Problem 1001. Pandaemonium Asphodelos: The First Circle (Savage)

Oops, there is something wrong with the Pandaemonium. The friend of Azem, Themis, is just waiting for you to have a look together.

Oh no, rattled Erichthonios, who is the guard of Pandaemonium, misunderstanding you as enemies, starts attacking you. Can you protect yourself and Themis until he calms down?

To simplify the problem, Themis' defending system have n blocks in a line. All the blocks have a initial weight 0 and the same attribute. Erichthonios will perform following 4 kinds of attack q times:

- $1\ x\ c$: Erichthonios uses his chain to connect the x-th block and all $\mathbf{closest}\ 2c$ blocks, giving them a new attribute (overlapping the origin atrributes of the blocks).
- $2\ x\ y$: Erichthonios copies the attribute of x-th block to y-th and all y-th block's $\mathbf{nearby}$, $\mathbf{continuous}$, $\mathbf{sameattribute}$, $\mathbf{longest}$ blocks. (A segment of same attribute blocks containing y-th, and the left adjacent block of the segment has a different attribute or is out of boundary, so as right.)
- $3\ x\ v$: Erichthonios makes the weight of all the blocks with the same attribute as x-th block increase by v.
- $4\ x$: Erichthonios attacks the defending system. Only if you output the weight of the x-th block, can you defend it.

Attention: Since you don't know what Erichthonios will do next, there is encoding with the queries. (See the $\mathbf{input}$)

If you couldn't solve this problem, you will be laughed at by Hythlodaeus later. You don't want to be like that, right?

Input

Each test contains multiple test cases. The first line contains the number of test cases $(1 \leq T \leq 20)$. Description of the test cases follows.

The first line contains two integers n and q ($3 \leq n \leq 10^8$, $1 \leq q \leq 10^5$) -- The number of Themis defending system blocks, and the number of attacks that Erichthonios will perform.

The following q lines contains Erichthonios' attacks, (initially, $last = 0$):

- $1\ x'\ c'$: contains 3 integers, $1 \leq x' \leq n$, $1 \leq c' \leq \lfloor \frac{n-1}{2} \rfloor$, actually, $x = \big((x'-1) \oplus last\big) \mod n + 1$, $c = \big((c'-1) \oplus last\big) \mod \lfloor \frac{n-1}{2} \rfloor + 1$.
- $2\ x'\ y'$: contains 3 integers, $1 \leq x' \leq n$, $1 \leq y' \leq n$, actually, $x = \big((x'-1) \oplus last\big) \mod n + 1$, $y = \big((y'-1) \oplus last\big) \mod n + 1$.
- $3\ x'\ v$: contains 3 integers, $1 \leq x' \leq n$, $1 \leq v \leq 10^9$, actually, $x = \big((x'-1) \oplus last\big) \mod n + 1$, and there is no encode with v, $1 \leq v \leq 10^9$.
- $4\ x'$: contains 2 integers, $1 \leq x' \leq n$, actually, $x = \big((x'-1) \oplus last\big) \mod n + 1$, after you get the $Answer$, don't forget to update, $last = Answer\ \&\ 1\,073\,741\,823$.

Where $\oplus$ means bitwise XOR operation, and $\&$ means bitwise AND operation.

It is guaranteed that the sum of n does not exceed $2 \cdot 10^9$ and the sum of m does not exceed 10^6

Output

For each test case:

For each 4-th attack, print one integer in a line --- the weight of the block.

Example Input

```
1
16 12
3 10 16
4 2
1 1 6
1 5 6
1 9 7
1 15 7
2 2 10
2 2 13
3 1 16
4 16
4 9
4 4
```

Example Output

```
16
32
32
16
```

Hint

The decoded attacks in example:

3, x = 10 , v = 16

4, x = 2

1, x = 1 , c = 1

1, x = 5 , c = 1

1, x = 9 , c = 2

1, x = 15 , c = 2

2, x = 2 , y = 10

2, x = 2 , y = 13

3, x = 1 , v = 16

4, x = 16

4, x = 9

4, x = 4

Problem 1002. Jo loves counting

Jo loves his teammate Ky's rick and roll! But he more than loves counting.

Jo thinks, for two numbers n and d (d is a factor of n), $d \in Good_n$ if and only if the prime factor set of d **equals** to that of n. That is, $Good_n = \{d \mid n \bmod d = 0 \land \forall p \in Prime \to (d \bmod p = 0 \leftrightarrow n \bmod p = 0)\}$.

