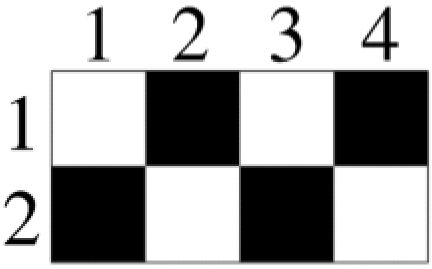
Problem A. A Meowy Night

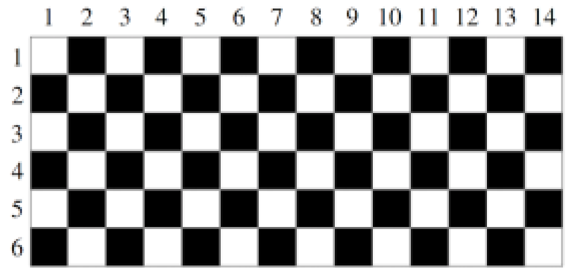
Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	256 megabytes

Meow is sitting under its roof full of squares which can be transparent or black while watching the night sky blink. These patterns change over time as the roof turns transparent and black in rectangles. Meow decided to look at the roof as a cartesian plane with c as its columns and r as its rows with each coordinate representing a square. Only squares that are transparent at the time can Meow see the stars through that square, meaning that the stars behind black squared cannot be seen.

The roof always starts off in a chequered pattern of transparent and black squares with a transparent square at the top left corner. For example:



Matrix 2 x 4



Matrix 6 x 14

The roof will then change shades in solid rectangles of (x_1, y_1, x_2, y_2) where (x_1, y_1) marks a corner of the rectangle and (x_2, y_2) marks the opposite corner of the rectangle. All squares within this rectangle will then be changed to either black or white based on input conditions (including the coordinates themselves).

All stars in the sky have different brightness levels, b $(0 < b < 100)$. These stars are through the transparent parts of the roof, thus Meow can group these stars into each square.

Meow wants to know the total brightness of the starts shining through its roof. Your job is to total up the brightness of the stars shining through Meow's transparent roof at a certain time with the roof's colour patterns considered.

Input

The first line contains 2 numbers, c and r for columns and rows of the roof $(0 < n, m < 1000)$

The second line is the number of queries, n $(0 < n < 105)$

The following n lines follows these 4 types of **query formats**:

1. $+\ x\ y\ b$ – Add stars at coordinate x and y, b shows brightness level
2. $B\ x_1\ y_1\ x_2\ y_2$ – The roof changes colour between 2 coordinates $x1$, $y1$ and $x2$, $y2$ to ***Black*** (including the coordinates themselves)
3. $T\ x_1\ y_1\ x_2\ y_2$ – The roof changes colour between 2 coordinates $x1$, $y1$ and $x2$, $y2$ to ***Transparent*** (including the coordinates themselves)
4. ? – Print total brightness of all stars behind ***Transparent Squares***

$(0 < x < c,\ 0 < y < r)$

Output

Print total brightness of all stars that Meow can see!

Example

standard input	standard output
4 4 12 + 2 1 5 + 2 2 5 + 4 4 5 + 2 3 5 ? T 1 1 4 4 ? B 1 1 4 4 ? T 1 1 2 2 T 3 3 4 4 ?	10 20 0 15

Problem B. Aspect Ratio

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	100 megabytes

Aspect ratio is the ratio between the width and height of a screen or display and it is expressed using two numbers separated by colon, for example, 16:9. Why is aspect ratio important is because we can have different resolution, yet we can have the similar ratio. If we have a 1920x1080 screen, then we are using the 16:9 aspect ratio. How about 4K (3840x2160)? Well, it is the same aspect ratio 16:9. Thus, this is why we want to have aspect ratio as we wanted to have a standard for the video or photo that we are trying to display to others.

Input

The first line contains the number of test cases. $1 \leq N \leq 5,000$
After the first line, every consecutive line contains the screen resolution, S, for example, 1920x1080, 3840x2160 and so on.

Note that the input value S_W (width of the resolution) and S_H (height of the resolution) will be less than 2^{64}.

Output

The aspect ratio for the given screen resolution.

Examples

standard input	standard output
2 1920x1080 423x423	16:9 1:1
5 1440x2560 2160x1440 1280x799 1200x1920 640x480	16:9 3:2 No 16:10 4:3

Note

The aspect ratio that is used in this question, 1:1, 3:2, 4:3, 16:9 and 16:10.

If the resolution is 1080x1920, the result will be 16:9 also.

Problem C. Choosing Modules

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

In University of Malaya, each student must choose some course to study in order to achieve a certain amount of credits. Some courses must be taken before certain courses, such as WIX 1002 Fundamental of Programming, which is always taken before WIA 1002 Data Structures.

Now there are N courses offered, each course has their own credit, C_i. And each course has one or no direct prerequisites (if course A is a prerequisite for course B, that is, course B can only be studied after completing course A).

Meow wants to choose M courses from these courses, what is the maximum credit he can get?

Input

The first line contains 2 integers N, M $(1 \le N, M \le 300)$ – the number of course offered and the number of course Meow wants to take.

