Problem A. Just A Beginning

Time limit 1000 ms
Mem limit 262144 kB

You're running a secret club where the password is always **YES**, but you're too chill to care about capitalization. Whether someone shouts **YES**, whispers **yes**, or gets creative with **YeS**, you're like, "Cool, you're in!" But if someone shows up with **Noo**, **orZ**, or anything else weird, it's a hard **NO**.

Your job? Be the bouncer for this club. For each guest, check their password and let them in with a **YES** if they nailed it (in any case), or slam the door with a **NO** if they didn't.

Input

The first line of the input contains an integer t ($1 \leq t \leq 10^3$) — the number of testcases.

The description of each test consists of one line containing one string s consisting of three characters. Each character of s is either an uppercase or lowercase English letter.

Output

For each test case, output "`YES`" (without quotes) if s satisfies the condition, and "`NO`" (without quotes) otherwise.

Examples

Input	Output
7 YES yES Yes YeS Noo Yas XES	YES YES YES YES NO NO NO

Problem B. Lets Play A Game

Time limit 1000 ms
Mem limit 524288 kB

Background

There are N students and M video games. Each student only likes to play one specific game and each game has at least one student who likes it. The school organizes a LAN connection for the computers over Q minutes, where in the i-th minute, it connects the computers of students U_i and V_i (considered as an undirected graph). All students who like to play the same type of game will start playing when their computers are connected (they can pass through vertices containing other games). What is the starting time for each game?

If a game has only 1 person who likes it, it will start at minute 0

If 1 type of game cannot be connected after Q minutes, output -1 for that game

Input

Line 1: N, M, Q corresponding to the number of students, number of games, number of minutes (each minute connects 1 LAN cable)

Line 2: Contains N numbers A_i describing the game that the i-th student likes

Q subsequent lines: each line contains 2 numbers U_i and V_i

Output

Consists of M lines, the i-th line is the starting time for game i

Constraints

- $1 \leq N, M \leq 10^5$.
- $0 \leq Q \leq 10^5$

<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td><pre>5 2 4
1 2 2 2 1
1 2
2 3
1 5
4 5</pre></td><td><pre>3
4</pre></td></tr>
</table>

Problem C. Guess The Score

Time limit	1000 ms
Mem limit	1048576 kB
OS	Windows

Problem Statement

In a Codeforces competition, there are usually **n** questions. Each question has:

- An initial score $\mathbf{a_i}$.
- A score deduction per minute $\mathbf{b_i}$.
- A minimum score that can be obtained $\mathbf{c_i}$.

Additionally, each incorrect submission will reduce your score for that question by 50 points. Specifically, if you submit a question and pass it at time $\mathbf{t_i}$ minutes with $\mathbf{s_i}$ submissions, your score for this question is calculated as:

$$\mathbf{score_i = max(c_i, a_i - b_i \times t - 50 \times (s - 1))}$$

If you fail to pass the question regardless of the number of submissions, your score for that question is **0**.

Given the competition's question information and YiYi's submission information, calculate her total score across all questions.

Input

The input consists of multiple lines:

1. The first line contains an integer **n** ($1 \le n \le 10^3$), representing the number of questions in the competition.
2. The second line contains **n** integers $\mathbf{a_1, a_2, ..., a_n}$ ($1 \le a_i \le 10^6$), representing the initial score of each question.
3. The third line contains **n** integers $\mathbf{b_1, b_2, ..., b_n}$ ($1 \le b_i \le a_i$), representing the points deducted per minute for each question.
4. The fourth line contains **n** integers $\mathbf{c_1, c_2, ..., c_n}$ ($1 \le c_i \le a_i$), representing the minimum score achievable for each question.

5. The next **n** lines each contain two integers $\mathbf{t_i}$ and $\mathbf{s_i}$:
   - $\mathbf{t_i}$ ($0 \le t_i \le 10^3$) represents the time in minutes when the last submission for the **i-th** question was made.
   - $\mathbf{s_i}$ ($-10^3 \le s_i \le 10^3$) indicates the number of submissions and the outcome:
     - If $\mathbf{s_i > 0}$, it means the last submission passed and $\mathbf{s_i}$ is the total number of submissions.
     - If $\mathbf{s_i \le 0}$, it means the question was not passed, and the score for this question is **0**.

