COCI 2018/2019

Round #6, March 9th, 2019

Tasks

Task	Time limit	Memory limit	Score
Lun	1 s	64 MB	50
Konj	1 s	64 MB	70
Sličice	1 s	64 MB	90
Simfonija	1 s	64 MB	110
Mobitel	6 s	64 MB	130
Total			450

Mom Tihana wanted to buy her daughter Leda a plush toy via an online store. During the purchase process, the system asked for a credit card number to be entered. However, the purchase failed because Tihana mistakenly wrote one of the digits from that number. Internet research has revealed that such systems recognize the wrong number based on Luhn's algorithm.
This algorithm confirms the correctness of the number using a control digit which is always the last digit in the number. Steps to determine the validity of a number are:

- Starting from the second digit from the right in the number (tens of the number), double the value of every second digit to the left. If this product is greater than nine, then the digits of that product should be summed up.
- Calculate the sum of all values obtained in the previous step.
- The sum thus obtained should be multiplied by nine and it should be determined the remainder of division by ten.
- If the resulting remainder is equal to the last digit of the number (unit), the number is considered valid.

E.g. account number 79927398713 is considered valid because the end right digit 3 can be obtained from the remaining digits in the way described.

Account number	7	9	9	2	7	3	9	8	7	1	**3**
Double every other	7	**18**	9	**4**	7	**6**	9	**16**	7	**2**	-
Sum	7	**9** (1+8)	9	4	7	6	9	**7** (6+1)	7	2	= **67**
(Sum after intermediate step · 9) *mod* 10 = (67 · 9) *mod* 10 = 603 *mod* 10 = **3**											

Write a program that loads the card number as a *N*-string that consists only of digits and exactly one sign "x", and prints the smallest one-digit number which we can replace the sign "x" with so that the account number is valid.

INPUT

In the first line there is an integer number N ($1 \le N \le 100$), the length of string from the task's test.
In the second line there is a string of length N consisting of just signs “0”, “1”, “2”, “3”, “4”, “5”, “6”, “7” , “8”, “9” and exactly one sign "x".

OUTPUT

In the only line of the output it should be printed the required one-digit number.

SCORING

In the test samples totally worth 25 points, the sign "x" will always be in the last place in the string.

SAMPLE TESTS

input	input	input
11 7992739871x	5 x2464	10 93380x1696
output	**output**	**output**
3	5	1

Domagoj loves drawing horses at leisure. For a long time, he's been a proud member of social groups dealing with this subject. But Domagoj is a very special boy, so because of his drawing technique most people do not understand his masterpieces.

One of his most famous drawings is *"#define HORSE 42-42*", also known as "*Ordinary Horse"*.

```
15
2 2 6 2
2 2 2 6
6 2 6 4
6 4 6 6
2 6 6 6
6 2 8 2
8 2 10 2
10 2 12 2
12 2 12 4
12 4 6 4
6 2 6 1
8 2 8 0
10 2 10 1
12 2 12 0
42 42 42 43
2 2
```

You must be wondering *"Where is that horse?"* and *"Is everything all right with Domagoj?"* because you only see some numbers on the drawing. The first question will be answered in the next section, while the answer to the second question also interests the author of this task.

In order to understand the drawing, you need to understand Domagoj's drawing technique. The first number in the drawing is the number N denoting the number of line segments that may have been drawn. Thereafter, the following N lines have four numbers, A_i , B_i , C_i and D_i , which describe the i^{th} line segment extending from the point (A_i, B_i) to the point (C_i, D_i). In the last line of the drawing there are two numbers, X and Y, the coordinates of point T. Domagoj will draw all the line segments that contain the point T and all that are directly or indirectly connected to a line segment that contains point T. For two line segments L_1 and L_2 we say that they are directly connected if they have a common end point, and they are indirectly connected if there is a sequence of line segments L_1, H_1, H_2, … H_k, L_2 such that the line segments L_1 and H_1 are directly connected, H_1 and H_2 are directly connected, ..., H_k and L_2 are directly connected.

