A. TONTON AND THE ACCIDENT

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

On the independence day of Tonton kingdom, Tonton friends take a day trip to the Tonton forest. However, an accident happens that all of friends fall down to a scared deep hole. The hole's depth is d $(1 \leq d \leq 10^5)$. Everybody decide to stand on other's shoulders to form a Tonton ladder. Afterwards, some of friends may escape the hole, and find teachers to help. For each friend, he or she knows exactly the length from his leg to shoulder, as well as length of his arm. With the friend i, these lengths are h_i and l_i respectively. If the friend i^{th} stands on top of other $j_1, j_2, \dots, j_k$ friends, the length of Tonton ladder would be $h_{j_1} + h_{j_2} + \cdots + h_{j_k} + h_i + l_i$. The friend i^{th} can escape the hole if and only if the length of the ladder is greater than or equal to hole's depth d. Because of being a Tonton citizen, all friends have enough strength ability to form the ladder. Additionally, the friends, who have escaped the hole already, are not able to help the others in the hole.

Your task is to calculate the maximum number of friends can escape the hole.

Input

- The first line is an integer n $(1 \leq n \leq 2000)$.
- The i^{th} in n following lines contains two integer h_i and l_i $(1 \leq h_i, l_i \leq 10^5)$
- The last line contains an integer d.

Output

- Print exactly one integer – the maximum number of friend can escape the hole.

Sample

Input	Output
6 6 7 3 1 8 5 8 5 4 2 10 5 30	4

B. TONTON AND THE AWARD

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

The city of Tonton has organized a tournament with a lot of food as award for the winner. Of course, Tobi quickly participates in. The award includes n kinds of food with $w_1, w_2, \dots, w_n$ $(0 < w_i \le 10^9)$ as their weights. With spirit of eating, Tobi is definitely the champion and take the award. However, the game does not end, after touching the food with weight v, suddenly all other food with weight v disappears, and finally the rest is for winner. Tobi wants to bring as much food as possible to his house, but as his stomach is growling, his brain stops working. You guys please help this poor rabbit.

Input

- The first line contains a positive integer n ($n \le 10^5$).
- The second line contains weights of food for winner $w_1, w_2, \dots, w_n$.

Output

- Print exactly one integer – the most amount of food that Tobi can bring to his house.

Sample

Input	Output
5 1 6 2 1 1	9

C. TONTON AND HOMEWORK

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

At school of Tonton, teacher assigns homework to Tobi. A string S with length not greater than 10^{18} and consisting only lower case English alphabet letter from 'a' to 'z' is encoded to string S_E which consists of only lower case letter 'a' to 'z' and digits. The encoding algorithm can be described as follows: From left to right, we replace the consecutive identical characters by one character and a number. The length of encoded string is not greater than 1000.

For example, string S = aaabbbbaaaaaaaaaaz can be encoded to S_E = a3b4a10z1

The homework consists of four tasks as follows:

1. Given two encoded string X_E and Y_E from string X and Y respectively. Output Z_E which is the encoded string of $Z = X + Y$.
   Example: X_E = a1b10, Y_E = b3c9 so Z_E = a1b13c9

2. Given an encoded string S_E from S and two integer number p and c. Delete c characters from position p. Output the encoded result.
   Example: S_E = a10b20, p=2, c=10 so the result S_E = a1b19 after being deleted.

3. Given an encoded string S_E from S and two integer number p and c. Output the substring of S from p to p + c - 1. Of course, the output should be encoded.
   Example: S_E =a10b20, p=2, c=10 so the answer is a9b1

4. Given two encoded string X_E and Y_E, and an integer number p. String Z is obtained by inserting string Y to string X at position p. Output the encoded string Z.
   Example: X_E = a10b20, Y_E = d1b2, p=11, so Z_E= a10d1b22

Tobi needs your help, because his grandmother is coming, and brings a lot of food. He wants to eat but do not want to do the homework.

Input

There are several tasks, each task format is as follows:

- The first line starts by '@' character followed by a number 1, 2, 3 or 4, which is the task index you have to do.
- If the number is 1, the next two lines are two string X and Y. If the number is 2 or 3, the second line is string S, then the third line contains two integer p and c separated by a single space. If the number is 4, the second and third line are two string X and Y, then the next line is an integer p.

Output

Write answer for each task in one line, the format of one line is as follows:
The first character is '@', then followed by number 1, 2, 3 or 4 which denotes the task index. Then character ':', and a single space and finally the encoded string result.