Output

Output a single integer representing YiYi's total score across all questions.

Examples

Input

```
5
7 1 2 6 5
3 1 2 2 1
3 1 1 4 2
1 1
0 2
0 1
15 -3
11 5
```

Output

```
9
```

Input

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

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

Output

```
0
```

Input

```
7
250 750 1250 3333 4444 5555 6666
1 2 3 4 5 6 7
1 1 1 1 1 1 1
0 1
1000 1
32 2
999 -1000
872 1
12 3
0 0
```

Output

```
6822
```

Problem D. Ethical or Unethical

Time limit 4000 ms
Mem limit 262144 kB

Shohan is trying to solve this problem with chatGPT but he can not. So, he needs your help.

Prince has n contacts stored on his phone, each represented by a unique 9-digit phone number. Every number starts with a non-zero digit, and all the numbers in his contact list are distinct.

The phone runs the latest version of GEMINI OS. When a sequence of digits is entered, GEMINI OS displays all contact numbers containing the entered sequence as a substring. For example, if the contact list includes the numbers 987654321, 908172635, and 123908456:

- Entering 908 will display two numbers: 908172635 and 123908456.
- Entering 987 will display only one number: 987654321.
- Entering 172 will display only one number: 908172635.

The task is to determine the shortest sequence of digits for each phone number in Prince's contacts so that when this sequence is entered, GEMINI OS displays only that specific phone number.

Input

The first line contains single integer n ($1 \le n \le 70000$) — the total number of phone contacts in Prince's contacts.

The phone numbers follow, one in each line. Each number is a positive 9-digit integer starting with a digit from 1 to 9. All the numbers are distinct.

Output

Print exactly n lines: the i-th of them should contain the shortest non-empty sequence of digits, such that if Prince enters it, the GEMINI OS shows up only the i-th number from the contacts. If there are several such sequences, print any of them.

Examples

<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td>3
123456789
100000000
100123456</td><td>9
000
01</td></tr>
</table>

<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td>4
123456789
193456789
134567819
934567891</td><td>2
193
81
91</td></tr>
</table>

Problem E. Hungry Adults!

Time limit 1000 ms
Mem limit 524288 kB

You are organizing a **New Year Party** and you have **D** tasty dishes. There are **X** adults and **Y** kids at the party. Every adult will finish their dish completely, while each kid will only eat part of their dish. For each dish, **you know how much happiness it gives if an adult eats it all or if a kid eats part of it.**

Your goal is to give each person exactly one dish, making sure you choose the best way to maximize the total happiness at the party.

Input

The first line contains one number **T** - the number of test cases.

For each test case:
The first line has 3 numbers **D, X,** and **Y** - the number of dishes, the number of adults, and the number of kids, respectively.

The next **D** lines describe the dishes. Each line has two numbers F_i and P_i — the happiness an adult gets if they eat the **i-th** dish completely, and the happiness a kid gets if they eat the **i-th** dish partially.

$1 \le T \le 10^6$,

$1 \le D \le 10^5$,

$0 \le X, Y \le 10^5$,

$X + Y \le D$,

$0 \le P_i, F_i \le 10^9$

The sum of D over all test cases does not exceed 10^6,

Output

For each test case, print the maximum happiness you can get by distributing the dishes to the adults and kids.

Sample

<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td><pre>2
2 1 1
30 12
20 1
3 1 1
20 10
12 10
15 15</pre></td><td><pre>32
35</pre></td></tr>
</table>

Problem F. Chop Chop Split

Time limit 2000 ms
Mem limit 262144 kB

Akib and Sabbir have n items they'd like to split between them, so they decided to play a game. All items have a cost, and the i-th item costs a_i. Players move in turns starting from Akib.

In each turn, the player chooses one of the remaining items and takes it. The game goes on until no items are left.

