Problem A
Horns

Time Limit: 2 seconds

Problem Description

Alan passed through the forest of horns. There are only two kinds of beasts, unicorns and twinhorns, in this forest. Every unicorn has one horn on its head, and every twinhorn has two horns on its head. Alan saw n horns and m beasts in total. Please write a program to compute the number of unicorns and the number of twinhorns seen by Alan.

Input Format

The first line contains an integer T indicating the number of test cases, where $T \leq 25$. Each test case has exactly one line. This line contains two integers n and m separated by a blank, where $1 \leq n \leq 300$ and $m \leq n \leq 2m$. Alan saw n horns and m beasts in total.

Output Format

For each test case, output one line containing two integers u and t separated by a blank, where u and t are the number of unicorns and the number of twinhorns, respectively.

Sample Input

```
2
5 3
7 5
```

Sample Output

```
1 2
3 2
```

Problem A is on the other side.

Problem B
Inverse Move-to-Front Transform

Time Limit: 2 seconds

Problem Description

The Move-to-Front (MTF) transform is an encoding scheme which maps the input data into a sequence of numbers. Entropy encoding schemes often achieve better compression ratio on the data encoded by the MTF transform. The MTF transform is quite simple. The following scheme is the MTF transform on string consisting of only characters in lowercase.

1. Maintain a list of characters in lowercase. Initially, the list is sorted in the lexicographic order. I.e., the list is `[abcdefghijklmnopqrstuvwxyz]` at the beginning.
2. Read a character α from the string. Output the index of α in the list, then move α to the front of the list.
3. Repeat the previous step until all characters in the string are read.

For example, the following is how the transform above works on the string `hakka`.

1. The first character `h` has index `7` in `[abcdefghijklmnopqrstuvwxyz]`. Output `7`, then move `h` to the front of the list.
2. The second character `a` has index `1` in `[habcdefgijklmnopqrstuvwxyz]`. Output `1`, then move `a` to the front of the list.
3. The third character `k` has index `10` in `[ahbcdefgijklmnopqrstuvwxyz]`. Output `10`, then move `k` to the front of the list.
4. The fourth character `k` has index `0` in `[kahbcdefgijlmnopqrstuvwxyz]`. Output `0`, then move `k` to the front of the list.
5. The fourth character `a` has index `1` in `[kahbcdefgijlmnopqrstuvwxyz]`. Output `1`, then move `a` to the front of the list.

The MTF transform maps `hakka` into the sequence $(7, 1, 10, 0, 1)$. Please write a program to inverse the MTF transform. In other words, your program reads a sequence of numbers $(a_1, \ldots, a_n)$, then compute the string s such that the MTF transform maps s into $(a_1, \ldots, a_n)$.

Input Format

The first line of the input contains an integer T, $T \leq 50$, which indicates the number of test cases. Each test case consists of two lines. The first one contains a positive integer n, $1 \leq n \leq 100$, which indicates the length of the sequence. The second line contains n integers $a_1, \ldots, a_n$ separated by blanks. The input sequence is $(a_1, \ldots, a_n)$, and $a_i \in \{0, 1, \ldots, 25\}$ for $i \in \{1, \ldots, n\}$.

Output Format

For each test case, output the string s such that the MTF transform maps s into $(a_1, \ldots, a_n)$.

Sample Input

```
3
5
7 1 10 0 1
6
1 1 13 1 1 1
8
7 1 1 1 20 4 0 1
```

Sample Output

```
hakka
banana
hahauccu
```

Problem C
Typing

Time Limit: 2 seconds

Problem Description

Cathy's typing speed is not fast, however, it is very steady. She strokes the keyboard exact once per second, and she always presses the keys correctly. Without interfering, Cathy has to spend n seconds to type a string s of n characters. In order to reduce the time spent for typing, Cathy copied a string p to the clipboard. Therefore, she can use the "paste" function to input many characters. Assume that pasting p also takes only one keyboard stroke for Cathy. If Cathy copied `bana` before typing `banana`, then Cathy can finish it in 3 seconds: pasting `bana`, then pressing `n`, then pressing `a`. Please write a program to compute the minimum time required for Cathy to type a string s when she copied p to the clipboard.

Input Format

The first line of the input contains an integer T, $T \leq 25$, indicating the number of test cases. Each test case has exactly one line containing two strings s and p separated by blanks. Cathy is going to type s with p copied to the clipboard. The length of s is at most 10000, and the length of p is at most 100.

Output Format

For each test case, output the minimum time (in seconds) for Cathy to type s with p copied to the clipboard.

Sample Input

```
2
banana bana
asakusa sa
```

Sample Output

```
3
5
```

Problem C is on the other side.

Problem D
Drinks

Time Limit: 2 seconds

Problem Description

Every weekend, `dreamoon` and `drazil` play in the park, and for each time, one of them has to buys drinks for both. They agree to apply the following procedure to determine who is on the duty of buying drinks.

1. Put n red balls and m white balls in a paper bag.
2. `dreamoon` and `drazil` draw a ball from the bag in turns. Note that once a ball is drawn, it is removed from the bag.
3. The person who draws a red ball first has to buy drinks.

`drazil` lets `dreamoon` perform the first draw every week for `dreamoon` is older than him. One day, `dreamoon` suddenly wonders what is the probability that he draws a red ball first. Can you help him to calculate it? You may assume when every ball has the same probability to be drawn.

Input Format

The first line contains a positive integer T, $T \leq 1770$, indicating the number of test cases. Each test case has one line contains two positive integers n and m where $1 \leq n \leq 59$, $1 \leq m \leq 59$ and $n + m \leq 60$. n is the number of red balls, and m is the number of white balls.

Output Format

For each test case, output one line containing the answer represented by a reduced fraction.

Sample Input

```
2
1 1
1 2
```

Sample Output

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

Problem D is on the other side.

Problem E
Explosive Materials

Time Limit: 3 seconds

Problem Description

Erik is going to send samples of n kinds of materials (numbered from 1 to n) to his laboratory for purity analysis. He will put these samples into several packages of the same capacity, and a package has capacity c if it is able to contain c kinds of materials. Some of these materials cannot be put in the same package, since their chemical reactions may cause an explosion. Erik finds that if putting k kinds of materials $a_1, \ldots, a_k$ in a package will explode, then putting any two of them will also explode. Erik has made a complete list of pairs of materials that will lead to an explosion. He finds that their are m pairs on the list.

Since all possible explosions are caused by two materials, Erik wonders if two packages of the same capacity are sufficient to send these materials to his laboratory safely. If so, what is the minimum capacity of the package?

Input Format

The first line contains a positive integer T ($T \leq 20$) indicating the number of test cases. The first line of each test case contains two integer n and m ($n \leq 1000, 0 \leq m \leq \min(\frac{n(n-1)}{2}, 105432)$) where n is the number of kinds of materials and m is the number of pairs on the list. Each of the following m lines contains two integer a and b indicating that material a and material b will cause an explosion if they are put in the same package.

Output Format

For each test case, output an integer. If it is impossible to send the materials by two packages, then output `-1`. Otherwise, output the minimum capacity of the package.

Sample Input

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

Sample Output

```
-1
2
```

Problem F
Forged Answers

Time Limit: 3 seconds

Problem Description

`wen`, `dream`, and `moon` had to take the make-up exam, since they had not gotten enough scores to pass the course. The make-up exam consisted of n multiple choice questions. There is one point for each question, and each question had four choices `A`, `B`, `C`, and `D`. Students submitted their answers sheets for computer scoring. After the exam, their best friend, `drazil`, has found out they submitted a wrong answer for every question.

`drazil` feels they are miserable, so he decides to crack into the teacher's computer to modify the standard answers. `drazil` aims to maximize the minimum of their scores. For example, assume there were 3 questions in the make-up exam, `wen` answered `ABC`, `dream` answered `BCD`, `moon` answered `CDA`, and the original standard answers were `DAB`. They answered wrongly to all questions, so `drazil` modifies the answers to `CCC` to make them "correctly" answered at least one question in the make-up exam.

Now, you are informed about how `wen`, `dream`, and `moon` answered in the make-up exam. Please help `drazil` to find out how to modify the standard answers to maximize the minimum of their scores.

Input Format

The first line contains a positive integer T ($T \leq 100$) indicating the number of test cases. Each test case consists of four lines. The first line contains a positive integer n ($n \leq 30000$) indicating the make-up exam consisted of n questions. The following three lines represent `wen`'s, `dream`'s, `moon`'s answers, respectively. Each of these line contains a string of n characters, and the i-th character is the answer to i-th question written on the sheet.

Output Format

For each test case, output one line containing an integer indicating the maximum possible value of the minimum of their scores.

Sample Input

```
2
3
ABC
BCD
CDA
4
AABC
AACD
BBAA
```

Sample Output

```
1
2
```

Problem G
Egg

Time Limit: 5 seconds

Problem Description

You are a president deeply loved by many folks in your country. Every time you go on a parade (which is your main job, what else should a president do), the folks would throw eggs at you — because you love eggs! The folks passionately send their eggs to you, and you always can catch the eggs. In fact, egg-catching is exactly what makes you look forward to the parade every day! A folk would throw an egg at you for each time your parade comes to his home. You are given n coordinates on a 2D-map, these are where the folks that will throw an egg at you each time they see you on a parade. Note that the coordinates may repeat, since several folks may live together. There are in total m days left in your term and the area to parade each day are set. A parade always takes place in an axis-parallel rectangle area, as stated clearly in the constitution and as the president you have no choice but to follow it. You are given m 2D-ranges $[\ell, r] \times [b, t]$ describing the parades.

Input Format

Input begins with an integer T ($1 \leq T \leq 20$) indicating the number of test cases. The first line of each test case contains two integers n ($0 < n \leq 10000$) and m ($0 \leq m \leq 50000$) separated by a blank where n is the number of folks throwing eggs and m is the number of days left in your term. Each of the following n lines contains two integers x and y ($0 \leq x, y \leq 10^5$) indicating that there is a folk's home located at (x, y). Then m more lines follow. Each of them contains four integer ℓ, r, b, t ($0 \leq \ell \leq r \leq 10^5$, $0 \leq b \leq t \leq 10^5$) separated by blanks. $[\ell, r] \times [b, t]$ corresponds to a parade area.

Output Format

For each test case, output the total sum of eggs you receive on one line.

Sample Input

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

Sample Output

```
2
4
```

Problem H
The Missing Permutation

Time Limit: 15 seconds

Problem Description

Little Tomato has a permutation P from 1 to n on a board. Each day, he swaps some numbers in P to form a new permutation P', and then tries to find the longest increasing subsequence (LIS) of P'. He believes that he can eventually find a faster algorithm for calculating LIS.

One day after an earthquake, some of the numbers in the permutation P has dropped off the board. Little tomato soon wondered, if he puts all the numbers back in a certain way, what will be the largest possible length of the LIS of the recovered permutation?

Input Format

First line of the input contains an integer T ($1 \leq T \leq 100$) denoting the number of the test cases. For each test case, the first line contains an integer n ($1 \leq n \leq 10^5$) indicating the length of the permutation. The next line contains a incomplete permutation $a_1, a_2, \cdots, a_n$. If $a_i = 0$, that means the number originally at the i-th position has dropped. The input will be always valid, and less than `10MB`.

Output Format

For each test case, output the maximum possible length of the LIS of the recovered permutation.

Sample Input

```
4
5
0 0 0 0 0
10
1 2 3 4 0 0 0 0 9 10
14
1 0 3 0 5 0 7 0 9 0 11 0 13 0
9
3 0 0 0 7 8 9 0 0
```

Sample Output

```
5
10
14
7
```