Sample

Input	Output
@1 a1b10 b3c9 @2 a10b20 2 10 @3 a10b20 2 10 @4 a10b20 d1b2 11 @1 a1 b3	@1: a1b13c9 @2: a1b19 @3: a9b1 @4: a10d1b22 @1: a1b3

D. TONTON AND TRIANGLE

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

The question “how many triangles are in a picture” is not easy to answer for Tonton Friends. Today, Yuta has drawn a picture, which contains a number of triangles, (see the picture below) in order to challenge his little sweetie Bella. However, it is such boring if there is only one picture, so that Yuta wants to remove from the original picture some edges among AB, AC and BC. Obviously, the number of triangle is not small, Yuta needs your help to calculate the number of triangles after remove these edges before giving the problem to Bella.

Your task is to count the number of triangles after removing some edges among AB, AC and BC.

Input

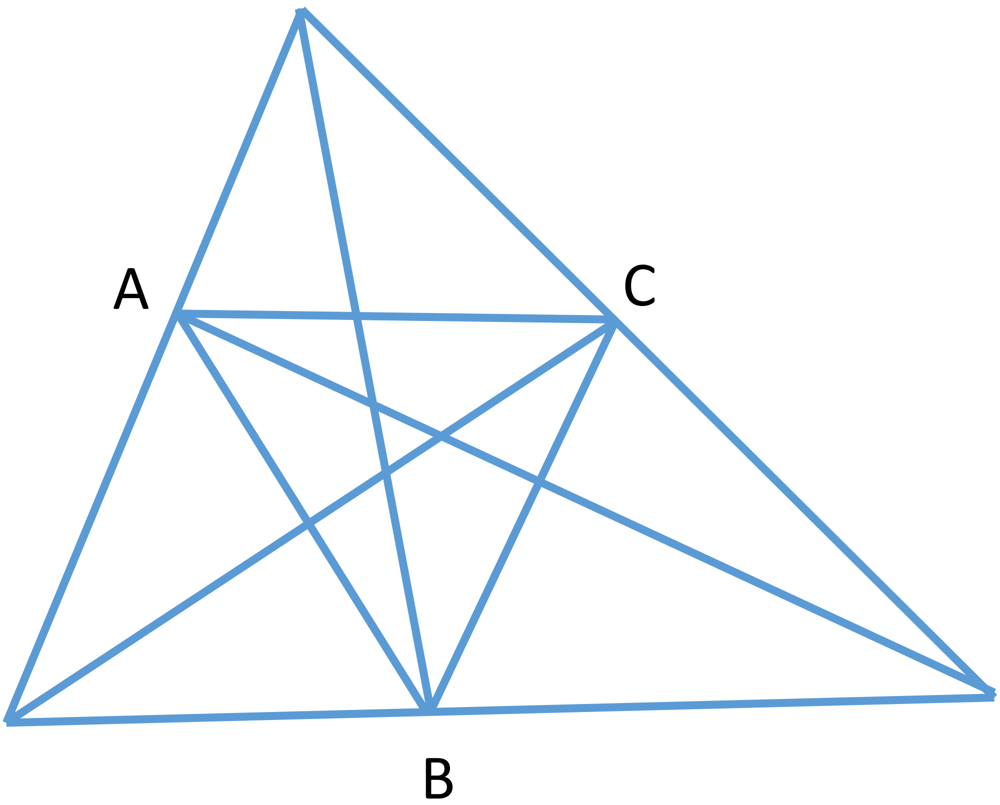
- The first line contains one integer n - the number of edges which are removed ($0 \leq n \leq 3$)
- The second line contains n integers corresponds to AB/AC/BC. 1 is for edge AB, 2 is for edge AC, and 3 is for edge BC.

Output

- Write in one line the number of triangles.

Sample

Input	Output
1 1	35



E. TONTON AND GAME

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Winnie likes to be alone and likes to stay at home. Winnie hates worms but Winnie is friendly with earthworms. It is everything people know about Winnie, but there is one more thing, not many people know: Winnie likes playing game. This little bear is always crazy about game of maze. A maze can be presented as a matrix with size $m \times n$ with m rows from top to bottom starting at 1, and n columns from left to right starting at 1. Four corners are cells (1, 1), (1, n), (m, 1), (m, n). For each cell (i, j) there is an integer number $a_{i,j}$ written on it. A journey starting at the (1, 1) corner and ends at the (m, n) corner by only right, or down move. In other words, for each cell (i, j), player can only move to either cell (i + 1, j) or (i, j + 1) if these cells are inside of the table. The cost for each journey is sum of integers written on cells. Denote W as the biggest cost among all possible journeys.

