Problem A: Coder

Description

> In mathematics and computer science, an algorithm describes a set of procedures or instructions that define a procedure. The term has become increasing popular since the advent of cheap and reliable computers. Many companies now employ a single coder to write an algorithm that will replace many other employees. An added benefit to the employer is that the coder will also become redundant once their work is done. [1]

You are now the single coder, and have been assigned a new task writing code, since your boss would like to replace many other employees (and you when you become redundant once your task is complete).

Your code should be able to complete a task to replace these employees who do nothing all day but eating: make the digest sum.

By saying "digest sum" we study some properties of data. For the sake of simplicity, our data is a set of integers. Your code should give response to following operations:

1. add x – add the element x to the set;
2. del x – remove the element x from the set;
3. sum – find the digest sum of the set. The digest sum should be understood by

$$\sum_{1 \le i \le k} a_i \quad \texttt{where } i \bmod 5 = 3$$

where the set S is written as $\{a_1, a_2, \cdots, a_k\}$ satisfying $a_1 < a_2 < a_3 < \cdots < a_k$

Can you complete this task (and be then fired)?

Input

There're several test cases.

In each test case, the first line contains one integer N ($1 \le N \le 10^5$), the number of operations to process.

Then following is n lines, each one containing one of three operations: "add x" or "del x" or "sum". You may assume that $1 \le x \le 10^9$.

Please see the sample for detailed format.

For any "add x" it is guaranteed that x is not currently in the set just before this operation.

For any "del x" it is guaranteed that x must currently be in the set just before this operation.

Please process until EOF (End Of File).

Output

For each operation "sum" please print one line containing exactly one integer denoting the digest sum of the current set. Print 0 if the set is empty.

[1] See `http://uncyclopedia.wikia.com/wiki/Algorithm`

Sample

Input	Output
9 add 1 add 2 add 3 add 4 add 5 sum add 6 del 3 sum 6 add 1 add 3 add 5 add 7 add 9 sum	3 4 5

Problem B: Control

Description

You, the head of Department of Security, recently received a top-secret information that a group of terrorists is planning to transport some WMD [1] from one city (the source) to another one (the destination). You know their date, source and destination, and they are using the highway network.

The highway network consists of bidirectional highways, connecting two distinct city. A vehicle can only enter/exit the highway network at cities only.

You may locate some SA (special agents) in some selected cities, so that when the terrorists enter a city under observation (that is, SA is in this city), they would be caught immediately.

It is possible to locate SA in all cities, but since controlling a city with SA may cost your department a certain amount of money, which might vary from city to city, and your budget might not be able to bear the full cost of controlling all cities, you must identify a set of cities, that:

- all traffic of the terrorists must pass at least one city of the set.
- sum of cost of controlling all cities in the set is minimal.

You may assume that it is always possible to get from source of the terrorists to their destination.

Input

There're several test cases.

The first line of a single test case contains two integer N and M ($2 \leq N \leq 200, 1 \leq M \leq 20000$), the number of cities and the number of highways. Cities are numbered from 1 to N.

The second line contains two integer S,D ($1 \leq S, D \leq N$), the number of the source and the number of the destination.

The following N lines contains costs. Of these lines the i^{th} one contains exactly one integer, the cost of locating SA in the i^{th} city to put it under observation. You may assume that the cost is positive and not exceeding 10^7.

The following M lines tells you about highway network. Each of these lines contains two integers A and B, indicating a bidirectional highway between A and B.

Please process until EOF (End Of File).

Output

For each test case you should output exactly *one* line, containing one integer, the sum of cost of your selected set.

See samples for detailed information.

[1] Weapon of Mass Destruction

Sample

Input	Output
5 6 5 3 5 2 3 4 12 1 5 5 4 2 3 2 4 4 3 2 1	3

Problem C: Counting Formations

Description

With the coming release of Marcohard Balconies 100 operating system, people are more and more interested in its new UI (User Interface), code-named "Subway".

This UI presents your desktop as a grid that is divided into N rows and M columns (so you have $N*M$ cells). In each cell, you can place one icon of an application of a certain type. Your applications can be of one of K types, numbered 1 through K. You're an expert in this filed, so it is assumed that there is an unlimited number of applications of each type.

Any placement is called an icon formation. Some of the icon formations are beautiful. An icon formation is called beautiful if and only if no pair of rows are similar. Two rows are similar if and only if for each X that $1 \leq X \leq K$, they contain exactly the same number of applications of type X.

Given N,M, and K, you should solve for the number of diffrent icon formations that are beautiful, modulo 10^9+7. Two formations are different if and only if there is a cell where the type of application in one formation is not the same as the type in another formation.

You may assume that $1 \leq N, M, K \leq 32$

Input

There are several test cases. For each test case there are 3 integers, named N, M, K, in a single line.

Please process until EOF (End Of File).

Output

For each test case, please print a single line with a integer, the corresponding answer to this case.

Sample

Input	Output
2 2 2 5 3 2 3 5 7	10 0 894953467

Problem D: A Short problem

Description

According to a research, VIM users tend to have shorter fingers, compared with Emacs users. Hence they prefer problems short, too. Here is a short one:

Given n ($1 \leq n \leq 10^{18}$), You should solve for

$$g(g(g(n))) \mod 10^9 + 7$$

where

$$\begin{aligned} g(n) &= 3g(n-1) + g(n-2) \\ g(1) &= 1 \\ g(0) &= 0 \end{aligned}$$

Input

There are several test cases. For each test case there is an integer n in a single line.
Please process until EOF (End Of File).

Output

For each test case, please print a single line with a integer, the corresponding answer to this case.

Sample

Input	Output
0 1 2	0 1 42837

Problem E: Food

Description

You, a part-time dining service worker in your college's dining hall, are now confused with a new problem: serve as many people as possible.

The issue comes up as people in your college are more and more difficult to serve with meal: They eat only some certain kinds of food and drink, and with requirement unsatisfied, go away directly.

You have prepared F ($1 \leq F \leq 200$) kinds of food and D ($1 \leq D \leq 200$) kinds of drink. Each kind of food or drink has certain amount, that is, how many people could this food or drink serve. Besides, You know there're N ($1 \leq N \leq 200$) people and you too can tell people's personal preference for food and drink.

Back to your goal: to serve as many people as possible. So you must decide a plan where some people are served while requirements of the rest of them are unmet. You should notice that, when one's requirement is unmet, he/she would just go away, refusing any service.

Input

There are several test cases.

For each test case, the first line contains three numbers: N,F,D, denoting the number of people, food, and drink.

The second line contains F integers, the i^{th} number of which denotes amount of representative food.

The third line contains D integers, the i^{th} number of which denotes amount of representative drink.

Following is N line, each consisting of a string of length F. The j^{th} character in the i^{th} one of these lines denotes whether people i would accept food j. "Y" for yes and "N" for no.

Following is N line, each consisting of a string of length D. The j^{th} character in the i^{th} one of these lines denotes whether people i would accept drink j. "Y" for yes and "N" for no.

Please process until EOF (End Of File).

Output

For each test case, please print a single line with one integer, the maximum number of people to be satisfied.

Sample

Input	Output
4 3 3 1 1 1 1 1 1 YYN NYY YNY YNY YNY YYN YYN NNY	3

Problem F: Groups

Description

After the regional contest, all the ACMers are walking alone a very long avenue to the dining hall in groups. Groups can vary in size for kinds of reasons, which means, several players could walk together, forming a group.

As the leader of the volunteers, you want to know where each player is. So you call every player on the road, and get the reply like "Well, there are A_i players in front of our group, as well as B_i players are following us." from the i^{th} player.

You may assume that only N players walk in their way, and you get N information, one from each player.

When you collected all the information, you found that you're provided with wrong information. You would like to figure out, in the best situation, the number of people who provide correct information. By saying "the best situation" we mean as many people as possible are providing correct information.

Input

There're several test cases.

In each test case, the first line contains a single integer N ($1 \leq N \leq 500$) denoting the number of players along the avenue. The following N lines specify the players. Each of them contains two integers A_i and B_i ($0 \leq A_i, B_i < N$) separated by single spaces.

Please process until EOF (End Of File).

Output

For each test case your program should output a single integer M, the maximum number of players providing correct information.

Sample

Input	Output
3 2 0 0 2 2 2 3 2 0 0 2 2 2	2 2

Explanation The third player must be making a mistake, since only 3 plays exist.

Problem G: Multiple

Description

Given a positive integer N, you're to solve the following problem:

Find a positive multiple of N, says M, that contains minimal number of different digits in base-K notation. If there're several solutions, you should output the numerical smallest one. By saying numerical smallest one, we compare their numerical value, so $0xA_{hex} < 11_{dec}$.

You may assume that $1 \leq N \leq 10^4$ and $2 \leq K \leq 10$.

Input

There're several (less than 50) test cases, one case per line.

For each test case, there is a line with two integers separated by a single space, N and K.

Please process until EOF (End Of File).

Output

For each test case, you should print a single integer one line, representing M *in base-*K *notation*, the answer.

Sample

Input	Output
10 8 2 3 7 5	2222 2 111111

Problem H: 4 substrings problem

Description

One day you heard the following joke

> In America, you write strings.
> In Soviet Russia, String writes *YOU*!! [1]

And find that now string is writing you! So to get rid of it, you must solve the following problem:

Given a string S and its four substring a,b,c, and d. In a configuration, you can place four substrings exactly one position it occurs in S (they may overlap), and characters covered by at least one such substring is called "covered".

You should solve for minimum and maximum possible number of covered characters in a configuration.

You may assume that s contains only lowercase letters, and is of length less than 4096. However, lengths of a,b,c, and d would never exceed 64.

Input

There are several test cases.
For each test case there are 5 lines, denoting S,a,b,c, and d, respectively.
Please process until the EOF (End Of File).

Output

For each test case, please print a single line with two integers, first the minimum, then the maximum.

Sample

Input	Output
hello he l l o abacaba ab ba a c	4 5 4 6

[1] An infamous Russian reversal

Problem I: Buildings

Description

Have you ever heard the story of Blue.Mary, the great civil engineer? Unlike Mr. Wolowitz, Dr. Blue.Mary has accomplished many great projects, one of which is the Guanghua Building.

The public opinion is that Guanghua Building is nothing more than one of hundreds of modern skyscrapers recently built in Shanghai, and sadly, they are all wrong. Blue.Mary the great civil engineer had try a completely new evolutionary building method in project of Guanghua Building. That is, to build all the floors at first, then stack them up forming a complete building.

Believe it or not, he did it (in secret manner). Now you are face the same problem Blue.Mary once stuck in: Place floors in a good way.

Each floor has its own weight w_i and strength s_i. When floors are stacked up, each floor has PDV(Potential Damage Value) equal to $(\sum w_j)$–s_i, where $(\sum w_j)$ stands for sum of weight of all floors above.

Blue.Mary, the great civil engineer, would like to minimize PDV of the whole building, denoted as the largest PDV of all floors.

Now, it's up to you to calculate this value.

Input

There're several test cases.

In each test case, in the first line is a single integer N ($1 \leq N \leq 10^5$) denoting the number of building's floors. The following N lines specify the floors. Each of them contains two integers w_i and s_i ($0 \leq w_i, s_i \leq 100000$) separated by single spaces.

Please process until EOF (End Of File).

Output

For each test case, your program should output a single integer in a single line - the minimal PDV of the whole building.

If no floor would be damaged in a optimal configuration (that is, minimal PDV is non-positive) you should output 0.

Sample

Input	Output
3 10 6 2 3 5 4 2 2 2 2 2 3 10 3 2 5 3 3	1 0 2

Problem J: One and One Story

Description

Have you ever played the romantic Flash game, "One and One Story"? [1] In this story of a boy and a girl and their romance you are to direct them to meet together as they face their euphoria and trials of their relationship.

You, as a member of the FFF Inquisition, [2] are fed up with such game since you believe that to make things fair, you should not keep providing guidance information while risking remaining forever alone [3]. So you decided to write a program working out guidance for these sweet small lovers on behalf of you. (Another reason is, you have to help K couples, which would make you *somewhat* overwhelmed.)

Fortunately, you're to handle not the Flash game above, but a simplified version: In the game, a maze consists of some rooms connected with one-way hallways. For each room, there's exactly one outgoing hallway here, and it would lead directly to some room (not necessarily a different one). The boy and girl are trapped in (not necessarily different) rooms. In each round of the games, both of them could choose to stay in the current room or walk to the room to which the unique outgoing hallway leads. Note that boy and girl could act independently of each other. Your goal is to come to the reunion between them.

Your program should determine a pair of numbers (A, B) for each couple of boy and girl, where A represents number of hallway the boy walked through, B the girl, that could lead reunion between them. First, your program should minimize $\max(A, B)$. If there're several solutions, you should then guarantee that $\min(A, B)$ is minimized subject to above. If, satisfying above conditions, there're still multiple solutions, girl should walk less, that is you should then keep $A \geq B$ subject to conditions above.

In case they couldn't reunion, just let $A = B = -1$.

Input

There're several test cases.

In each test case, in the first line there are two positive integers N and K ($1 \leq N \leq 500000, 1 \leq K \leq 500000$) denoting the number of rooms and number of couples. Rooms a numbered from 1 to N.

The second line contains n positive integers: the i^{th} integer denotes the number of room to which the hallway going out of room i leads.

The following K lines are queries of several couples. Each query consists of two positive integers in a single line denoting the numbers of rooms where the lovers currently are: first the boy, then the girl.

Please process until EOF (End Of File).

[1] It's available here: `http://armorgames.com/play/12409/one-and-one-story`

[2] See `http://bakatotest.wikia.com/wiki/FFF_Inquisition`

[3] See `http://foreveralonecomic.com/`

Output

For each test case you should output exactly K lines, one line per query. Each line consists two integers separated by a space: the integer A and B for this couple.

See samples for detailed information.

Sample

Input	Output
12 5 4 3 5 5 1 1 12 12 9 9 7 1 7 2 8 11 1 2 9 10 10 5 12 5 4 3 5 5 1 1 12 12 9 9 7 1 7 2 8 11 1 2 9 10 10 5	2 3 1 2 2 2 0 1 -1 -1 2 3 1 2 2 2 0 1 -1 -1