Your task is to print a rectangular matrix P of characters that displays Domagoj's drawing. The value of $P_{a,b}$ should be set to '#' if the point with the coordinates *(a, b)* is part of some line segment drawn, otherwise this value should be set to '.'. Coordinate *a* in the matrix rises from **left to right**, while coordinate *b* rises from **bottom up**. Matrix P should contain all points that are part of a drawn lines and should not contain any single row or column that contains only characters '.', i.e. it should be minimal in size.

INPUT

In the first line of the input there is a positive integer N ($1 \le N \le 200\ 000$).

In the next N lines there four non-negative integers A_i, B_i, C_i and D_i ($0 \le A_i, B_i, C_i, D_i \le 300$). For each line segment it will hold either $A_i \ne C_i$ or $B_i \ne D_i$. No two line segments will intersect, but some might have common end point. All the will be **parallel** to the coordinate axes.
In the last line of the input there will be two non-negative integers X and Y, coordinates of the point T. Point T will be part of at least one of the given line segment.

OUTPUT

Print required matrix P from the task.

SCORING

In the test samples totally worth 30% of the points you should draw all line segments.

SAMPLE TESTS

input

```
15
2 2 6 2
2 2 2 6
6 2 6 4
6 4 6 6
2 6 6 6
6 2 8 2
8 2 10 2
10 2 12 2
12 2 12 4
12 4 6 4
6 2 6 1
8 2 8 0
10 2 10 1
12 2 12 0
42 42 42 43
2 2
```

output

```
#####......
#...#......
#...#######
#...#.....#
###########
....#.#.#.#
......#...#
```

input

```
6
1 1 10 1
10 1 10 3
10 3 1 3
1 3 1 1
10 3 11 3
11 3 11 6
2 1
```

output

```
..........#
..........#
..........#
###########
#........#.
##########.
```

Clarification of sample tests:
In the first example all the line segments should be drawn except the last, and in the second example all the line segments should be drawn to get the drawing of the name *"Summarized horse".*

Nikola is a passionate collector of albums with images of football players. He and his friends compete with each other in a game they invented based on the albums whose images are currently being collected. The images in that album are divided into N teams, each of which has exactly M football players. The main rule of the game is that the total number of points a person wins for i^{th} team is B_x, where x is the total number of unique pictures of football players of that team collected by the person. They have also agreed that the array B is growing, i.e. having more unique images of football players of a team means having more or equal points.

Nikola would like to win as many points as possible in the game. For each team x the amount of unique images Nikola currently owns of that team, P_x, is known.

Ivan is a friend of Nikola who has already collected the entire album twice and when he heard about the game Nikola plays with his friends, he decided to give him any K images that Nikola wants. After finding out about this joyful news, Nikola wondered what is the maximal number of points he could have after Ivan gives him K images. Too excited for this news, he is not able to count and begs you to answer his question.

INPUT

In the first line there are integer numbers N, M and K ($1 \le N$, $M \le 500$, $1 \le K \le \min(N \cdot M, 500)$), numbers from the task's text.
In the second line there is an array P consisting of N non-negative integer numbers ($0 \le P_i \le M$).
In the third line there is an array B consisting of M+1 non-negative integer numbers ($0 \le B_i \le 100\ 000$), amount of points Nikola gets for i ($0 \le i \le M$) unique images of a team.
For every t between 0 and $M-1$ it holds $B_t \le B_{t+1}$.
It is also holds that $K \le N \cdot M - (P_1 + P_2 + \dots + P_N)$.

OUTPUT

In the only line print the answer to Nikola's question.

SCORING

In test samples totally worth 20% of the points it will hold $K = 2$.

SAMPLE TESTS

input

```
4 4 3
4 2 3 1
0 1 3 6 10
```

output

```
31
```

input

```
4 3 5
1 1 2 3
0 1 2 3
```

output

```
12
```

input

```
3 6 2
2 4 1
31 38 48 60 75 91 120
```

output

```
206
```

Clarification of the first sample:
Nikola is most likely to ask Ivan to give him an image of the third team and two from the second, so that his score is 31 (10 + 10 + 10 + 1).

