Problem A. First Mission

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Herman is a young Padawan training to become a Jedi master. His first mission is to understand the powers of the force - he must use the force to print the string "May the judge be with you" (without the quotes)! Help Herman complete his first task as an apprentice.

Input

No input

Output

Print the string "May the judge be with you" (without the quotes).

Problem B. Basketball

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Herman the Jedi Padawan is learning the ways of the force by playing basketball. However, in this galaxy, baskets are not always worth two or three points. For this particular game, some baskets are worth p points and other baskets are worth q points.

Herman is on the Golden Galactic Warriors and is playing against the Utapau Droids. The Golden Galactic Warriors currently have m points and the Utapau Droids have n points.

In the final minutes, the Utapau Droids score another b baskets. Help Herman be clutch by determining the fewest number of baskets his team can make (if any) and possibly still win (not tie) the game?

Input

The only line of input contains five integers, p, q, m, n, and b ($1 \leq p, q, m, n, b \leq 10^3$) - the two possible point values of one basket, the number of points for the Golden Galactic Warriors, the number of points for the Utapau Droids, and the number of additional baskets the Utapau Droids score, respectively. It is guaranteed that $p \neq q$.

Output

Print a single integer representing the fewest number of baskets Herman's team can score and possibly still win the game.

Examples

standard input	standard output
2 3 46 49 1	2
1 2 1 2 1	2

Note

In the first sample, it is possible that the Utapau Droids score a 2-point basket, obtaining a final score of $49 + 2 = 51$ points. Then the Golden Galactic Warriors can beat the Utapau Droids by scoring two 3-point baskets for a final score of $46 + 2(3) = 52$ points.

In the second sample, it is possible that the Utapau Droids score a 1-point basket, obtaining a final score of $2 + 1 = 3$ points. Then Herman's team can beat the opponent by scoring a 2-point basket and a 1-point basket for a final score of $1 + 2 + 1 = 4$ points. Note that Herman's team cannot just score a 2-point basket because that would only tie the opponent.

Problem C. Unfair War

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

During his training break, Herman the Jedi Padawan decides to play a fun card game called Unfair War with Jar Jar Binks. The cards are simply all the numbers from 1 to n, for a total of n cards (there are no repeats). Both Herman and Jar Jar Binks have all the cards from 1 to n available to them at the start, but once they play a card, they no longer have that card.

Jar Jar Binks gets to choose how many cards he would like to play. However, Herman uses the force to confuse Jar Jar! Now, Jar Jar will say the order he will play his cards to Herman. For example, he might say he's playing 3 cards (where the deck is from 1 to 5), and tell Herman he's playing 4 first, then 5, and then 1.

Once Herman know the cards Jar Jar has played, he plays the same number of cards, in some order. Going back to the previous example where the cards are from 1 to 5 and Jar Jar plays 3 cards, Herman might play 3, 4, and then 5 (this is not necessarily optimal). Herman gets 1 point every time his card has higher value than Jar Jar's in the same position, and 0 otherwise. In this example, his 3 is smaller than Jar Jar's 4, so he get 0 points for the first card. Similarly, he get 0 points for the second card. However, for the 3rd card, his 5 is higher than Jar Jar's 1, so he gets 1 point. Hence, Herman gets a total of 1 point.

Given the size of the deck, the number of cards Jar Jar plays, and the list of cards Jar Jar plays, find the most number of points Herman can win.

It is guaranteed that the cards Jar Jar plays are distinct.

Input

The first line contains two space-separated integers n and m ($1 \leq m \leq n \leq 200000$), the number of cards in the deck and the number of cards Jar Jar plays, respectively.

The second line contains m space-separated integers, $c_1, c_2, \cdots, c_m$, ($1 \leq c_i \leq n$), the values of the cards that Jar Jar plays, in the order that he plays them.

Output

Output a single integer - the maximum possible score Herman can achieve.

Examples

standard input	standard output
3 2 1 3	1
4 3 2 4 3	2

Note

In the first sample case, Herman can first play a '2' to beat the '1' for the first pair of cards. Then, he can play a '3' which ties with Jar Jar's '3', giving a total score of 1.

In the second sample case, Herman can first play a '3' to beat the '2' for the first pair of cards. Then, he can play a '2' which loses to Jar Jar's '4'. Finally, he can play a '4' which beats Jar Jar's '3', giving a total score of 2.

Problem D. Smallest Substring

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Herman the Jedi Padawan has received an important message from his master Lingxiao Kenobi. But to prevent the First Order from deciphering his message, Lingxiao sent the message as an array of zeros and ones. Luckily, Herman knows how to decode the message - he must find the length of the shortest contiguous subarray containing exactly k ones.

Input

The first line of input contains a single integer n ($1 \leq n \leq 10^5$) representing the number of elements in the array.

The second line of input contains a single integer k ($1 \leq k \leq n$) representing the number of ones that need to be in the subarray.