For example, $Good_{12} = \{6, 12\}$, since the factors of 12 are $\{1, 2, 3, 4, 6, 12\}$. $\{2, 3\}$ are prime factors of 12, so all its factors of their good factors must contain prime factors $2, 3$. Therefore, only $6, 12$ satisfy the condition.

For a number n, Jo will select a factor d randomly from $Good_n$ with equal possibility. if $d = n$, then the rich Jo will pay you n yuan as reward. Otherwise, you will gain nothing.

Ky, the man who treats money as dirt, wants to choose an integer from $[1, M]$ randomly for Jo's game. Help Ky calculate the expectation of money he can get.

Input

The first line contains an integer $T(T \le 12)$. Then T test cases follow.

For each test case, there is only one integer $M(1 \le M \le 10^{12})$.

It's guaranteed that there are at most 6 cases such that $M > 10^6$.

Output

For each test case, output one integer in a single line --- the expectation of the money Ky can get.

Since it can be too large, print it modulo $4179340454199820289 (= 29 \cdot 2^{57} + 1)$.

Example Input

```
1
4
```

Example Output

```
2
```

Hint

$Good_1 = \{1\}$

$Good_2 = \{2\}$

$Good_3 = \{3\}$

$Good_4 = \{2, 4\}$

Therefore, the answer is $\frac{1}{4}(\frac{1}{|Good_1|} + \frac{2}{|Good_2|} + \frac{3}{|Good_3|} + \frac{4}{|Good_4|}) = \frac{1}{4}(\frac{1}{1} + \frac{2}{1} + \frac{3}{1} + \frac{4}{2}) = 2$.

Problem 1003.Slipper

Gi is a naughty child. He often does some strange things. Therefore, his father decides to play a game with him.

Gi's father is a senior magician, he teleports Gi and Gi's Slipper into a labyrinth. To simplify this problem, we regard the labyrinth as a tree with n nodes, rooted at node 1. Gi is initially at node s, and his Slipper is at node t. In the tree, going through any edge between two nodes costs w unit of power.

Gi is also a little magician! He can use his magic to teleport to any other node, if the depth difference between these two nodes equals to k. That is, if two nodes u, v satisfying that $|dep_u - dep_v| = k$, then Gi can teleport from u to v or from v to u. But each time when he uses magic he needs to consume p unit of power. Note that he can use his magic any times.

Gi want to take his slipper with minimum unit of power.

Input

Each test contains multiple test cases. The first line contains the number of test cases $(1 \leq T \leq 5)$. Description of the test cases follows.

The first line contains an integer n --- The number of nodes in the tree. $2 \leq n \leq 10^6$

The following $n-1$ lines contains 3 integers u, v, w that means there is an edge between nodes u and v. Going through this edge costs w unit of power. $1 \leq u, v \leq n, 1 \leq w \leq 10^6$

The next line will contain two separated integers k, p. $1 \leq k \leq \max_{u \subseteq V}(dep_u), 0 \leq p \leq 10^6$

The last line contains two positive integers s, t, denoting the positions of Gi and slipper. $1 \leq s \leq n, 1 \leq t \leq n$. It is guaranteed the $s \neq t$.

Output

For each test case:

Print an integer in a line --- the minimum unit of power Gi needs.

Example Input

```
1
6
6 1 2
3 5 2
2 4 6
5 2 2
5 6 20
3 8
6 5
```

Example Output

```
12
```

Hint

Example1: Gi can go from node 6 to node 1 using 2 units of power. Then he teleports from node 1 to node 2 using 8 units of power. Finally, he goes from node 2 to node 5 using 2 units of power.
$Total\ cost = 2 + 8 + 2 = 12$

Problem 1004. Jo loves counting

As we know, Civil Engineering is the best specialty in the world. To transfer from Computer Science to Civil Engineering, Kuki needs to preview Surveying, the compulsory course.

There are m buildings in this city. Each building can be regarded as a rectangle. The four vertices of the retangle are the Detail Points.

Before starting measurement, Kuki found n positions and would set some of these positions as Control Points. At a Control Point, Kuki can measure all positions within the field of vision. A position can be measured if there is nothing (building or Detail Point) on the segment between this position and a Control Point. In addition, every Control Point should be measured by at least one other Control Points.

Kuki wants to set the mininum number of Control Points to survey all Detail Points. Please help her solve this problem.