Almost no one believed in the virtuous abilities of the composer Marin. Specifically, not until the day he composed his 9th symphony.

The symphony can be represented as a series of frequencies that are integer numbers. In order for Marin to prove his talent and demonstrate that this symphony is not just one of many, he decided to compare it with the ancient symphony *"Little Night Fiesta"* of the best musician in history, Stjepan. In the stars it is written that the lengths of these two symphonies are equal to *N*.

Marin compares the symphonies by writing them one under the other to a piece of paper. The symphony diversity is defined as the sum of the absolute differences of the corresponding frequencies. The diversity of symphonies *A* and *B* of length *N* is:

$$\sum_{i=1}^{N} \left| A_i - B_i \right|$$

Before comparing the two symphonies, Marin will do two things. First, he will modulate his symphony by adding **an integer number *X*** to each frequency. Then he will change **no more than *K*** frequencies to some other arbitrary frequency value because he had a vision in the dream as well as every top author.

Marin will choose *X* and change some *K* frequencies so that his symphony is as similar to Stjepan's, i.e. so the defined diversity is minimal. Help Marin and calculate the smallest possible diversity to Stjepan's symphony.

INPUT

In the first line there are integer numbers *N* and *K* ($1 \le N \le 100\ 000$, $0 \le K \le N$), numbers from the task's text.
In the second line there are *N* integer A_i ($-1\ 000\ 000 \le A_i \le 1\ 000\ 000$) which represent frequencies of Marin's symphony.
In the third line there are *N* integer B_i ($-1\ 000\ 000 \le B_i \le 1\ 000\ 000$) which represent frequencies of Stjepan's symphony.

OUTPUT

In the only line print out the smallest possible diversity between Marin and Stjepan's symphony.

SCORING

In the test samples totally worth 40% of the points it will hold K = 0.

SAMPLE TESTS

input	input	input
3 0	3 1	4 1
1 2 3	1 2 3	1 2 1 2
4 5 7	4 5 7	5 6 7 8
output	**output**	**output**
1	0	2

Clarification of the second sample:
If Marin modulates his symphony for X = 3 and changes the last frequency to 7, his symphony will then be completely equal to Stjepan's, so the required diversity is 0.

Little Nikola has recently learned a multiplication table. To try to continue learning, he came up with the following task.

He made a table of size R×S. In each field of the table he wrote an integer value and asked himself: How many possible ways are there to get from the upper left corner to the lower right corner of the table by moving each step to one field right or down, so that a product of all the numbers on the path (including the initial and the final field) is at least N?

Since currently he has no time, he has asked you for help. Since the required number of ways can be quite large, just print its remainder of division by $10^9 + 7$.

INPUT

In the first line there are integer numbers R, S ($1 \le R, S \le 300$) and N ($1 \le N \le 10^6$).
In the next R lines there are S integer numbers between 1 and 10^6 which denotes the numbers written in each field of the table.

OUTPUT

In the only line print the remainder of the required number of the ways modulo $10^9 + 7$.

SCORING

In the test samples totally worth 20% of the points it will hold $N \le 300$.
In the test samples totally worth 20% of the points it will hold R, $S \le 100$, and all the numbers in the table will be less than or equal to 10.
In the test samples totally worth additional 30% it will hold R, $S \le 100$.

SAMPLE TESTS

input

```
2 3 200
2 3 4
5 6 7
```

output

```
2
```

input

```
3 3 90
2 1 1
45 1 1
1 1 1
```

output

```
3
```

input

```
2 5 3000
1 2 3 4 5
6 7 8 9 10
```

output

```
3
```

Clarification of the first sample:
There are three possible ways:

- 2->3->4->7 - total product 168
- 2->3->6->7 - total product 252
- 2->5->6->7 - total product 420