Problem A. Parallelepiped

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You are given the dimensions of a parallelepiped; find its volume.

Input

The first line contains one integer n ($1 \le n \le 10$) — the height of the parallelepiped.

The second line contains one integer m ($1 \le m \le 10$) — the width of the parallelepiped.

The third line contains one integer k ($1 \le k \le 10$) — the length of the parallelepiped.

Output

Output one integer — the volume of the parallelepiped.

Example

standard input	standard output
2 3 4	24

Note

The volume of the parallelepiped is equal to $2 \cdot 3 \cdot 4 = 24$.

Problem B. Grandchildren

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Vus the Cossack has exactly x sons. Each of his sons has exactly $(x+1)$ sons. And each of his grandsons has exactly $(x+2)$ sons.

Determine how many great-grandsons Vus the Cossack has.

Input

The first line contains one integer x ($1 \le x \le 100$).

Output

Print one integer — the answer to the problem.

Example

standard input	standard output
2	24

Note

Vus the Cossack has 2 sons. Each son has 3 sons, which means Vus the Cossack has 6 grandsons. Each grandson has 4 sons, which means Vus the Cossack has 24 great-grandsons.

Problem C. Heartbeat, Heartbreak

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Sakurako has two arrays $a_1, a_2, \ldots, a_n$ and $b_1, b_2, \ldots, b_m$. Using these arrays, she painted a picture in a frame of size $n \times m$. The color of the cell (i, j) in the picture is determined by the value $c_{i,j} = a_i + b_j$.

Her drawing turned out so mesmerizing that it was displayed in a prestigious art gallery.

One day, you visited that gallery. Being a curious programmer, you decided to study the "beauty" of Sakurako's picture. You define the beauty of the picture as the area of the largest region in the grid where all cells have the same color and are connected.

Two cells (p_1, q_1) and (p_2, q_2) are considered part of the same connected region if there exists a sequence of cells $(p_1, q_1), (x_1, y_1), \ldots, (x_k, y_k), (p_2, q_2)$ such that:

1. All cells in the sequence are of the same color.
2. Each pair of consecutive cells in the sequence is adjacent by edge.

Your task is to determine the "beauty" of Sakurako's picture — the area of the largest connected region where all cells have the same color.

Input

The first line contains two integers n and m ($1 \le n, m \le 2 \cdot 10^5$) — the lengths of a and b, respectively.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$) — elements of a.

The third line contains m integers $b_1, b_2, \ldots, b_m$ ($1 \le b_i \le 10^9$) — elements of b.

Output

Output a single integer — the "beauty" of Sakurako's picture.

Scoring

In this problem, there are conditional blocks. If your solution works correctly for certain constraints, it will receive a certain number of points. Note that testing is going test by test, but not by blocks.

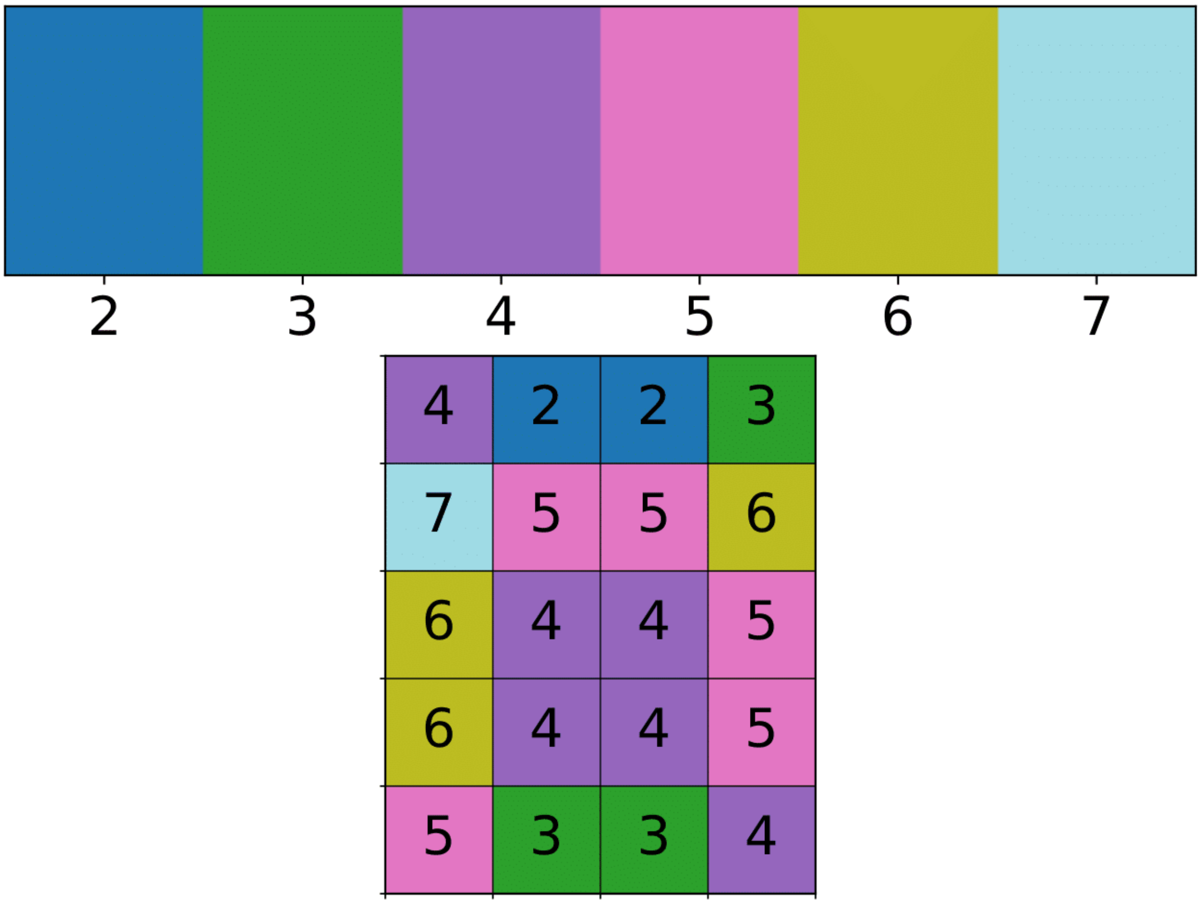
1. (10 points): $m = 1$;
2. (40 points): $n, m \le 1\,000$;
3. (50 points): without additional constraints.

Example

standard input	standard output

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

Note



Visualization of the first sample.

Problem D. Winrate

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Sakurako is playing checkers. Right now, out of q played games, she has won p games ($p < q$).

She wants to increase her winrate. She wants it to be equal to at least $\frac{a}{b}$ (where a and b are co-prime numbers).

Integers a and b are called co-prime numbers if their GCD (greatest common divisor) equals one.

What is the minimum amount of games that she needs to play so that her winrate becomes at least $\frac{a}{b}$ ($a < b$)?

Win rate is equal to $\frac{x}{x+y}$, where x is the amount of games that Sakurako wins and y is the amount of games that she loses.

Input

The first line contains two integers p and q ($0 \le p < q \le 10^6$).

The second line contains two co-prime integers a and b ($0 \le a < b \le 10^6$).

Output

Output the minimum amount of games that Sakurako needs to play in order for her win rate to become at least $\frac{a}{b}$.

Scoring

In this problem, there are conditional blocks. If your solution works correctly for certain constraints, it will receive a certain number of points. Note that testing is going test by test, but not by blocks.

1. (34 points): $p, q \le 10^4$;
2. (66 points): without additional constraints.

Example

standard input	standard output
1 3 8 11	5

Note

If Sakurako wins all five games, her winrate will be $\frac{1+5}{3+5} = \frac{6}{8}$, which is bigger than $\frac{8}{11}$. It is possible to show that if she plays only four games, it is not going to be enough.

Problem E. Sakurako's Painting

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Classic 2D paintings are boring. That is why Sakurako decided to paint a painting which consists of 10^{100} dots that are positioned on a single line.

Initially, she wanted to paint some points with n different colors.

For each color i, she chose a segment of points numbered from l_i to r_i that she wanted to paint.

After you saw that, you argued that no point should be painted in more than **one** color.

Since Sakurako is stubborn, she decided that she would do exactly one of the following for each color i ($1 \le i \le n$):

- Remove color i completely (thus, no point is colored in color i).
- Choose segment $[x_i, y_i]$ such that $l_i \le x_i \le y_i \le r_i$ and paint those points in color i.

Sakurako is trying to maximize the total amount of points that are colored, if no point should be painted in more than **one** color.

Since she is busy with preparations, she asked you to determine the maximal amount of points that can be colored.

Point q is said to be painted in color i if $x_i \le q \le y_i$.

Input

The first line contains one integer n ($1 \le n \le 10^5$) — the amount of colors that Sakurako initially chose.

Each of the next n lines contains two integers l_i and r_i ($0 \le l_i \le r_i \le 10^{15}$).

Output

Output the maximal amount of points that can be colored.

Scoring

In this problem, there are conditional blocks. If your solution works correctly for certain constraints, it will receive a certain number of points. Note that testing is going test by test, but not by blocks.

1. (36 points): $l_i, r_i \le 10^7$;
2. (64 points): without additional constraints.

Example

standard input	standard output
5 1 1 4 4 5 8 3 4 4 5	7

Note

One of the options to achieve seven is:

1. First color. Choose $x = 1$ and $y = 1$.
2. Second color. Choose $x = 4$ and $y = 4$.
3. Third color. Choose $x = 5$ and $y = 8$.
4. Fourth color. Choose $x = 3$ and $y = 3$.
5. Fifth color. Remove it.