Input

Each test contains multiple test cases. The first line contains the number of test cases $T(1 \le T \le 10)$. Description of the test cases follows.

There is only one test case in each test file.

The first line of the input contains two integers n and m $(1 \le n \le 20, 1 \le m \le 100)$ indicating the number of stations and the number of buildings.

For the following n lines, the i-th line contains two integers x_i and y_i $(-2 \times 10^6 \le x_i, y_i \le 2 \times 10^6)$ indicating that the coordinate of the i-th station.

For the following m lines, the i-th line contains eight integers $x_{i1}, y_{i1}, x_{i2}, y_{i2}, x_{i3}, y_{i3}, x_{i4}, y_{i4}$ $(-2 \times 10^6 \le x_{i1}, y_{i1}, x_{i2}, y_{i2}, x_{i3}, y_{i3}, x_{i4}, y_{i4} \le 2 \times 10^6)$ indicating that the four vertices of the i-th building. The coordinates are given in counter-clockwise order starting from the top-right corner. It's guaranteed that the boundaries of buildings are parrallel to the coordinate axes. Any two buildings will not intersect or contain. Building boundaries will not overlap.

It's guaranteed that the stations will not be inside or on the boundary of buildings.

Output

For each test case:

If it's impossible to measure all Detail Points, print "No Solution!" in a single line (without quotes).

Otherwise, print one interger in one line indicating the mininum number of Control Points

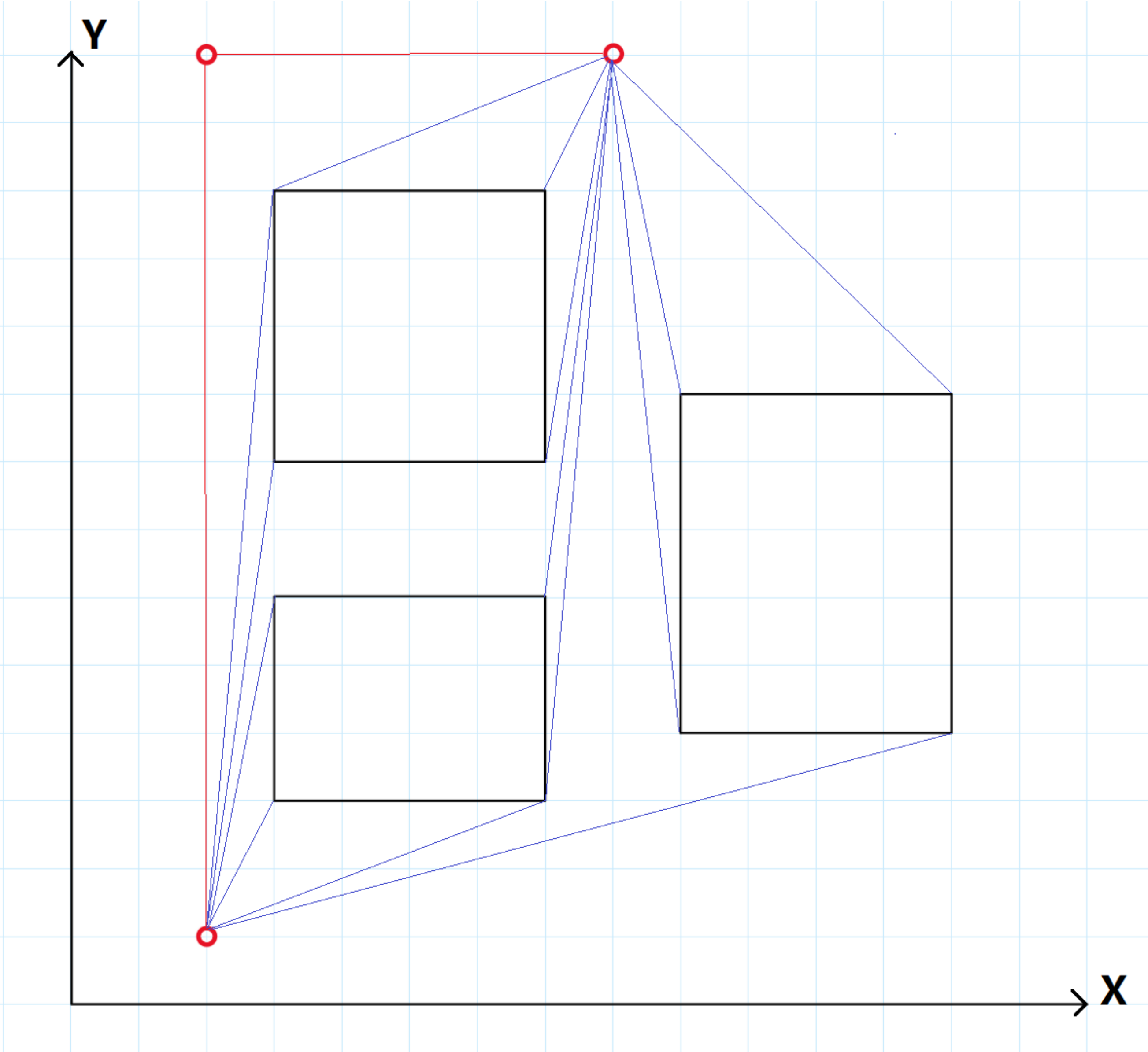
Example Input

```
1
3 3
2 1
2 14
8 14
7 6 3 6 3 3 7 3
7 12 3 12 3 8 7 8
13 9 9 9 9 4 13 4
```