The gameplay is simple, player needs to choose a submatrix with size $p \times q$, then blocking every cells of this submatrix with a condition that the new table, after blocking a number of cells, should consist of at least one journey. Blocking means that player can not make a move through blocked cells. Similarly, denote W' as the biggest cost of journeys in the new matrix. A submatrix with size $p \times q$ is called excellent if and only if $W' < W$.

Your task is to find an excellent submatrix with the smallest size, it means that $p \times q$ is smallest.

Input

- The first line contains two integer m, n ($1 \leq m, n \leq 1000$)
- The next following m lines. For each line, there are n non negative integers which is the matrix description. All number is not greater than 10^9

Output

- Print exactly one integer – the smallest value of $p \times q$. If there is no satisfied submatrix, print -1

Sample 1

Input	Output
4 4 2 2 2 1 2 2 2 2 1 1 2 2	1

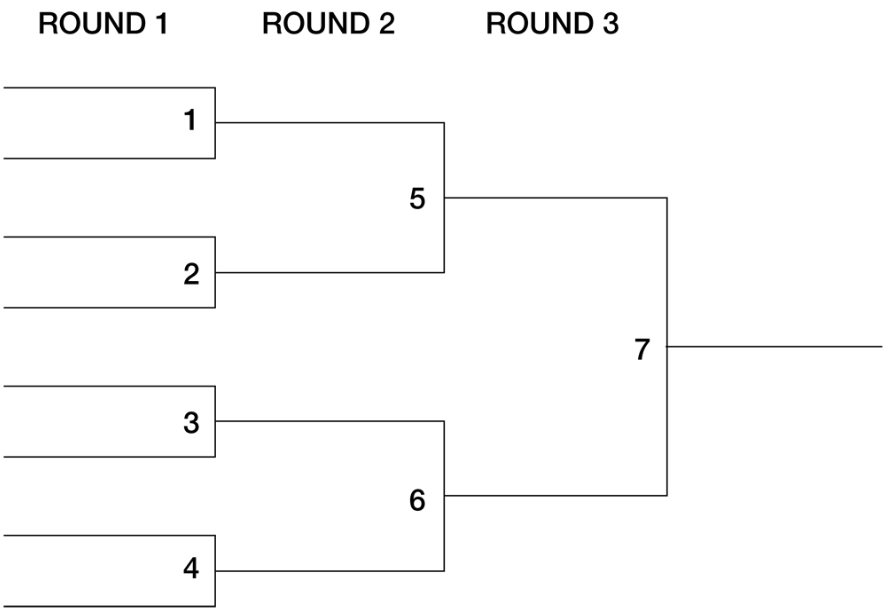
Sample 2

Input	Output
4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-1

F. TONTON AND THE TOURNAMENT

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

The school of Tonton has organized a marathon tournament to select three candidates for ACM ICPC World Final 2019. The tournament consists of several tests including IQ test, Beauty test, etc. Candidates have passed most of the tests, and nearly entering the final test. Before the final test, each candidate already got a score s_i from previous tests. The rule of final test is single elimination. There are $n = 2^k$ candidates competing through k round (See the format below for $k = 3$)



A candidate winning in each round will receive point. The longer survival, the point is rewarded bigger. It means that rewarding point for round 2 will be greater than or equal to that of round 1; round 3's is greater than or equal to round 2's, etc. After round k^{th}, candidates will be ranked by their scores. Rank 1 should have the highest score, rank 2 has the second highest score, etc. Candidates, who have the same score, have the same rank. In other words, a candidate has rank r if and only if there are exact r – 1 other candidates who have strictly more points than him/her. For example, for five candidates with score $\{5, 5, 4, 4, 1\}$, their ranks are $\{1, 1, 3, 3, 5\}$.

Your task is to count how many situations of the final test that the candidate x^{th} is on top 3. (i.e. his/her rank is either 1, 2 or 3). There are $2^{number\ of\ match} = 2^{n-1}$ situations of the final test. Since the answer can be very large, you should print it modulo $10^9 + 7$.

Input

- The first line contains two integer k and x ($1 \leq x \leq 2^k$, $1 \leq k \leq 14$)
- The second line contains $n = 2^k$ integers $s_1, s_2, \dots, s_n$ – score of each candidate before entering the final test
- The third line contains k integers $r_1, r_2, \dots, r_k$– rewarding points for each round ($1 \leq r_1 \leq r_2 \leq \dots \leq r_k \leq 10^9$)

Output

- Print the number of satisfied situations modulo $10^9 + 7$ in one line.

