

Educational Codeforces Round 1**A. Tricky Sum**

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

In this problem you are to calculate the sum of all integers from 1 to n , but you should take all powers of two with minus in the sum.

For example, for $n = 4$ the sum is equal to $-1 - 2 + 3 - 4 = -4$, because 1 , 2 and 4 are 2^0 , 2^1 and 2^2 respectively.

Calculate the answer for t values of n .

Input

The first line of the input contains a single integer t ($1 \leq t \leq 100$) — the number of values of n to be processed.

Each of next t lines contains a single integer n ($1 \leq n \leq 10^9$).

Output

Print the requested sum for each of t integers n given in the input.

Examples

input
2 4 1000000000
output
-4 4999999998352516354

Note

The answer for the first sample is explained in the statement.

B. Queries on a String

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given a string S and should process m queries. Each query is described by two 1-based indices l_i, r_i and integer k_i . It means that you should cyclically shift the substring $S[l_i \dots r_i]$ k_i times. The queries should be processed one after another in the order they are given.

One operation of a cyclic shift (rotation) is equivalent to moving the last character to the position of the first character and shifting all other characters one position to the right.

For example, if the string S is abacaba and the query is $l_1 = 3, r_1 = 6, k_1 = 1$ then the answer is abbacaa. If after that we would process the query $l_2 = 1, r_2 = 4, k_2 = 2$ then we would get the string baabcaa.

Input

The first line of the input contains the string S ($1 \leq |S| \leq 10\,000$) in its initial state, where $|S|$ stands for the length of S . It contains only lowercase English letters.

Second line contains a single integer m ($1 \leq m \leq 300$) — the number of queries.

The i -th of the next m lines contains three integers l_i, r_i and k_i ($1 \leq l_i \leq r_i \leq |S|, 1 \leq k_i \leq 1\,000\,000$) — the description of the i -th query.

Output

Print the resulting string S after processing all m queries.

Examples

input
abacaba 2 3 6 1 1 4 2
output
baabcaa

Note

The sample is described in problem statement.

C. Nearest vectors

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given the set of vectors on the plane, each of them starting at the origin. Your task is to find a pair of vectors with the minimal non-oriented angle between them.

Non-oriented angle is non-negative value, minimal between clockwise and counterclockwise direction angles. Non-oriented angle is always between 0 and π . For example, opposite directions vectors have angle equals to π .

Input

First line of the input contains a single integer n ($2 \leq n \leq 100\,000$) — the number of vectors.

The i -th of the following n lines contains two integers x_i and y_i ($|x_i|, |y_i| \leq 10\,000, x_i^2 + y_i^2 > 0$) — the coordinates of the i -th vector. Vectors are numbered from 1 to n in order of appearing in the input. It is guaranteed that no two vectors in the input share the same direction (but they still can have opposite directions).

Output

Print two integer numbers a and b ($a \neq b$) — a pair of indices of vectors with the minimal non-oriented angle. You can print the numbers in any order. If there are many possible answers, print any.

Examples

input
4 -1 0 0 -1 1 0 1 1
output
3 4

input
6 -1 0 0 -1 1 0 1 1 -4 -5 -4 -6
output
6 5

D. Igor In the Museum

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Igor is in the museum and he wants to see as many pictures as possible.

Museum can be represented as a rectangular field of $n \times m$ cells. Each cell is either empty or impassable. Empty cells are marked with '.', impassable cells are marked with '*'. Every two adjacent cells of different types (one empty and one impassable) are divided by a wall containing one picture.

At the beginning Igor is in some empty cell. At every moment he can move to any empty cell that share a side with the current one.

For several starting positions you should calculate the maximum number of pictures that Igor can see. Igor is able to see the picture only if he is in the cell adjacent to the wall with this picture. Igor have a lot of time, so he will examine every picture he can see.

Input

First line of the input contains three integers n , m and k ($3 \leq n, m \leq 1000$, $1 \leq k \leq \min(n \cdot m, 100\,000)$) — the museum dimensions and the number of starting positions to process.

Each of the next n lines contains m symbols '.', '*' — the description of the museum. It is guaranteed that all border cells are impassable, so Igor can't go out from the museum.

Each of the last k lines contains two integers x and y ($1 \leq x \leq n$, $1 \leq y \leq m$) — the row and the column of one of Igor's starting positions respectively. Rows are numbered from top to bottom, columns — from left to right. It is guaranteed that all starting positions are empty cells.

Output

Print k integers — the maximum number of pictures, that Igor can see if he starts in corresponding position.

Examples

input
5 6 3 ***** *..* ***** *...* ***** 2 2 2 5 4 3
output
6 4 10

input
4 4 1 **** *..* *.* **** 3 2
output
8

E. Chocolate Bar

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You have a rectangular chocolate bar consisting of $n \times m$ single squares. You want to eat **exactly** k squares, so you may need to break the chocolate bar.

In one move you can break any single rectangular piece of chocolate in two rectangular pieces. You can break only by lines between squares: horizontally or vertically. The cost of breaking is equal to square of the break length.

For example, if you have a chocolate bar consisting of 2×3 unit squares then you can break it horizontally and get two 1×3 pieces (the cost of such breaking is $3^2 = 9$), or you can break it vertically in two ways and get two pieces: 2×1 and 2×2 (the cost of such breaking is $2^2 = 4$).

For several given values n , m and k find the minimum total cost of breaking. You can eat exactly k squares of chocolate if after all operations of breaking there is a set of rectangular pieces of chocolate with the total size equal to k squares. The remaining $n \cdot m - k$ squares are not necessarily form a single rectangular piece.

Input

The first line of the input contains a single integer t ($1 \leq t \leq 40910$) — the number of values n , m and k to process.

Each of the next t lines contains three integers n , m and k ($1 \leq n, m \leq 30$, $1 \leq k \leq \min(n \cdot m, 50)$) — the dimensions of the chocolate bar and the number of squares you want to eat respectively.

Output

For each n , m and k print the minimum total cost needed to break the chocolate bar, in order to make it possible to eat exactly k squares.

Examples

input
4 2 2 1 2 2 3 2 2 2 2 2 4
output
5 5 4 0

Note

In the first query of the sample one needs to perform two breaks:

- to split 2×2 bar into two pieces of 2×1 (cost is $2^2 = 4$),
- to split the resulting 2×1 into two 1×1 pieces (cost is $1^2 = 1$).

In the second query of the sample one wants to eat 3 unit squares. One can use exactly the same strategy as in the first query of the sample.

F. Cut Length

time limit per test: 0.5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Given simple (without self-intersections) n -gon. It is not necessary convex. Also you are given m lines. For each line find the length of common part of the line and the n -gon.

The boundary of n -gon belongs to polygon. It is possible that n -gon contains 180-degree angles.

Input

The first line contains integers n and m ($3 \leq n \leq 1000; 1 \leq m \leq 100$). The following n lines contain coordinates of polygon vertices (in clockwise or counterclockwise direction). All vertices are distinct.

The following m lines contain line descriptions. Each of them contains two distinct points of a line by their coordinates.

All given in the input coordinates are real numbers, given with at most two digits after decimal point. They do not exceed 10^5 by absolute values.

Output

Print m lines, the i -th line should contain the length of common part of the given n -gon and the i -th line. The answer will be considered correct if the absolute or relative error doesn't exceed 10^{-6} .

Examples

input
4 3 0 0 1 0 1 1 0 1 0 0 1 1 0 0 0 1 0 0 1 -1
output
1.41421356237309514547 1.00000000000000000000 0.00000000000000000000