Let's say that A is the total cost of items taken by Akib and S is the total cost of Sabbir's items. The resulting *score* of the game then will be equal to $A - S$.

Akib wants to maximize the score, while Sabbir wants to minimize it. Both Akib and Sabbir will play optimally.

But the game will take place tomorrow, so today Sabbir can modify the costs a little. He can increase the costs a_i of several (possibly none or all) items by an integer value (possibly, by the same value or by different values for each item). However, the total increase must be less than or equal to k. Otherwise, Akib may suspect something. Note that Sabbir **can't decrease** costs, only increase.

What is the minimum possible score Sabbir can achieve?

Input

The first line contains a single integer t ($1 \le t \le 5000$) — the number of test cases. Then t cases follow.

The first line of each test case contains two integers n and k ($2 \le n \le 2 \cdot 10^5$; $0 \le k \le 10^9$) — the number of items and the maximum total increase Sabbir can make.

The second line of each test case contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$) — the initial costs of the items.

It's guaranteed that the sum of n over all test cases doesn't exceed $2 \cdot 10^5$.

Output

For each test case, print a single integer — the minimum possible score $A - B$ after Sabbir increases the costs of several (possibly none or all) items.

Examples

Input	Output
4 2 5 1 10 3 0 10 15 12 4 6 3 1 2 4 2 4 6 9	4 13 0 0

Note

In the first test case, Sabbir can increase a_1 by 5, making costs equal to $[6, 10]$. Tomorrow, Akib will take 10 and Sabbir will take 6. The total score will be equal to $10 - 6 = 4$, and it's the minimum possible.

In the second test case, Sabbir can't change costs. So the score will be equal to $(15 + 10) - 12 = 13$, since Akib will take 15, Sabbir will take 12, and Akib — 10.

In the third test case, Sabbir, for example, can increase a_1 by 1, a_2 by 3, and a_3 by 2. The total change is equal to $1 + 3 + 2 \le 6$ and costs will be equal to $[4, 4, 4, 4]$. Obviously, the score will be equal to $(4 + 4) - (4 + 4) = 0$.

In the fourth test case, Sabbir can increase a_1 by 3, making costs equal to $[9, 9]$. The score will be equal to $9 - 9 = 0$.

Problem G. kingdom of Archivia

Time limit 4000 ms
Mem limit 524288 kB

In the kingdom of Archivia, there was a grand festival where N scrolls were created to preserve the most famous knowledge fragments of that era. Each scroll contained exactly one fragment, and all fragments were unique. Each fragment had a length of K characters, and they were written one after another in a circular parchment without any gaps or overlaps. Years later, the parchment was rediscovered, but the fragments were no longer clearly distinguishable as the circular parchment had been rotated and split at an arbitrary position. Fortunately, a list of G candidate fragments from that era has been preserved. All fragments on the parchment are guaranteed to be among these candidates, and no fragment appears more than once on the parchment.

Your task is to determine:

- If it is possible to identify the exact sequence of fragments on the parchment.
- If it is possible, provide any valid sequence of fragments in the order they could have been written on the parchment.

Input

1. The first line contains two positive integers, N and K:

- N : the number of fragments on the parchment.
- K : the length of each fragment.

2. The second line contains a string of length N*K , consisting of lowercase English letters. This represents the text written on the circular parchment.It is guaranteed that the length is not greater than 10^6.

3. The third line contains a positive integer, G (N <= G <= 10^5) — the number of candidate fragments.It is guaranteed that the total length of names of all candidate fragment is not greater than $2 \cdot 10^6$.

4. Each of the next G lines contains a single string of length K , representing a candidate fragment. All candidate fragments are distinct.

Output

• If it is impossible to determine the sequence of fragments, print:NO

• If it is possible, print: YES. Followed by N integers, representing the indices of the fragments in the candidate list (1-based indexing). The fragments should be listed in the order they appear on the parchment, starting from any valid position.

