Problem A. Virus

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

The immune system of Sponge Bob is a rectangle $n \times m$ consisting of immune cells. Sponge Bob doesn't want to go to school tomorrow, so he needs to get sick.

In order to get sick he is ready to infect some of his immune cells with the ARVI virus. After initial infection, the virus propagation process takes place: every millisecond all healthy cells which have two or more infected neighbors become infected, and nothing happens with already infected cells. Here we consider two cells as neighbors if they share an edge. Sponge Bob will get sick only if all his immune cells will be infected. Since the infecting immune cells is quite painful, Sponge Bob wants to minimize the number of initially infected cells.

Find and output any example of the initial infection with the minimum possible number of infected cells, which leads to Sponge Bob's illness.

Input

The single line contains two integers n and m ($1 \le n, m \le 10^3$) — the size of Sponge Bob's immune system.

Output

Print a description of any initial infection with the minimum possible number of infected cells, which leads to Sponge Bob's illness. Output must contain n lines of m characters: 1 if the corresponding cell of the immune system is initially infected, and 0 otherwise. Do not separate the characters with spaces or other delimiters.

Examples

standard input	standard output
1 3	101
2 1	1 1

Problem D. Long Nim

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Two players are playing famous game Nim. They are given n heaps of stones, i-th of them contains a_i stones. Two players alternate taking any positive number of stones from any single heap. The goal is to be the last to take a stone. It's obvious that this game has predetermined result in case both players are acting optimally. In this problem you should answer how long the game will last if losing player is trying to play as long as possible, but the winning player is trying to finish it as soon as possible without making any moves that could lead him to lose the game. You should also output one of the first possible turns of the first player, that leads to the described result.

Input

The first line of input contains a positive integer n ($1 \le n \le 10^5$).

The second line contains n positive integers a_i ($1 \le a_i \le 10^{12}$) — the sizes of heaps.

Output

In the first line output a positive integer — how many turns the game will last if both players are playing optimally.

In the second line output the turn of the first player in format i k, where i is the index of the heap and k is the number of stones taken from the i-th heap. If there are multiple possible turns which lead to the optimal result, you may output any of them.

Examples

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

Problem E. Guess Table

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Jury has created a $n \times m$ matrix A consisting of zeroes and ones. You should guess it.

In order to do that you can send no more than 200 queries. At the end you should print the desired matrix.

Each query is described by the matrix B of size $a \times b$ ($1 \le a \le n, 1 \le b \le m$) consisting of zeroes, ones and questions. The answer to the query is 1 if the matrix A contains continuous submatrix that corresponds to the given pattern B. Otherwise the answer will be equal to 0.

Formally the answer will be equal to 1 if and only if exists some values (i, j) ($1 \le i \le n - a + 1, 1 \le j \le m - b + 1$), so for each (x, y) ($1 \le x \le a, 1 \le y \le b$) B_{xy} is a question or $B_{xy} = A_{i+x-1,j+y-1}$.

Also there is another restriction for the query matrix B: there should be no row and no column fully consisting of questions.

Note the problem is interactive, so you should flush your output after each query and at the end of the guess. To do that use function `fflush(stdout)` in `C++` language and `PrintWriter.flush()` in `Java` language.

Input

You are given two integers n and m ($1 \le n, m \le 13$) — the size of the matrix to guess.

Output

At the end you should print a line with a string `"Answer:"` (without quotes) on the first line. After that print n lines with m symbols “`0`” and “`1`” — the desired matrix. Don't forget to flush you output after that.

Interaction Protocol

On the first line of each your query print a string `"Query:"` (without quotes) and two integers a, b ($1 \le a \le n, 1 \le b \le m$) — the size of the submatrix. After that print a lines with b symbols “`0`”, “`1`” and “`?`”. Don't forget to flush you output after that.

After each query you will get an answer — a single line with number 1 if the desired matrix contains given submatrix and 0 otherwise.

Example

standard input	standard output

`2 3`	`Query: 2 1`
	`0`
	`0`

`1`	`Query: 1 2` `01`

`1`	`Query: 2 2`
	`01`
	`0?`

`1`	`Query: 2 3`
	`101`
	`??0`

`0`	`Answer:`
	`101`
	`001`

Problem H. MIPT Campus

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds (5 seconds for Java)
Memory limit:	256 mebibytes

A part of Dolgoprudny that belongs to MIPT is very convenient for students. Long Pervomayskaya street divides Dolgoprudny into two parts: university (study) buildings are on the left side of this street, and dormitories are on the right side. Assume $0X$-axis is collinear to that street. The width of Pervomayskaya street and distances from the buildings to the street are negligible, so you may consider this model as one-dimentional.