Example Output

```
3
```

Hint

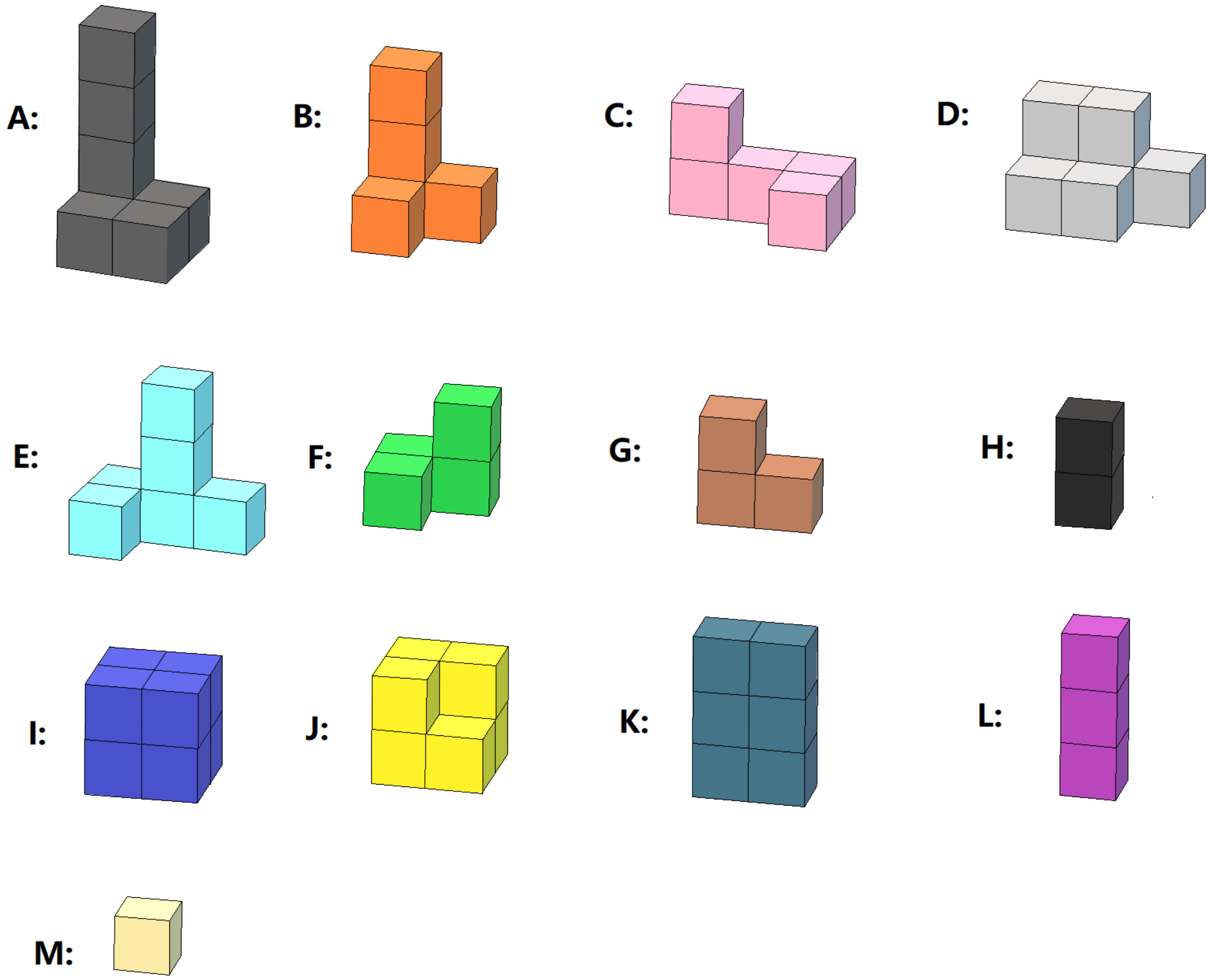


Problem 1005. 3D Puzzles

Klee likes toys. Klee's mom, Alice bought her a new toy from Sumeru.