For the next N lines, each line i contains 2 integers K_i, C_i $(1 \le K_i \le N, 1 \le C_i \le 20)$ – K_i represent the prerequisite course for course i, C_i represent the credit for course i. If $K_i = 0$, that means no prerequisite for that course.

Output

Output a single integer – the maximum credit that Meow can get.

Example

standard input	standard output
7 4 2 2 0 1 0 4 2 1 7 1 7 6 2 2	13

Note

The input as interpreted as follow:

7 courses are offered and Meow want to take 4 courses.

The 1^{st} course has prerequisite of course 2, and course 1 has 2 credit.

The 2^{nd} course has no prerequisite, and course 2 has 1 credit.

...

The 7^{th} course has prerequisite of course 2, and course 7 has 2 credit.

Meow can take course 3 ($credit = 4$), course 2 ($credit = 1$), then course 7 ($credit = 2$), and finally course 6 ($credit = 6$). In total, he will have $4 + 1 + 2 + 6 = 13$ credits

Problem D. Gas Stations

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

Meow just got a motorcycle license but he's not very good at it, so he needs to practice. He decides to go in a **circular path in a clockwise direction** (left to right) around his city, starting from one of the gas stations but he's not sure if he has enough gas or not so you need to help him!

Meow's motorcycle has an unlimited gas tank, and it costs him a certain amount of gas to get from his current station to the next one. He starts off with an empty tank and will only fill it at his chosen starting station. Each station has a limited amount of gas that Meow can pump into his motorcycle. Stations are 0 indexed.

Which gas station should Meow start from?

Input

The first line contains an integer, n ($2 \leq n \leq 10^5$) – the total number of stations Meow wants to pass through on his circular practice route.

The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \leq a_i \leq 10000$) – the amount of gas added at each station i.

The third line contains n integers $b_1, b_2, ..., b_n$ ($1 \leq b_i \leq 10000$) – the cost of gas needed to get from this station to the next subsequent station.

Output

Print the index of Meow's starting station (0-based).

In the event that Meow can start from station 2 or 3, he should start from gas station 2. If Meow cannot start from any of the available stations, display -1.

Examples

standard input	standard output
5 34 56 77 20 50 45 46 77 12 89	-1
5 1 23 5 6 77 3 4 5 6 7	1

Problem E. Identical Strings

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

Meow wants to know if two words are equivalent, not in the sense that the words are spelled similarly, or that they are equal in length. Meow is looking for words or strings that has the same structure in the sense that substituting one letter for another can create the other string.

For example, the string "purryfurry"and "lannotanno these two words are considered equivalent because once we substitute p -> l, u -> a, r -> n, y -> o, f -> t, we will get "lannotanno"from "purryfurry".

In another case, the two strings "apawlling"and "appalling"is not equivalent because 'a' in apawling will need to map into both 'a' and 'p' in appalling. Following this, the transformation is no longer a one-to-one substitution.

Input

The input contains 2 lines, containing only characters a-z (lowercase alphabets).

First line is the first word.

Second line is for the second word.

($1 \leq$ Length of word $\leq 10^5$)

Output

If the two words given are equivalent based on the description Meow gave, display 1. If the words are not equivalent, display -1.

Examples

standard input	standard output
`purryfurry` `lannotanno`	`1`
`clawful` `awful`	`-1`
`hoodini` `zyyxlil`	`1`
`baboon` `cocoon`	`-1`

Problem F. Mental Calculation

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

Meow is a school teacher that wants to test his students mental math calculation capability. He devised a plan – he would randomly generate a set of positive integer, every number in the set are unique. Then, he asks students to answer: **How many of them are exactly equal to the sum of the other two (different) numbers in the set?**

The students seek for your help, please help to find the answers.

Note: The two numbers that add up must be two different number in the set. For example: $1 + 4$ and $4 + 1$ are considered as duplicates.

Input

The first line contains an integer n $(3 \leq n \leq 10000)$

The second line contains n positive integers $a_1, a_2, ..., a_n$ $(1 \leq a_i \leq 10000)$ – the numbers Meow gave his student.

Output

Print an integer – the answer to Meow's question.

Example

standard input	standard output
5 1 2 3 4 5	3

Note

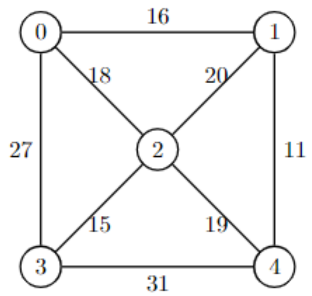
$1 + 2 = 3,\ 1 + 3 = 4,\ 1 + 4 = 5$. Hence, the answer is 3.

Be aware that $1 + 4 = 5$ and $2 + 3 = 5$ should only be considered as 1 (not 2) as the question ask "What number(s) can be formed"**NOT** "How many pairs".