There are exactly n students of MIPT that attend the classes. Every morning each of them goes from his dormitory to his study building, crossing the Pervomayskaya street. i-th student lives in dormitory with x-coordinate a_i and studies in the building with x-coordinate b_i. Students can cross the street only at crosswalks. The are m crosswalks perpendicular to the $0X$-axis which are located in points with x-coordinates $c_1, c_2, \ldots, c_m$. While going to the study building, students always choose the shortest way to reach it.

Recently the Youth Committee of MIPT has concluded that the number of crosswalks is not enough for students. They lobbied the initiative to make a new crosswalk at any point of Pervomayskaya street. So now they want to make a new crosswalk in such a way that the sum of distances walked by all the students on their way from their dormitories to the study buildings is minimized. Your task is to find this minimum value.

Input

The first line contains an integer n ($1 \le n \le 5 \cdot 10^5$) — the number of students attending classes at MIPT.

Each of the next n lines contain two integers a_i, b_i ($1 \le a_i, b_i \le 10^9$) — the coordinates of the dormitory and the study building of i-th student.

The next line contains an integer m ($0 \le m \le 5 \cdot 10^5$) — the number of crosswalks.

The last line contains m distinct integers $c_1, c_2, \ldots, c_m$ ($1 \le c_i \le 10^9$) — the coordinates of crosswalks.

Output

Output one integer in a single line — the minimal sum of distance students have to travel after the building of a new crosswalk. It can be proven that the answer is always an integer.

Examples

standard input	standard output
2 5 10 20 30 0	35
2 5 10 10 20 1 2	15
2 5 10 20 30 1 11	17

Problem J. Total control

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

ByteCity is the capital of Byteland. It can be described as a convex polygon with n vertices, surrounded by walls.

The mayor of Bytecity decided to upgrade the weapons that the army of ByteCity is using. If new guns have a firing range d ($d \geq 0$) then the mayor of the city would consider all terrain inside the city and all terrain on the distance no further than d from the city walls as loyal.

Pride of the mayor will be satisfied if loyal area will be at least S. What is the minimum value of guns' firing range he need to buy for his army?

Input

In the first line you are given two integers n and S ($3 \leq n \leq 5 \cdot 10^4, 1 \leq S \leq 10^{13}$) — number of vertices in city polygon and needed area of loyal terrain.

In each of the next n lines you are given two integers x and y ($-10^6 \leq x, y \leq 10^6$) — coordinates of polygon vertices.

It is guaranteed that these n points are vertices of convex polygon given in counterclockwise order.

Output

Output a single number — minimum fire range of guns. Your answer considered will be correct if its absolute or relative error doesn't exceed 10^{-6}.

Example

standard input	standard output
4 2 0 0 1 0 1 1 0 1	0.21402387849518847

Problem K. Mbius

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

For any positive integer n, let's define Mbius function $\mu(n)$. It has values in $\{-1, 0, 1\}$ depending on the factorization of n into prime factors:

- $\mu(x) = 1$ if x is a square-free positive integer with an even number of prime factors.
- $\mu(x) = -1$ if x is a square-free positive integer with an odd number of prime factors.
- $\mu(x) = 0$ if x has is divisible by some squared prime factor.

For example, $\mu(1) = 1, \mu(2) = -1, \mu(6) = 1, \mu(12) = 0$.

You are given two arrays a and b, consisting of positive integers.

Let k_y be the number of pairs $(i, j), 1 \le i \le n, 1 \le j \le m$ such that $\mu(a_i \cdot b_j)$ is equal to y.

Your task is to calculate k_{-1}, k_0 and k_1.

Input

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

The second line contains n integers a_i ($1 \le a_i \le 10^6$) separated by spaces.

The third line contains m integers b_i ($1 \le b_i \le 10^6$) separated by spaces.

Output

Output three integers k_{-1}, k_0, k_1 separated by spaces in a single line, where $k_y = |\{(i, j) : \mu(a_i \cdot b_j) = y\}|$.

Example

standard input	standard output
6 4 1 2 3 4 5 6 2 3 5 7	6 9 9

Problem L. Continuous Fraction

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Given the formula

$$\cfrac{b_1}{a_1 + \cfrac{b_2}{a_2 + \cfrac{b_3}{\cdots \cfrac{\cdots}{a_{n-1} + \cfrac{b_n}{a_n}}}}}$$

and the values of a_i and b_i, calculate the result.