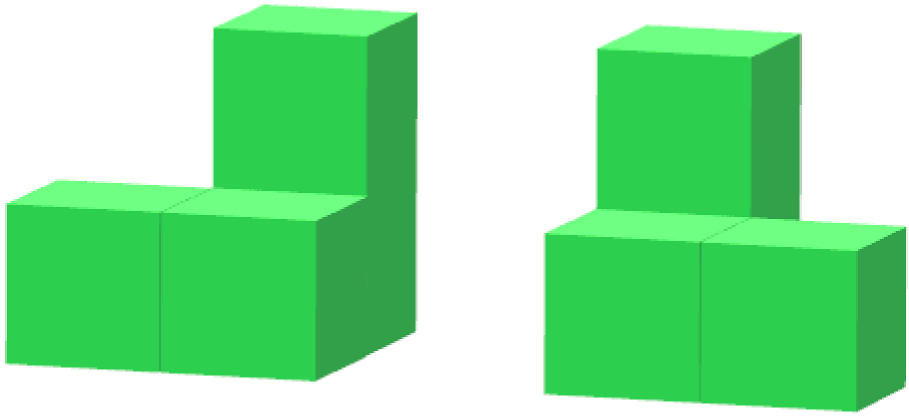
The toy is a $4 \times 4 \times 4$ cube. The cube can be divided into 13 different parts of the blocks.

The 13 blocks are shown in the figure.



Each block can be placed anywhere in the cube, but cannot overlap.

Klee can freely rotate the blocks and use a kind of magic, mirror magic. After using mirror magic, the blocks will flip symmetrically. For example, block F is shown in the figure after using mirror magic.



At the beginning, Alice has put some blocks in place. Klee needs to put the remaining blocks into a $4 \times 4 \times 4$ cube.

Using Astrology, Alice knew the number of solutions will not exceed 500 .

Klee wants to know all the solutions of this puzzle, but it is too difficult for Klee. Please help her.

Input

Each test contains multiple test cases. The first line contains the number of test cases $T(1 \le T \le 10)$. Description of the test cases follows.

There are 16 lines in a case. Each line contains a string of 4 characters. Every 4 lines describe one layer of the cube from top to bottom.

Each input character may only be upper-case letters from "A" to "M" or ".".

"A" to "M" are indicating the blocks in the figure above and "." are indicating the position is empty.

Output

For each test case:

If it's impossible to solve the puzzle, print "No Solution!" in a single line (without quotes).

Otherwise, print the number of solutions in the first line.

Then for each solution, print 16 lines. Each line contains a string of 4 characters. Every 4 lines describe one layer of the cube from top to bottom.

Each input character may only be upper-case letters from "A" to "M", indicating the blocks in the figure above.

The output format of block is the same as input.

If there are multiple solutions, print them in the lexicographical order.

Example Input

```
2
E...
EEE.
E...
...L
E...
....
....
...L
JJ..
GJ..
GII.
HIIL
JJ..
JJ..
GII.
HIIM
E...
EEE.
E...
...L
E...
....
....
...L
JJ..
GJ..
G...
H..L
JJ..
JJ..
G...
H..M
```

Example Output

```
1
ECCC
EEEC
EDDD
BDDL
ECKK
AAAA
BDDA
BBBL
JJKK
GJFA
```

```
GIIA
HIIL
JJKK
JJFF
GIIF
HIIM
2
ECCC
EEEC
EDDD
BDDL
ECKK
AAAA
BDDA
BBBL
JJKK
GJFA
GIIA
HIIL
JJKK
JJFF
GIIF
HIIM

EKKK
EEEA
EBBA
DDBL
EKKK
AAAA
DDBA
DDDL
JJII
GJII
GFBC
HFFL
JJII
JJII
GCCC
HCFM
```

Hint

3D Model for the first example.
Download and open it with paint 3D.
https://share.weiyun.com/5iX1150Z

Problem 1006. BBQ

Today is XllX's birthday. XllX wants to go to barbecue with his good friends. They go to a supermarket and get a lot of food. Then they ride to Laoyingzui, a good place to barbecue outside.

