only way you can measure the lengths while being on a desert island. And both x **and** y **must be at least** 2 since the raft that is one log wide is unstable.

You can cut logs in pieces but you can't merge two logs in one. What is the maximum area of the raft you can craft?

Input

The first line contains the only integer n ($1 \le n \le 5 \cdot 10^5$) — the number of logs you have.

The second line contains n integers $a_1, a_2, \dots, a_n$ ($2 \le a_i \le 5 \cdot 10^5$) — the corresponding lengths of the logs.

It's guaranteed that you can always craft at least 2×2 raft.

Output

Print the only integer — the maximum area of the raft you can craft.

Examples

input

```
1
9
```

output

```
4
```

input

```
9
9 10 9 18 9 9 9 28 9
```

output

```
90
```

Note

In the first example, you can cut the log of the length 9 in 5 parts: $2+2+2+2+1$. Now you can build 2×2 raft using 2 logs of length $x = 2$ and $x = 2$ logs of length $y = 2$.

In the second example, you can cut $a_4 = 18$ into two pieces $9+9$ and $a_8 = 28$ in three pieces $10+9+9$. Now you can make 10×9 raft using 2 logs of length 10 and 10 logs of length 9.

F. Football

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

There are n football teams in the world.

The Main Football Organization (MFO) wants to host at most m games. MFO wants the i-th game to be played between the teams a_i and b_i in one of the k stadiums.

Let s_{ij} be the numbers of games the i-th team played in the j-th stadium. MFO does not want a team to have much more games in one stadium than in the others. Therefore, for each team i, the absolute difference between the maximum and minimum among $s_{i1}, s_{i2}, \dots, s_{ik}$ should not exceed 2.

Each team has w_i — the amount of money MFO will earn for **each** game of the i-th team. If the i-th team plays l games, MFO will earn $w_i \cdot l$.

MFO needs to find what games in what stadiums they need to host in order to earn as much money as possible, not violating the rule they set.

However, this problem is too complicated for MFO. Therefore, they are asking you to help them.

Input

The first line contains three integers n, m, k ($3 \le n \le 100$, $0 \le m \le 1\,000$, $1 \le k \le 1\,000$) — the number of teams, the number of games, and the number of stadiums.

The second line contains n integers $w_1, w_2, \dots, w_n$ ($1 \le w_i \le 1\,000$) — the amount of money MFO will earn for each game of the i-th game.

Each of the following m lines contains two integers a_i and b_i ($1 \le a_i, b_i \le n$, $a_i \ne b_i$) — the teams that can play the i-th game. It is guaranteed that each pair of teams can play at most one game.

Output

For each game in the same order, print t_i ($1 \le t_i \le k$) — the number of the stadium, in which a_i and b_i will play the game. If the i-th game should not be played, t_i should be equal to 0.

If there are multiple answers, print any.

Example

input

```
7 11 3
4 7 8 10 10 9 3
6 2
6 1
7 6
4 3
4 6
```

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

output

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

Note

One of possible solutions to the example is shown below: