104 學年度
全國大專電腦軟體設計競賽
台大校內初賽

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Table 1: Compilation Information

Language	Version	Flags	Accepted Extension
C	gcc 4.8.4	`-lm -std=c11 -O2`	`.c`
C++	g++ 4.8.4	`-g -O2 -static -std=gnu++0x`	`.cc, .cpp, .cxx, .c++, .C`

Note: Time Limit of each problem is on the website.

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A. Stickers and Dolls

Problem ID: stickerdoll

Alice is a little girl who usually go to bed lately and get up lately. Her mother hopes to quit her bad habit and says to Alice: "If you go to bed early a day, I will give you a pink sticker. And if you get up early a day, I will give you an orange sticker."

When Alice grow up, she becomes a good girl who go to bed early and get up early. She has collected A pink stickers and B orange stckers. But she don't like sticker any more. So she doesn't get sticker from her mother any more. Someday, she complains to her mother why does she need to collect so many stickers before. Her mother says to her: "Then now, you can use x_1 pink stickers and y_1 orange stickers to change a kitten doll or use x_2 pink stickers and y_2 orange stickers to change a puppy doll." Alice don't prefer to either kitten or puppy. She just wants to collect as many dolls as possible.

Now you are asked to calculate the maximum number of dolls Alice can get in different configurations.

Input

First line of the input will consist of one integer T, denoting the number of queries you should process.

For each query, you are given one line containing six integer A, B, x_1, y_1, x_2, y_2, denoting the configuration in above statement.

- $1 \leq T \leq 10^5$
- $1 \leq A, B, x_1, y_1, x_2, y_2 \leq 2 \times 10^9$

Output

For each query, you should output one line consists one integer indicating the answer.

Sample Input 1	Sample Output 1
4 10 10 2 3 3 2 10 14 2 3 3 2 10 15 2 3 3 2 1000000000 999999999 1 4 10000 3	4 4 5 250018751

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B. Odd Cycles

Problem ID: oddcycle

Pusheenland is a beautiful land fulfilled with pusheens. On this land, there are many islands, and there are also bidirectional bridges between many pair of islands, too.

One day, the Pusheen King – Pushik want to build some sightseeing tours on the Pusheenland. He asked little Poorsheen to design such a route so that one can start from an island, go through several distinct bridges, and come back at the end.

Pushik wants the things to be even, so he asked little Poorsheen to make the number of bridges in the tour to be even. Unfortunately, little Poorsheen found that Pusheenland is odd enough so that every cycle route is a odd one.

Being so frustrated, Pushik asked little Poorsheen to find the longest possible route. Can you find the length of such route if any of the odd cycle exists?

Input

First line of the input will consist of two integers n, m, denoting the number of islands and bridges in the Pusheenland. Islands are numbered from 1 to n inclusively.

Next m lines consists of m pair of integers a_i, b_i, indicating that there is a bridge connecting island a_i and b_i.

It is guaranteed that the input Pusheenland is odd enough, and you can always start from an island to any other island by traveling through some bridges.

- $1 \leq n \leq 100000$
- $1 \leq m \leq 120000$
- $1 \leq a_i, b_i \leq n$
- $a_i \neq b_i$

Output

Please output the size of the largest odd length cycle required by Pushik, or 0 if no such cycle.

Sample Input 1	Sample Output 1
3 3 1 2 2 3 1 3	3

Sample Input 2	Sample Output 2
3 2 1 2 2 3	0

C. Board Game Again

Problem ID: boardgame

There is a board with n rows and m columns. So, the board consists of $n \times m$ cells. Each cell contains either a symbol 'W', or a symbol 'B', indicating the cell is white or black initally.

You want to play a game with the board as below.

In the beginning, you should put a chessman to any cell in the first column. Your target is moving the chessman to any cell of the last column. In each move, you can move the chessman to one of its neighbour cells (we call two cells are neighbouring cells iff they share a common side). In the same time, if the color of cell you want to move to is as same as the color of current cell, You should repaint the color of the cell you want to move to. This is, You should repaint it from white to black or from black to white. If you repaint some cell with a color c, the cell will maintain color c until the next time you repaint it. You want to move the chessman to the last column with least number of times of repaint a cell. Please answer the least possible number of times you need to repaint.

Input

First line of the input will consist of two integers n, m, denoting the number of rows and columns in the board.

Each of next n lines consists of m characters. Every character is either 'W' or 'B'. The j-th character of i-th row denote the color of j-th column of i-th row of the board.

- $1 \leq n \times m \leq 10^5$
- $2 \leq m \leq 10^5$

Output

Please output the least number of times you should repaint such that you can move the chessman from the first column to the last column.

Sample Input 1

```
3 5
WWWWW
WWWWW
WWWWW
```

Sample Output 1

```
2
```

Sample Input 2

```
1 8
WBWBWBWB
```

Sample Output 2

```
0
```

Sample Input 3	Sample Output 3
1 6 WBWWBW	3

D. Place The Coins

Problem ID: pushcoin

In the Casino of the Pusheen Land, there is a game called "Place the coins!" (or "Nobody Can Place Coins" — NCPC in short.)

The game is played in two rounds on a $n \times m$ board. In the first round, the player roll some dices and determine n numbers $r_1, r_2, \cdots, r_n$. Then the host, the king of the pusheen land, Pushik will determine m numbers $c_1, c_2, \cdots, c_m$ such that $c_1 + c_2 + \cdots + c_m = r_1 + r_2 + \cdots + r_n$. Then, the player needs to find a way to put coins on the board, such that for each little 1×1 square of the board there is at most one coin. Moreover, the number of coins in i-th row should be exactly r_i; the number of coins in j-th column should be exactly c_j.

Pushik knows that the more possible ways to put these coins on the board, the more players will participate to the game. Given the numbers $r_1, r_2, \cdots, r_n$ that a player rolls, Pushik has come up with some possible choices of $c_1, c_2, \cdots, c_m$, can you help him find the number of solutions for each choice?

Input

The first line of the input contains four integers n, m, q, MOD.

Then the second line contains n integers $r_1, r_2, \cdots, r_n$.

Then there are q lines, each line contains m integers $c_1, c_2, \cdots, c_m$.

- $1 \leq n, m, q \leq 36$
- $r_i, c_j \geq 0$ for all i, j
- $r_1 + r_2 + \cdots + r_n \leq 36$
- $c_1 + c_2 + \cdots + c_m = r_1 + r_2 + \cdots, r_n$
- $1 \leq MOD \leq 10^9 + 7$

Output

For each query, output the answer modulo MOD.

Sample Input 1	Sample Output 1
3 3 2 10007 1 2 3 2 2 2 1 2 3	3 1

Sample Input 2	Sample Output 2
10 5 3 1000000007 3 3 3 3 3 3 3 3 3 3 6 6 6 6 6 0 0 0 0 30 5 7 5 7 6	56586600 0 31003560

E. NTU

Problem ID: ntu

There are so many NTUs hidden in other names, such as NTNU, NCTU, and NTHU, they all contains NTU as a subsequence.

Pushik wants to know how many NTUs are there on any string he is given. Can you help him?

A subsequence is a sequence that can be derived from another sequence by deleting some (or none) elements without changing the order of the remaining elements. For example, the sequence "BDF" is a subsequence of "ABCDEF".

Input

The input contains a string S consists of uppercase letters.

- $1 \leq |S| \leq 100000$

Output

Please output the number of subsequences that represent NTU.

Sample Input 1	Sample Output 1
NTU	1

Sample Input 2	Sample Output 2
NCTU	1

Sample Input 3	Sample Output 3
NNTTUU	8

Sample Input 4	Sample Output 4
NTUISNATIONALTAIWANUNIVERSITYUCCU	29

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F. Inversion

Problem ID: inversion

Let p be a permutation $p_1, p_2, \ldots, p_n$. If $i < j$ and $p_i > p_j$ then we say pair (i, j) is an inversion of p. We all know how to count inversions efficiently. But can you construct a permutation with a specific number of inversions?

Input

The input only contains one line with two integers n, m.

- $1 \leq n \leq 10^5$
- $0 \leq m \leq \frac{n(n-1)}{2}$

Output

Output a single line with a permutation with exactly m inversions. If there are more than one possible permutations, please output the lexicographically smallest one.

Sample Input 1	Sample Output 1
5 7	2 5 4 3 1

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G. Poring

Problem ID: poring

Poring is a lovely monster in Ragnarok (RO) which is a famous RPG online game. He is a jelly-type creature and is commonly seen everywhere. Also, Poring is the most weak monster. Killing Poring is a good choice for level 1 newbie to gain experience.

One day, he travelled to Japan and all the children call him "Poring san". He liked this appellation which make he feel more respected than when he was in RO world. Since he likes this appellation, he find out he liked "Polygon", too. However, good fortune won't last forever. His visa expired and he had to return.

The other day, Poring is chased by some newbie players. He was jumping and fell down. He was rolling down the hill like a ball and then rolled into a cave. There was a big hole in front of him. He tried to stop, but fail…

After a long time, he awaked. Poring's body is flexible so he didn't injure.

"Where am I?" he mumbled and swang his head. This accident saved his life, but made him got lost.

With the faint light, he found out the entrance is above his head and dozens meters high.

"I wouldn't be trapped here!" he tried to encourage himself and started to jump forward.

After a period of time, the other faint light appeared in front of his sight. There was a wall with some straight lines and a stele next to it.

"Lots of lines make lots of polygons. Polygons make everything. Tell me how many closed polygons are formed by these n straight lines and what is the largest and smallest area of them? Moreover, could you tell me q_i-th largest area? If you are correct, welcome to the Wisely Monster Kingdom. Otherwise…" some scratches destroyed the last few words on stele. It seems that it is made by the other monster's nails.

"Polygon! I like polygon. I think I could solve this problem and find the exit in the kingdom." He shouted excitedly.

Poring is smart. If q_i greater than the number of polygons, he will tell stele that the question is invalid.

Note that, a closed polygon is bounded by straight lines and no any straight line go across it.

Input

The first line of input contains an integer n, the number of lines. The following are n lines, each line contains four integers x_1, y_1, x_2 and y_2, indicate the two points on the i-th line. The next line contains an integer m, indicate the number of questions. The following are m lines, each line contains an integer q_i.

- $3 \leq n \leq 1000$
- $1 \leq m \leq 10000$

- $|x_i|, |y_i| \leq 1000$
- $1 \leq q_i \leq 10^9$
- No three lines intersect in one point.
- No two lines coincide.
- There is at least 1 closed polygon.

Output

Output a single line with three numbers, the number of closed polygons, the largest area and the smallest area. Then, output m lines. Each line contains one number indicating q_i-th largest area. If q_i greater than the number of polygons, output "`Invalid question`" (without quotes) instead.

Your answer will be considered correct if its absolute or relative error doesn't exceed 10^{-4}.

Sample Input 1

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

Sample Output 1

```
6 5.75 0.25
5.75
4.0
3.0
2.25
1.0
0.25
Invalid question
```

Sample Input 2

```
4
0 0 1 0
1 0 1 1
1 1 0 1
0 1 0 0
2
1
2
```

Sample Output 2

```
1 1.0 1.0
1.0
Invalid question
```

H. Sum of Cool Numbers

Problem ID: coolsum

Yay! Another easy problem about interval query!

You are given an array with n numbers $a_1, a_2, \ldots, a_n$ and m queries. Each query is an interval $[l_i, r_i]$. Please calculate the sum of cool numbers for each inerval. We say a number x is cool in an interval if x appears exactly once in that interval.

Input

The first line contains two integers n, m. The second line contains n integers $a_1, a_2, \ldots, a_n$.

- $1 \leq n, m \leq 10^6$
- $0 \leq a_i \leq 10^9$

Output

For each query please output the sum of cool numbers in one line.

Sample Input 1	Sample Output 1
10 3 3 1 4 1 5 9 2 6 5 3 2 5 3 8 1 10	9 27 21

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I. Anywhere Door

Problem ID: anywheredoor

Dreamoon is a cute cat. He lives in a one dimensional world. He likes doraemon, a character in a cartoon, very much. So he wants to invent one machine that have similar function to anywhere door. (For those unfamiliar with the cartoon, anywhere door is a door that can teleport you to any location by walking through it.)

After some hard work, He discovered that for each day, there are two distinct positions in the world containing magic power. If he sets two machines in these two spots, the machines absorb the magic power and linked together and everyone can use the machines to teleport from one of the two positions to another in no time forever (the magic power is infinite). But everyone including Dreamoon himself can teleport at most once for each day because otherwise the order of the world will be destroyed and the world itself will collapse. Note that the machine only teleport you to the linked one, you may not teleport arbitrarily.

Dreamoon determine to devote all the remainder of his life to setup these machines for people in the world. Everyday, he will go to one of the magic position and place one machine there. Then he go to another magic position and set the other machine. It's very tire to carry the machine from one magic position to another magic position because if the machines are apart they became heavier due to some quantum mechanics. In order to save energy, Dreamoon can choose to use machines he has built before if it can reduce the distance he need to walk (the only method of moving other than teleporting in the one dimensional world is walking). Can you help Dreamoon to calculate the minimum distance he need to walk between the two positions for each day?

Input

First line of the input will consist one integer n, denoting the number of days in dreamoon's remaining life.

The i-th line of the next n lines consist of one pair of integers a_i, b_i, indicating the two positions containing magic power in the i-th day.

- $1 \leq n \leq 10^5$
- $0 \leq a_i, b_i \leq 10^9$
- $a_i \neq b_i$

Output

For each day in dreamoon's remaining life, please output a line containing the minimum distance that dreamoon need to walk in that day.

Sample Input 1	Sample Output 1
5 2 4 0 9 1 8 1000000000 10 3 514	2 7 2 999999990 508

J. Rectangular Land

Problem ID: rectland

On a $n \times m$ grid, every cell has a number a_{ij} indicating the strength of that piece of the land. We want to select at most two rectangles on the grid. What is the maximum possible sum over all cells that belongs to exactly one rectangle?

Input

The first line of the input contains two integers m, n. Then there are a matrix of m rows and n columns, each integer a_{ij} denotes the value of the cell on the i-th row and j-th column.

- $1 \leq m, n \leq 50$
- $-10^5 \leq a_{ij} \leq 10^5$

Output

For each test case, output the maximum possible sum that we desired.

Sample Input 1

```
5 5
-1 -1 -1 -1 -1
-1 10 10 10 -1
-1 10 -1 -1 -1
-1 10 10 10 -1
-1 -1 -1 -1 -1
```

Sample Output 1

```
70
```

Sample Input 2

```
5 5
10 10 10 10 -1
10 -1 -1 -1 10
10 -1 -1 -1 10
10 -1 -1 -1 10
-1 10 10 10 10
```

Sample Output 2

```
140
```

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