XllX thinks a perfect barbecue string must satisfy the property that it is in a format of $abba$ (just like his name). That is, a perfect barbecue string s satisfies that $s_i = s_{i+3}$, $s_{i+1} = s_{i+2}$ ($i \equiv 1 \pmod 4$, $len \equiv 0 \pmod 4$), the index starts from 1 . Note that, empty string is a perfect string.

However, XllX is too busy to prepare the barbecue string. It might not be a perfect string. Now you can modify, add or delete one letter in 1 unit of time. Can you transfer the barbecue string into a perfect string in minimum unit of time?

Input

Each test contains multiple test cases. The first line contains the number of test cases $(1 \le T \le 12)$. Description of the test cases follows.

Only one string stands for the barbecue string. It is guaranteed that the length of the string is not greater than 10^6. All the letters of the string is in lowercase.

Output

For each test case:

Print one integer in a line --- the minimum unit of time.

Example Input

```
1
abbba
```

Example Output

```
1
```

Problem 1007.Count Set

Given a permutation p of $\{1, 2, \cdots, n\}$ and a non-negative integer k. Please calculate the number of subsets T of $\{1, 2, 3, 4, \ldots n\}$ satisfying $|T| = k$ and $|P(T) \cap T| = 0$.

Where $P(T)$ means $P(T) = \{y|y = p_x, x \in T\}$.

Input

Each test contains multiple test cases. The first line contains the number of test cases $(1 \leq T \leq 15)$. Description of the test cases follows.

The first line contains two separated integers n, k.

The second line contains n integers $p_1, p_2, \cdots, p_n$ $(1 \leq p_i \leq n)$, denoting the given permutation.

$1 \leq n \leq 5 \times 10^5, 0 \leq k \leq n$.

For all test cases , $\sum n \leq 5 \times 10^6$

Output

For each test case:

Print one integer in a line, denoting the answer number modulo $998\,244\,353$.

Example Input

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

Example Output

```
5
5
40
```

Problem 1008. AC/DC

Description

J likes playing electric guitar, especially the famous guitar model - Gibson SG Standard. He always composes music with his Gibson SG Standard.

A tune he composes is made up of several notes. Formally, a **tune** can be regarded as a string consisting of only lower-case letters. Different letters stands for different notes. A substring of a tune is called **phrase**.

At the beginning, J has a tune of length n. To create new music, J has three operations:

- `1 c` : Insert a note c at the end of the current tune.
- `2` : Delete the note at the beginning of the current tune.
- `3 t` : Query the number of the phrase t appears in the current tune.

Now, J is busy with his new album and invites you to write music together. Can you help him with it?

Input

The first line contains a single integer T $(1 \le T \le 5)$, the number of test cases. For each test case:

The first line contains a string S of length n $(1 \le n \le 10^5)$, the initial tune.

The next line contains one integer m $(1 \le m \le 10^5)$, the number of operations.

For the following m lines, the i-th line contains an operation like `1 c'`, `2` or `3 t'`.

Let's define the last answer as $lastans$. At the beginning, $lastans = 0$.

- For `1 c'`, the real operation is $c = ((c' -' a') \oplus lastans) \bmod 26 +' a'$.
- For `3 t'`, the real operation is for every $1 \le i \le |t|,\ t_i = ((t'_i -' a') \oplus lastans) \bmod 26 +' a'$.

It's guaranteed that c is a lower-case letter. t is a string consisting only of lower-case letters. The sum of the lengths of t of all test cases will not exceed 5×10^6.

Note that string S may be deleted to an empty string. But it's guaranteed that there will be no operations of type 2 at this time.

Output

For each query `3 t`, print a single integer in a single line to represent the answer.

Example Input

```
1
abcbaba
5
3 ab
3 c
1 a
2
3 da
```

Example Output

```
2
3
1
```

Problem 1009. Cube Rotate

Why does YahAHa always like cubes?

YahAHa has a special cube. Each side of cube has a number x $(1 \le x \le 1000)$. At the beginning, YahaHa placed the cube on the table. Then rolled the cube n $(1 \le n \le 2 \times 10^5$) times, each time along one edge of bottom side.It means rotate top face to other faces.