Sample

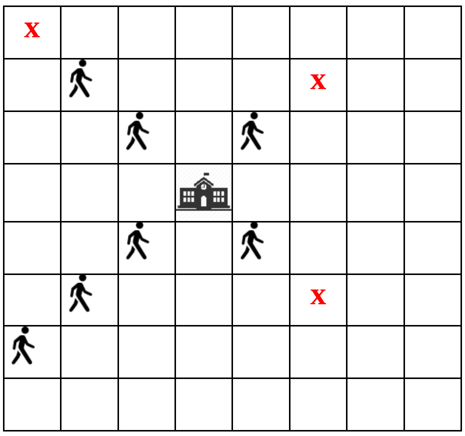
Input	Output
2 1 1 2 2 2 2 2	4

G. TONTON AND THE STORM

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Transportation system of Tonton kingdom can be represented as a matrix of size $n \times n$. There are n rows, n columns from top to bottom, left to right respectively starting at 1. Cell located at row i and column j is denoted as (i, j). Storm Măng cụt is approaching Tonton Kingdom, it is raining cats and dogs all day. Today, little Bella has finished at school and is going back to home. Her school is located at cell (x_s, y_s), Bella's house is located at cell (x_f, y_f). Transportation system of Tonton kingdom is so strange. You are only able to move to cells on diagonal lines. Formally, you can move from cell (x, y) to cells $(x+i, y+i), (x+i, y-i), (x-i, y+i), (x-i, y-i)$ $\forall i \in N$ with 1 unit of time as long as these destination cells are inside the matrix.

At the moment, there are m falled trees which are at cells $(x_1, y_1), (x_2, y_2), \ldots, (x_m, y_m)$, and blocks you going through these cells. You guys please help Bella figure out the fastest time to her home as she starts crying now.



The transportation system of Tonton Kingdom

Input

- The first line contains two integers n, m $(1 \leq n \leq 5000, 0 \leq m \leq 10^5)$
- The second line contains four integers $x_s, y_s, x_f, y_f (1 \leq x_s, y_s, x_f, y_f \leq n)$
- The next m lines, each line contains two integers$x_i, y_i (1 \leq x_i, y_i \leq n)$.

Output

- Print exactly one integer – the fastest time Bella can go to her house. If Bella can't return her home, print -1 instead.

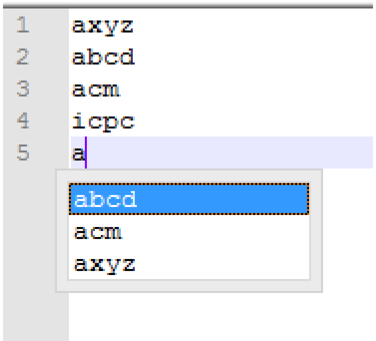
Sample

Input	Output
8 1 1 1 4 4 3 3	4

H. TONTON AND TYPING JOB

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Bella has ran out her money after a big summer sale. She needs a job to pay the huge debt to "Bốc bát họ" team. Fortunately, she has found one – Typing words at Tonton Company. The job description is as follows: given a document with several words, each consist of only lower case alphabet English characters from 'a' to 'z'. You have to type all these words consecutively following strictly order from the document on company typing program. The typing program is designed to faster the typing process. When you type i^{th} word, a list of distinct words which have been typed completely drops down, these words should have the same prefix with typed characters of i^{th} word. The most frequently occurring word is on top, the second most occurring word is next, and so on. Those words with the same number of occurrences are sorted by lexicographical order.



There is another selector which points to the first of the drop-down list. You can move it up or down but you can not jump to the last position by moving up at the first position. The same thing holds for jump from the last position to the first position. There are two ways to complete typing a word w:

- Type entire word, each character costs 1 unit of time.
- Type a prefix of w, each character costs 1 unit of time. If the list contains w, then moving the selector to it and pressing Enter. Each moving costs 1 unit of time, the same for pressing Enter.

The job description is too long, Bella is getting angry, but she still needs to pay the debt. Your task is to help Bella type the entire document with minimum amount of time.

Input

- The first line is a positive integer n – number of words in the document
- The next n lines, each line contains a string - one word in the document. The total length of words is at most 250000 characters.

Output

- Print exactly one integer – the minimum amount of time to type entire the document

Sample 1

Input	Output

`4`
`abcd`
`abcd`
`abefg`
`abefg`
	`14`

Sample 2

Input	Output

`2`
`abcdef`
`abcdefghijk`
	`17`

I. TONTON AND THE SCHOOL FAIR

Time limit: 4s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Yuta has been growing up and no longer being a little pupil. He is a Mathematics teacher now. Today, school of Tonton organizes a fair for international women's day celebration with a lot of activities for pupils. An activity called Game of Friends is his favorite activity. There are n $(2 \leq n \leq 10^5)$ pupils standing on a line starting from 1 to n. Each pupil has his or her own height denoted as $w_1, w_2, \dots, w_n$. Yuta's mission is to split n pupils into a number of groups. Each group should contains at least 2 consecutive pupils and a pupil should belongs to exactly one group. Weakness of a group is defined as the difference between the tallest and shortest pupils. Total weakness of groups is denoted as W. The question is to determine the minimum value of W. Yuta wants to know the answer quickly to take the gift. It is revealed that the gift is Bella's favorite handbag.