Problem F. Colorful Circles

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Sakurako has found n circles arranged on a straight line. The i-th circle is positioned at coordinate x_i with a radius r_i. Initially, each circle is divided into two parts: the left half is purple, and the right half is yellow.

Sakurako is allowed to rotate some of the circles, which will swap their colors—so the left half becomes yellow, and the right half becomes purple.

Help Sakurako to determine if it's possible to rotate the circles such that no two circles have overlapping regions of different colors. If it's possible, provide the necessary rotations; otherwise, determine that it is impossible.

Input

The first line contains one integer n ($1 \le n \le 2 \cdot 10^5$) — the number of circles.

The second line contains n integers $x_1, x_2, \ldots, x_n$ ($1 \le x_i \le 10^9$) — coordinates of the circles.

The third line contains n integers $r_1, r_2, \ldots, r_n$ ($1 \le r_i \le 10^9$) — radii of the circles.

Output

Output -1 if it is impossible to rotate the circles as described in the statement. If it is possible, output a string of length n where the i-th character is "`0`" if Sakurako does not rotate the i-th circle and "`1`" otherwise.

If there are multiple answers, you are allowed to output any.

Scoring

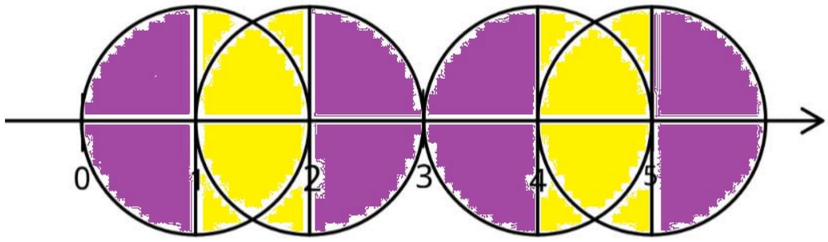
In this problem, there are conditional blocks. If your solution works correctly for certain constraints, it will receive a certain number of points. Note that testing is going test by test, but not by blocks.

1. (40 points): $r_1 = r_2 = \cdots = r_n$;
2. (60 points): without additional constraints.

Examples

standard input	standard output
4 1 2 4 5 1 1 1 1	0101
3 1 2 3 2 2 2	-1

Note



Visualization of the first sample.

Problem G. Prefix-Suffix Dictionary

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Sakurako just found the oldest dictionary in the whole universe. It contains more than n words. Sakurako can create new words based on these words.

Every new word can be constructed by taking a prefix of some word from the dictionary and concatenating it with a suffix of some word (can be the same word). The length of the newly constructed word should be at most 10^3. It is possible to choose empty prefixes and suffixes.

Each time, Sakurako can create a new word, choosing any two existing words (even those that she has created).

Sakurako wonders if it is possible to create her favorite word s without creating more than 2 000 new words.

Input

The first line contains one string s ($1 \le |s| \le 10^3$) — the word Sakurako is interested in. The string contains only lower case English letters.

The second line contains one integer n ($1 \le n \le 10^5$) — the number of words in the dictionary initially.

Each of the next n lines contains one string a_i ($1 \le |a_i| \le 10^3$) — first words that were in the dictionary, which contain only lower case English letters. It is guaranteed that the sum of all the lengths does not exceed $2 \cdot 10^5$.

Output

Output "`No`" if it is not possible and "`Yes`" otherwise.

If it is possible, output integer k ($0 \le k \le 2\,000$), the number of operations you need to do to get string s and next k lines describe operations. Note that there is no need to minimize this value.

Each line contains four integers:

- i_p ($1 \le i_p \le t$, where t is the number of strings at that time) is the index of the string from which we are taking a prefix;
- l_p ($0 \le l_p \le |a_{i_p}|$, where $|a_{i_p}|$ is the length of the i_p-th string) is the length of the prefix we want to take;
- i_s ($1 \le i_s \le t$, where t is the number of strings at that time) is the index of the string from which we are taking a suffix;
- l_s ($0 \le l_s \le |a_{i_s}|$, $1 \le l_p + l_s \le 10^3$, where $|a_{i_s}|$ is the length of the i_s-th string) is the length of the suffix we want to take.

The i-th word will be having index $n + i$.

Scoring

In this problem, there are conditional blocks. If your solution works correctly for certain constraints, it will receive a certain number of points. Note that testing is going test by test, but not by blocks.

1. (24 points): s and a_i for all i contain only letters a and b;
2. (30 points): $n \le 1\,000$;

3. (46 points): without additional constraints.

Examples

standard input	standard output
a 1 bac	Yes 3 1 2 1 0 2 0 2 1 3 1 3 0
ab 1 bcad	Yes 6 1 1 1 0 2 0 2 1 1 3 1 0 4 0 4 1 5 1 5 0 6 1 3 1