YahAHa have a number x,x is 1 in the beginning.After each roll, YahAHa multiply the number on the front side of the cube to x. The product was so large that YahAHa write down the product module 998244353.

Carelessly, YahAHa forgot m $(1 \le m \le 20)$ of these rolling directions. But YahAHa has written down the start state of the cube, the final state, and the product of numbers on the front side after module.

Can you tell YahAHa that how many different ways of rolling that satisfy all the conditions?

Input

Each test contains multiple test cases. The first line contains the number of test cases $(1 \le T \le 10)$. Description of the test cases follows.

The first line of the input contains only one integers n $(1 \le n \le 2 \times 10^5)$ indicating the number of rolls of the cube.

The next line contains n integers. The i-th integer a_i $(0 \le a_i \le 4)$ indicating the i-th roll. $a_i = 1$ means rotate top face to front; $a_i = 2$ means rotate top face to back; $a_i = 3$ means rotate top face to left; $a_i = 4$ means rotate top face to right; $a_i = 0$ means YahAHa has forgotten the direction of this roll;

The next line contains 6 distinct integers indicating the start state of the cube.

The next line contains 6 distinct integers indicating the final state of the cube.

The state of the cube is represented as 6 integers. The 6 integers are sorted by front, back, left, right, top and bottom sides.

The last line contains one integer indicating the product of numbers on the front side module 998244353.

It's guaranteed that there are at most 5 cases such that $n \ge 10^5, m \ge 20$.

Output

For each test case:

Print one interger in one line indicating the answer.

Example Input

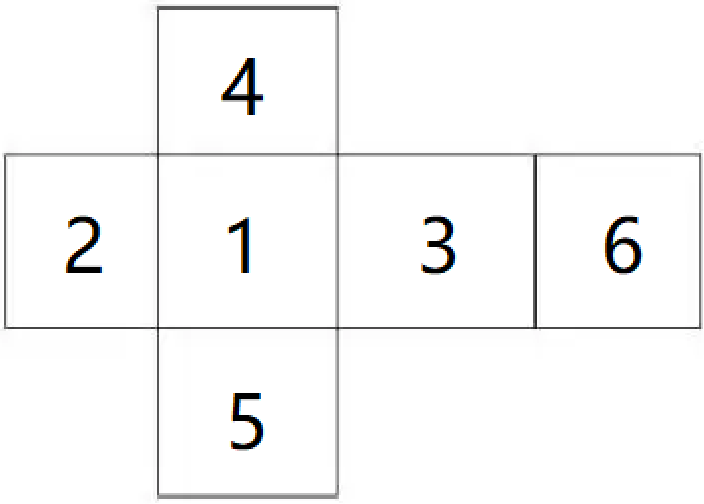
```
1
7
3 0 4 2 0 4 4
1 6 2 3 4 5
1 6 4 5 3 2
3
```

Example Output

```
1
```

Hint

The rotate direction of example: 3 4 4 2 1 4 4
Change of front side:1->1->1->1->3->1->1->1
stretch-out view:



Problem 1010. Bragging Dice

In the mysterious accient East, there is an ancient dice game - "bragging". Now YahAHa and Peanut is playing bragging.

The rules of the game are as follows:

There are 2 players in one game. Each player has n dices in the cup. Both players roll the dice once.

Players play in turns. YahAHa start. In the first turn, YahAHa can claim "there are $x(x \geq 1)$ dices with $y(1 \leq y \leq 6)$ points in the 2 cups".

Then Peanut has 2 choices.

1. Challenge YahAHa. If anyone challenges, the game is over . Each player opens its cup. If indeed there are x dices with y points in the cups, YahAHa wins, otherwise Peanut wins.
2. Continue to claim, but can only claim "there are x_1 $(x_1 > x)$ dices with $y_1(1 \leq y_1 \leq 6)$ points in the cups" or "there are x_2 $(x_2 = x)$ dices with y_2 $(y_2 > y)$ points in the cups".

After Peanut cliamed, YahAHa continued to choose whether to challenge or cliam. Both players take turns until someone challenges, then the game is over.

To make the game more interesting, here are some special rules.

1. If no one has claimed that "there are x dices with 1 point in the cups", the dice with 1 point can be regarded as any points of dice.
2. If all dices has the same points, it's considered there is an extra dice with the same points. For example, if there are 5 dices and 5 dices are all with 6 points, it's considered there are 6 dices with 6 points.
3. If each dice has different points, it's considered "there are 0 dice with any points in the cups". For example, if there are 5 dices,their points are 1 point, 2 points, 3 points, 4 points and 5 points. It's considered "there are 0 dice with 1 point in the cups", "there are 0 dice with 2 point in the cups", ... , "there are 0 dice with 5 point in the cups".