Examples

Input	Output
3 1 abc 4 b a c d	YES 2 1 3

Input	Output
4 2 aabbccdd 4 dd ab bc cd	NO

Problem H. Magical Artifacts

Time limit 2000 ms
Mem limit 262144 kB

In a distant kingdom, a wise king has n magical artifacts numbered sequentially from 1 to n. These artifacts are to be displayed in a grand parade, but the king insists on a special arrangement to showcase their magical properties:

Phase 1: The artifacts with odd numbers (1,3,5,...) are displayed first, in ascending order.
Phase 2: Next, artifacts that are twice the value of an odd number (2×1,2×3,2×5,...) are displayed in ascending order.
Phase 3: Then, artifacts that are three times the value of an odd number (3×1,3×3,3×5,...) are displayed in ascending order.
Phase 4: This process continues for artifacts that are four times, five times, and so on, the value of an odd number, until all n artifacts are part of the parade.

Once all the artifacts are arranged for display, you, the royal historian, are tasked with determining which artifact appears at the **k-th** position in the parade.

Input

The first line contains a single integer t ($1 \le t \le 50{,}000$) — the number of test cases. Each of the next t lines contains two integers n and k ($1 \le k \le n \le 10^9$) — the total number of artifacts and the position in the parade you need to identify.

Output

For each test case, output the number of the artifact that appears at the k**-th** position in the parade.

Examples

Input	Output
11 7 1 7 2 7 3 7 4 7 5 7 6 7 7 1 1 34 14 84 19 1000000000 1000000000	1 3 5 7 2 6 4 1 27 37 536870912

Note

In the first seven test cases where $n=7$, the king arranges the magical artifacts as follows:

Phase 1: He begins by displaying all the artifacts with odd numbers, arranged from smallest to largest. The order is 1,3,5,7.

Phase 2: Next, he displays all the artifacts that are double the value of an odd number, also in ascending order. These artifacts are 2,6.

Phase 3: Since there are no artifacts that are three times an odd number (as $3\times3=9>n$), this phase is skipped.

Phase 4: Then, he displays all artifacts that are four times an odd number. Only one such artifact exists: 4.

Phase 5: As all the artifacts have now been displayed, the king concludes the arrangement. Therefore, the final display sequence of artifacts is: 1,3,5,7,2,6,4.

Problem I. Rabbits Don't Care, Code-er Logic!

Time limit 2000 ms
Mem limit 1048576 kB
OS Windows

The little white rabbit has a magical palette with a grid of n rows and m columns. Before starting to mix the colors, the little white rabbit will squeeze a kind of pigment to the left of each row, denoted by $a_1, a_2, \ldots, a_n$, and also squeeze a kind of pigment above each column, denoted by $b_1, b_2, \ldots, b_m$.

There are a total of $n \times m$ kinds of selectable pigments, represented by integers $0, 1, 2, \ldots, nm - 1$ for different pigments. Then, in the cell of the i-th row and the j-th column, the little white rabbit will mix a color $c_{i,j} = a_i b_j \bmod nm$ using the pigment a_i to the left of the i-th row and the pigment b_j above the j-th column.

The little white rabbit hopes that each of the $n \times m$ cells has a different color, and you need to find out whether it can be achieved.

Input

The first line of the input contains an integer T ($1 \leq T \leq 10^4$), indicating the number of test cases. For each test case:

The only line contains two integers n and m ($1 \leq n, m \leq 10^6$, $1 \leq n \times m \leq 10^6$), indicating the number of rows and the number of columns.

It is guaranteed that the sum of $n \times m$ over all test cases does not exceed 10^6.

Output

For each test case, if no solution exists, output "`No`" (without quotes) in one line. Otherwise, output three lines:

- The first line contains one string "`Yes`" (without quotes).
- The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \leq a_i < nm$).
- The third line contains m integers $b_1, b_2, \ldots, b_m$ ($0 \leq b_i < nm$).

Examples

Input	Output
2 2 3 2 2	Yes 1 2 1 3 5 No

Note

For the first sample case, $[c_{1,1}, c_{1,2}, c_{1,3}, c_{2,1}, c_{2,2}, c_{2,3}] = [1, 3, 5, 2, 0, 4]$, which are pairwise different.