The third line of input contains n space separated integers. The ith integer, representing the ith element of the array, will be either 0 or 1. It is guaranteed that the whole array contains at least k ones.

Output

Output a single integer - the length of the shortest contiguous subarray containing exactly k ones.

Examples

standard input	standard output
7 2 1 0 0 1 1 0 1	2
4 3 1 1 0 1	4

Note

In the first sample, the best subarray to take is the fourth and fifth elements for a length of 2.

In the second sample, the only way to get 3 ones is to take the whole array.

Problem E. Maximum Product

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	512 megabytes

During his training, Herman the Jedi Padawan is given an array of numbers. He must choose four numbers from this array so that the product of the four numbers is maximized. Since there are a lot of ways to choose four numbers from an array, Herman needs to use the force to quickly determine the answer. Help him find this maximum product!

Input

The first line of input has only one integer n ($4 \leq n \leq 10^5$), denoting the size of the array; the second line has n integers a_i ($1 \leq i \leq n$), denoting the array. Each term in the array has absolute value no greater than 10^4.

Output

Output only a single integer - the maximum product. Note that this answer may not fit in 32-bit integer.

Examples

standard input	standard output
10 -3 -5 1 2 3 2 1 2 9 0	405
8 -1 9 -8 5 -10 -10 -12 4	9600

Note

In the first sample, it is best for Herman to choose -3, -5, 3, and 9 for a product of 405.

In the second sample, Herman should choose -8, -10, -10, and -12 for a product of 9600.

Problem F. Human Pyramid

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

The First Order has attacked the Jedi Academy! To protect themselves during the attack, Herman the Jedi Padawan and his friends must form a human pyramid, and they want to make the tallest pyramid possible to avoid damage. The pyramid must satisfy the following constraints: (with level numbers increasing from bottom to top)

1) The are fewer people on level $i + 1$ than on level i.

2) The sum of the weights of the people on level $i + 1$ is strictly less than the sum of the weights of the people on level i.

Given n people and their weights, determine the height (number of levels) of the tallest possible pyramid Herman and his friends can make.

Input

The first line of input contains a single integer n ($1 \leq n \leq 10^5$) representing the number of people.

The second line of input contains n space separated integers. The ith integer, w_i ($1 \leq w_i \leq 10^9$), represents the weight of the ith person.

Output

Output a single integer - the number of levels of the tallest possible pyramid.

Examples

standard input	standard output
4 1 2 3 4	2
2 15 18	1

Note

In the first sample, we can build a pyramid of height 2 by putting the people with weights 3 and 4 on the first level and the person with weight 1 on the second level.

In the second sample, we can only make a one person pyramid by taking either person, so the height is 1.

Problem G. Cookies

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

After finishing a mission at Tatoonie, Herman the Jedi Padawan decides to take a break by eating cookies.

In Tatoonie, there are two cookie shops, Unkar Plutt's Junkyard and Jabba's Cookie Hut. Unkar Plutt's Junkyard is selling m cookies for x dollars a cookie. The ith cookie in this shop gives Herman a_i units of happiness if he buys it. Similarly, Jabba's Cookie Hut is selling n cookies for y dollars a cookie. The ith cookie in this shop gives Herman b_i units of happiness if he buys it.

Unfortunately, Herman is still a poor Padawan, so he has a budget of c dollars for buying cookies in any of the two shops. What is the greatest amount of happiness he can obtain from buying cookies?

Input

The first line of input contains two integers m and x ($1 \leq m \leq 10^5$ and $1 \leq x \leq 10^9$) - the number of cookies sold at Unkar Plutt's Junkyard and the price of each cookie in Unkar Plutt's Junkyard.

The second line of input contains m integers. The ith integer, a_i with $1 \leq a_i \leq 10^9$, in this line represents the amount of happiness obtained if Herman buys the ith cookie in Unkar Plutt's Junkyard.

The third line of input contains two integers n and y ($1 \leq n \leq 10^5$ and $1 \leq y \leq 10^9$) - the number of cookies sold at Jabba's Cookie Hut and the price of each cookie in Jabba's Cookie Hut.

The fourth line of input contains n integers. The ith integer, b_i with $1 \leq b_i \leq 10^9$, in this line represents the amount of happiness obtained if Herman buys the ith cookie in Jabba's Cookie Hut.

The fifth line of input contains a single integer c ($1 \leq c \leq 10^9$) - the total number of dollars Herman can spend on the cookies.

Output

Print a single integer representing the greatest amount of happiness that Herman can obtain from buying cookies.

Examples

standard input	standard output
5 3 9 7 3 4 6 4 4 1 9 10 8 20	45
3 1 5 12 13 2 3 15 15 3	30

Note

In the first sample, Herman can buy the four cookies with happiness values of 4, 6, 7, and 9 from Unkar Plutt's Junkyard for a cost of $4 \cdot 3 = 12$ dollars. Then Herman can also buy the two cookies with happiness values of 9 and 10 from cookie shop B for a cost of $2 \cdot 4 = 8$ dollars. Thus, his total cost is $12 + 8 = 20$ dollars (which is not over our budget) and he achieves a happiness value of $4 + 6 + 7 + 9 + 9 + 10 = 45$.