Input

- The first line contains one integer – n
- The second line contains n integers – heights of the pupils. For each i^{th} pupil, $1 \leq w_i \leq 10^9$.

Output

- Print exactly one integer – the minimum value of W.

Sample 1

Input	Output
4 1 2 3 4	2

Sample 2

Input	Output
4 5 2 3 4	3

J. TONTON AND DIFFICULT HOMEWORK

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Little duck Nari is on semester break, golden and beautiful beach are waiting for him. However, there is a monster preventing him from holiday called homework. Even though he has almost finished the homework, there is still a difficult task left. The task is as follows. Given a sequence of n integer numbers $a_1, a_2, \ldots, a_n$. There are q operations you need to do in order. Each operation is described by two integers l and r. The operation requires replacing all numbers at position from l to r in the given sequence by either minimum or maximum value of replaced ones. After having done this operation, length of the sequence decreases by $r - l$. The question is how many different sequences that Nari can obtained after having done q operations. Since the answer can be very large, Nari only interested in its remainder after dividing $10^9 + 7$.

Limit

$1 \leq n, q \leq 10^5$
$1 \leq a_i \leq 10^9$

Input

- The first line contains one integer – n.
- The second line contains n integers - $a_1, a_2, \ldots, a_n$ separated by a single space.
- The third line contains q – number of operations
- The next q lines, each line contains two integers l and r $(1 \leq l < r \leq length\ of\ sequence\ so\ far)$

Output

- Print exactly one integer modulo $10^9 + 7$ – the number of different sequences after q operations.

Sample

Input	Output
5 1 2 2 3 4 2 1 4 1 2	3

K. TONTON AND SUPERCOMPUTER

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Yuta is interested in computer science, he had spent half of his life to create a supercomputer in order to count how many time his little sweetie Bella gets angry with him, and he succeeded. Yuta's supercomputer has an incredible ability to deal with super ultra big integer. However, Yuta needs to test it carefully by solving a much simpler problem: Reducing Fraction.

The task is as follows. Given two sequences $a_1, a_2, .., a_m$ and $b_1, b_2, .., b_n$ and an integer number M. Find two coprime integers P and Q such that $\frac{a_1 \times a_2 \times .. \times a_m}{b_1 \times b_2 \times .. \times b_n} = \frac{P}{Q}$.

Input

- The first line consists of three integer number m, n, M ($1 \leq m, n \leq 1000$, $1 \leq M \leq 10^{15}$).
- The second line contains m integer numbers $a_1, a_2, .., a_m$ ($1 \leq a_i \leq 10^{15}$).
- The second line contains n integer numbers $b_1, b_2, .., b_n$ ($1 \leq b_i \leq 10^{15}$)..

Output

- The first line is the reminder of P after dividing M.
- The second line is the reminder of Q after dividing M.

Sample

Input	Output
2 3 100 3 30 1 2 27	5 3

L. TONTON AND MAGICAL PLANTS

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Winnie is a first grade pupil at school of Tonton. In this semester, Winnie has started to study a new subject called *Introduction to Magic Biology*. After understanding the underline theory of it, he decides to do his own experiment.

Winnie has n seeds, the i^{th} seed has power p_i. He can combine some seeds $s_1, s_2, \dots, s_k$ $(0 < k \leq n, 1 \leq s_1 < s_2 < \dots < s_k \leq n)$ and do a spell, this will result in S new seeds, each seed with a random type $s_1, s_2, \dots, s_k$ where $S = \prod_{i=1}^{k} p_{s_i}$. Winnie wants S to be a square integer so that he can use S seeds to plant a square garden.

Your task is to calculate how many ways Winnie can select the seeds so that he has a square garden. Since the answer can be very large, you should print it modulo $10^9 + 7$.

Input

- The first line contains an integer n $(1 \leq n \leq 2 \times 10^5)$.
- The second line contains n integers $p_1, p_2, \dots, p_n$ $(1 \leq p_i \leq 4 \times 10^6)$.

Output

- Print exactly one integer modulo $10^9 + 7$ – answer of task.

Sample 1

Input	Output
3 3 5 7	0

Sample 2

Input	Output
4 2 3 6 2	3