Problem G. Power Grid

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

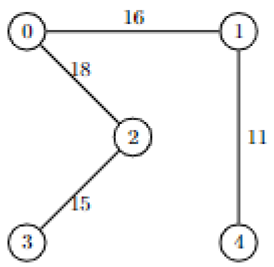
Meow works for a major electricity company. One of his many tasks is to plan the construction of power grids. For example, below is an undirected network consisting of 5 vertices and 8 edges with a total weight of 157. A vertex represents a transmission tower while an edge represents the cost to set up a power line between two towers.



The same network can also be represented as an edge list, such as the one below:

0 1 16
0 2 18
0 3 27
1 2 20
1 4 11
2 3 15
2 4 19
3 4 31

Meow's task is to optimize the network by removing some edges while still ensuring that all points on the network remains connected. The network above can be optimized and the network which achieves the maximum saving is shown below. It has a weight of 60, representing a saving of 157 – 60 = 97 from the original network.



Help Meow optimize networks given in edge list form and find its maximum saving achievable.

Input

The first line contains two integers, the number of vertices, N and the number of edges, E.

The next E lines contains 3 integers x, y, and z representing an undirected edge between x and y and their weight, z.

If there are edges between the same pair of vertices with different weight, they are to be considered as is, like multiple edges.

Constraints

$1 \le N \le 100$

$N - 1 \le E \le \frac{N*(N-1)}{2}$

$1 \le x, y \le N$

$0 \le z \le 10^5$

Output

Output the maximum saving achievable by removing unnecessary edges whilst ensuring the network remains connected.

Example

standard input	standard output
5 8 0 1 16 0 2 18 0 3 27 1 2 20 1 4 11 2 3 15 2 4 19 3 4 31	97

Problem H. Prime Numbers

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

Prime number is a special kind of number that is widely used in a lot of places, even our mother nature uses it! This question is simple, find the prime factor of a number, sum all of it, modulo it with the greatest prime factor and check whether the result is a prime number.

Input

The first line consists of an integer, $1 \le n \le 100$.

Every n lines consists of a number that is between $1 \le kleq2 \times 10^7$.

Output

"YES"or "NO"as to determine whether the result is a prime number.

Examples

standard input	standard output
3 11 18 1000	NO YES NO
3 1352888 7213189 17378468	NO YES YES

Note

For the first example, 11 has only one prime factor which is 11. Thus the result will be 11 modulo $11 = 0$ and 0 is not a prime number. 1000 has a prime factor of 2 x 2 x 2 x 5 x 5 x 5 and 5 is the greatest prime factor. Thus, $(2 + 2 + 2 + 5 + 5 + 5)$ modulo $5 = 1$ and 1 is not a prime factor.

For the second example, the second case 7213189 has a prime factor of 61 x 118249. Thus the result will be $(61 + 118249)$ modulo $118249 = 61$ and 61 is a prime number.

Problem I. Math Formula

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

Given n numbers, without changing their relative positions, add k multiplication signs ($\times$) and $(n-k-1)$ plus signs ($+$) in the between those numbers. You may add any number of parentheses to make the final result as large as possible.

Note that since there are $n-1$ multiplication signs and plus signs in total, there is exactly one sign between every two adjacent numbers.

Input

The first line contains 2 integers n, k $(2 \le n \le 15), (0 \le k < n)$ – the number of numbers given and the number of multiplication signs

The second line contains n integers $a_1, a_2, ..., a_n$ $(0 \le a_i \le 9)$ – the given numbers.

Output

Print a single integer – the maximum possible value. It is guaranteed that the answer will be less than 2^{31}.

Example

standard input	standard output
5 2 1 2 3 4 5	120

Note

The test case requires $k = 2$ multiplicative signs and $(5-2-1) = 2$ plus signs. Those five number can be written as:

$$1 \times 2 \times (3+4+5) = 24$$

$$1 \times (2+3) \times (4+5) = 45$$

$$(1+2) \times 3 \times (4+5) = 81$$

$$...$$

$$(1+2+3) \times 4 \times 5 = 120$$

Problem J. Wall Painting

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

You are given a wall represented by mn integer grid where b_{mn} represents the bricks in the wall. You are also given three integers r, c, and $newColour$. You should paint on the wall starting from the brick b_{xy}. To paint the wall, consider the starting brick, plus any bricks horizontally or vertically connected to the starting brick of the same colour as the starting brick, plus any bricks connected 4-directionally to those bricks (also with the same colour) and so on. Paint the aforementioned bricks with $newColour$.

Input

The first line of input contains an integer $t (1 \le t \le 100)$ – the number of test cases.

The first line of each test case contains 5 integers m, n, r, c, $newColour$ where $(1 \le m, n \le 50)$, $(0 \le r < m)$, $(0 \le c < n)$, and $(0 \le newColour \le 100)$.

The subsequent line of each test case contains a mn integer grid representing the wall where $(0 \le b_{mn} \le 100)$.

Output

For every output, print out the newly coloured wall.

Example

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

Note

In the first test case, the starting brick is at the position (r = 1, c = 1). All bricks with the same colour as the starting brick either connected horizontally or vertically towards the starting brick are coloured with the new colour. Note the bottom corner is not coloured 2, because it is not 4-directionally connected to the starting brick.

In the second test case, all bricks are coloured with "3".