Input

The first line contains only one integer T $(1 \le T \le 500)$, which indicates the number of test cases.

For each test case, the first line contains one integer n $(n \le 8)$. The second line contains n integers: $a_1, a_2, \ldots, a_n$ $(1 \le a_i \le 10)$. The third line contains n integers: $b_1, b_2, \ldots, b_n$ $(1 \le b_i \le 10)$.

Output

For each case, print the result as irreducible fraction p/q. If the result is integer, consider $q = 1$.

Example

standard input	standard output
1 2 1 1 2 3	1/2

Problem M. Morse Alphabet

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 second
Memory limit:	256 mebibytes

Your task is to implement a decoder of the famous Morse alphabet. As most of you know, the Morse code represents characters as variable-length sequences of short and long signals ("beeps"), often written as dots and dashes. The following table shows the Morse code sequences for all letters:

```
A .-     B -...   C -.-.   D -..    E .      F ..-.
G --.    H ....   I ..     J .---   K -.-    L .-..
M --     N -.     O ---    P .--.   Q --.-   R .-.
S ...    T -      U ..-    V ...-   W .--    X -..-
Y -.--   Z --..
```

If more letters are to be transferred, they are separated by a short pause, typically written as a slash. A space between words is represented by an even longer pause, written as two slashes.

Input

The input contains no more than 1234 test cases. Each test case is specified on one line with at most 1000 characters, which describes a valid Morse code transmission:

- The line consists only of dashes ('-'), dots ('.'), and slashes ('/').
- There is at least one character.
- The first and last characters will never be a slash.
- There will never be more than two slashes together.
- Each non-empty sequence between two slashes contains a valid Morse code of one letter.

Output

For each test case, print one line containing the decoded message in uppercase letters.

Example

standard input	standard output
../-.-./.--./-.-.	ICPC
--./---/---/-..//.-../..-/-.-./-.-	GOOD LUCK

Problem N. Two Sequences

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Given two sequences $a_1, a_2, \ldots, a_n$ and $b_1, b_2, \ldots, b_m$ and a number p. Calculate the number of positions q such that sequence $b_1, b_2, \ldots, b_m$ is exactly the sequence $a_q, a_{q+p}, a_{q+2p}, \ldots, a_{q+(m-1)p}$, where $q + (m-1)p \le n$ and $q \ge 1$.

Input

The first line contains only one integer $T \le 100$, which indicates the number of test cases. Each test case contains three lines.

The first line contains three space-separated integers $1 \le n \le 4 \cdot 10^4$, $1 \le m \le 4 \cdot 10^4$ and $1 \le p \le 4 \cdot 10^4$. The second line contains n integers $a_1, a_2, \ldots, a_n$ $(1 \le a_i \le 10^9)$. The third line contains m integers $b_1, b_2, \ldots, b_m$ $(1 \le b_i \le 10^9)$.

It is guaranteed that sum of all n in the input does not exceed $2 \cdot 10^6$.

Output

For each test case, print on the separate line one integer y which is is the number of valid q's.

Example

standard input	standard output
2 6 3 1 1 2 3 1 2 3 1 2 3 6 3 2 1 3 2 2 3 1 1 2 3	2 1

Problem O. Build The Square

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Given three rectangles, determine if they can be glued together to form a square. The rectangles can be rotated, but they cannot overlap.

Input

There will be exactly three lines of input. The first line of input contains two integers w_1 and h_1 ($1 \leq w_1, h_1 \leq 100$), which are the width and height of the first rectangle. The second line of input contains two integers w_2 and h_2 ($1 \leq w_2, h_2 \leq 100$), which are the width and height of the second rectangle. The third line of input contains two integers w_3 and h_3 ($1 \leq w_3, h_3 \leq 100$), which are the width and height of the third rectangle.

Output

Output 1 if the two rectangles can be put together to form a square, and 0 of they cannot.

Example

standard input	standard output
8 2 1 6 7 6	1

Problem P. No Triangles

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Given n sticks, whose lengths are $1, 2, 3, \ldots n$ respectively. You need to remove the minimal number of sticks such as it will be impossible to form a triangle with any three of the remaining sticks.

Input

The first line contains only one integer T ($T \leq 20$), which indicates the number of test cases. For each test case, there is only one line containing the given integer n ($1 \leq n \leq 10^9$).

Output

For each test case, print the minimal number of sticks you need to remove.

Example

standard input	standard output
3 2 4 6	0 1 2