YahAHa and Peanut don't like stupid game of chance, so they want to play this game while knowing the points of every dices in the 2 cups.

Given you the points of all dices they roll. YahAHa wants to find out who will win the game if both of them play the game optimally.

Input

Each test contains multiple test cases. The first line contains the number of test cases $(1 \leq T \leq 30)$. Description of the test cases follows.

The first line of the input contains only one integers n $(2 \leq n \leq 2 \times 10^5)$ indicating the number of dices.

The next line contains n integers $a_1, a_2, \cdots, a_n$. The i-th integer a_i indicating the points of the i-th dice from YahAHa.

The next line contains n integers $b_1, b_2, \cdots, b_n$. The i-th integer b_i indicating the points of the i-th dice from Peanut.

Output

For each test case:

If YahAHa wins, print "Win!" in one line; If Peanut wins, print "Just a game of chance." in one line.

Example Input

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

Example Output

```
Win!
```

Problem 1011.Kazuha's String

Kazuha has two strings S_1 and S_2 consisting of lowercase letters "a", "b" and "c", here are the possible operations:

Add or Delete "aa" at any place of the string.

Add or Delete "bbb" at any place of the string.

Add or Delete "$cccc$" at any place of the string.

Add or Delete "$abababab$" at any place of the string.

Add or Delete "$acacac$" at any place of the string.

Add or Delete "$bcbc$" at any place of the string.

Add or Delete "abc" at any place of the string.

Kazuha can operate any time with any operations, determine if S_1 can be transformed into S_2 .

Input

The first line contains one integer $T\,(1 \le T \le 2 \times 10^5)$.

The first line of each test case contains a single string S_1 .

The second line of each test case contains a single string S_2.

It guaranteed that the length of each string does not exceed 10^5, and the sum of string lengths does not exceed 2×10^6.

Output

For each test case, print a single line containing **yes** if S_1 can be transformed into S_2 and **no** otherwise.

Example Input

```
3
aa
bbb
bab
acc
acbacccac
bbcacacbc
```

Example Output

```
yes
yes
no
```

Problem 1012.Buy Figurines

During the "Hues of the Violet Garden" event, As the professional Lady Guuji hired, Sayu is assigned to buy one of the figurines, that is "Status of Her Excellency, the Almighty Narukami Ogosho, God of Thunder".

There are n people numbered from 1 to n who intent to buy a figurine and the store has m windows with m queues identified from 1 to m. The i-th person has an arrival time a_i and a spent time s_i to buy a figurine(It guaranteed that everyone's arrival time a_i is different). When a person arrives at the store, he will choose the queue with the least number of people to queue. If there are multiple queues with the least number of people, he will choose the queue with the smallest identifier. It should be noted that if someone leaves the queue at the same time, the person will choose the queue after everyone leaves the team.

Sayu has been here since last night so she could buy a figurine. But after waiting and waiting, her eyes started to feel real droopy and... overslept. If Sayu doesn't buy one of these figurines, the Tenryou Commission tengu will lock her up for life! The store will close after these n people buy figurines, that means she must wake up before the last one leaves. Now Lady Guuji wants to know the latest time Sayu wakes up.

For example, there are two people in the same line, $a_1 = 1, s_1 = 2, a_2 = 2, s_2 = 2$. When the first person arrives, there is no one in the line, so the start time and end time of purchasing the figurine are 1 and 3. When the second person arrives, the first person is still in line, so the start time and end time of purchasing the figurine are 3 and 5. And if the end time of the last person is x, the answer is x.

Input

The first line contains one integer $T\ (1 \le T \le 10)$.

The first line of each test case contains two positive integers n and $m\ (1 \le n \le 2 \times 10^5, 1 \le m \le 2 \times 10^5)$ --- the number of people and the number of queues.

Then, n lines follow, each consisting of two integers a_i and $s_i\ (1 \le a_i, s_i \le 10^9)$ --- the arrival time and spent time of i-th person.

It guaranteed that the sum of n does not exceed 2×10^6, and the sum of m does not exceed 2×10^6.

Output

For each test case, print a line containing a single integer --- the latest time Sayu wakes up, that means the end time of the last person.

Example Input

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

Example Output

```
7
```