In the second sample, Herman can buy all three cookies from Unkar Plutt's Junkyard.

Problem H. GCD

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	512 megabytes

At Maz's Castle, Maz gives Herman the Jedi Padawan an interesting problem to test his knowledge of the force. She gives him two numbers a and b and Herman must find a non-negative integer i with $i < \min(a, b)$ so that the greatest common divisor between $a - i$ and $b - i$ is maximized. Don't let this be an answer for another time by helping Herman!

Input

The only line of input contains the two integers a and b ($1 \leq a, b \leq 10^9$).

Output

Output the maximized greatest common divisor that can result from the procedure described.

Examples

standard input	standard output
3 7	2
19 10	9

Note

In the first sample, Herman should subtract 1 from both of the numbers to get $\gcd(2, 6) = 2$.

In the second sample, Herman should again subtract 1 from both of the numbers to get $\gcd(18, 9) = 9$.

Problem I. Racing

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Herman the Jedi Padawan has been given an important task! The New Republic Starfleet is about to attack another Death Star and he is in charge of designing the flight sequence of the X-wings fighters.

However, he first must resolve a logistical issue. There are n X-wings that will fly on the long straight path to the Death Star. The ith X-wing starts at position x_i and moves towards the Death Star with speed v_i (in units per second). They all start flying at the same time. Herman must determine the last time an X-wing passes another X-wing (if such a time exists). For the purposes of this problem, Herman is assuming that the length of the road to the Death Star is infinite.

Input

The first line contains a single integer n ($2 \le n \le 2 \cdot 10^5$) - the number of X-wing fighters.

The next n lines contain 2 space-separated integers x_i ($-10^8 \le x_i \le 10^8$) and v_i ($0 \le v_i \le 10^8$) - The starting position and velocity of the ith X-wing, respectively.

It is guaranteed that all x_i and v_i are distinct. That is, no two X-wings have the same starting point, and no two X-wings have the same velocity either.

Output

Print a single real number - the last time an X-wing passes another X-wing, or -1 if no such time exists. Your answer will be considered if its absolute or relative error does not exceed 10^{-6}.

Namely: let's assume that your answer is a and the answer of the jury is b. The checker will consider your answer correct if $\frac{|a-b|}{\max(1,b)} \le 10^{-6}$.

Examples

standard input	standard output
3 1 1 -3 3 0 2	3
2 2 3 1 2	-1

Note

In the first sample, there are three X-wings with starting positions at 1, -3, and 0 and velocities of 1, 3, and 2 respectively. After 1 second, their positions change to 2, 0, and 2 respectively, so the third X-wing passes the first X-wing. After 2 seconds, their positions are 3, 3, and 4 respectively, so the second X-wing passes the first X-wing. Finally, after 3 seconds, their positions are 4, 6, and 6 respectively, so the second X-wing passes the third X-wing. After $t = 3$, no more passing takes place.

In the second sample, two X-wings will never pass each other.

Problem J. Painting

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Herman the Jedi Padawan has received a painting created by his master Lingxiao. The painting is an n by m grid, where each cell in the grid is either red or blue (Lingxiao doesn't leave any cells uncolored).

Herman knows the force technique Lingxiao used to paint it. He started with a grid of all white cells, and performed several steps. In each step, he chose either a row or a column, and painted that row or column either red or blue. Note that a cell becomes the color that it was last painted on with, so if he paints over a red cell with blue paint, the cell becomes blue.

Herman is looking at Lingxiao's painting and is wondering how he can paint the same exact painting. Please provide Herman with an ordered list of steps to recreate Lingxiao's painting from a blank white grid.

Input

The first line contains 2 space separated integers - n and m ($1 \leq n, m \leq 1000$), the number of rows and columns in the grid, respectively.

The next n lines contain m symbols each, "R" for red, "B" for blue, "W" for white.

Output

Print a list of steps, one on each line.

The format for each step is 3 space-separated tokens: A x D, where A indicates whether Herman should paint a row or a column: "R" for row, "C" for column. x indicates which row or column number Herman should paint, (1 - indexed). D indicates what color Herman should use, "R" for red, and "B" for blue. For example, "C 23 R" means color the 23rd column red.

Your solution must not contain more than 10^6 steps. It is guaranteed that there exists a valid way to paint the grid.

Examples

standard input	standard output
2 4 RBRB BBRB	R 1 B C 1 R R 2 B C 3 R
1 2 BR	R 1 B C 2 R

Note

In the first sample, Herman must paint the first row blue, then the first column red, then the second row blue, and finally the third column red.

In the second sample, Herman can paint the first (and only) row blue and then the second column red.