Inter University Programming Contest (IUPC 2021)

City University

https://toph.co/c/inter-university-iupc-2021

Toph

Schedule

The contest will run for **5h0m0s**.

The standings will be frozen for the last **1h0m0s** of the contest.

Authors

The authors of this contest are ihumaunkabir, whoisshihab, and Zeronfinity.

Rules

This contest is formatted as per the official rules of ICPC Regional Programming Contests.

You can use Bash 5.0, Brainf*ck, C# Mono 6.0, C++11 GCC 7.4, C++14 GCC 8.3, C++17 GCC 9.2, C11 GCC 9.2, Common Lisp SBCL 2.0, Erlang 22.3, Free Pascal 3.0, Go 1.13, Haskell 8.6, Java 1.8, Kotlin 1.1, Node.js 10.16, Perl 5.30, PHP 7.2, PyPy 7.1 (2.7), PyPy 7.1 (3.6), Python 2.7, Python 3.7, Python 3.8, Ruby 2.6, Swift 5.3, and Whitespace in this contest.

Be fair, be honest. Plagiarism will result in disqualification. Judges' decisions will be final.

Notes

There are 6 challenges in this contest.

Please make sure this booklet contains all of the pages.

If you find any discrepencies between the printed copy and the problem statements in Toph Arena, please rely on the later.

A. Ema and Her Garden

Limits 1s, 512 MB

In Bangladesh, there is a popular TV show on its national TV channel BTV named "Ityadi". In this show, trees are given as award to the participants which directly inspires gardening. Inspired from the TV show **Ema** shows interest in gardening. While planting trees for her garden, Ema wants to make sure that she gets a garden full of different trees in every row. Trees are tagged by a different ID with A to Z. You've given different types of row-based layout of the garden, help Ema to make the garden as she wants to be.

Input

Each line of input contains a string layout **L** of ID of trees **A** to **Z**.

Output

Print "YES" without quotes if the layout fulfills Ema's requirement. Otherwise, print "NO" without the quotes.

Samples

Input	Output
ABCDE	YES

B. Ripon the Sharpshooter

Limits 1s, 512 MB

Ripon is a sharpshooter with an air gun. Whenever he has an air gun, he never missed the target. If he finds a stall with an air gun and balloons, he will burst all the balloons surely.

One day, he was walking in Rabindra Shorobor with his friends. Suddenly he found a stall with balloons and an air gun. As usual, he stands in front of that stall and picks the air gun for shooting. One of his friends Nigar, a mathematician, give an idea to make this game more interesting. She draws numbers to every balloon in a row and told Ripon about the idea.

The idea is when Ripon shoot on a balloon, that burst, and it's left and right balloon's number will multiplied by each other and so on. If there is no balloon on the left, just add the right balloon to the sum and vice versa. Ripon's task is to maximize the sum by adding all the multiplication result or the left or the right balloon value.

As Ripon is very weak in mathematics, he is asking for your help.

Input

The 1st line of the input N is denoting the number of balloons in the row, where 1 <= N <= 10. The 2nd line will have N space separated numbers drawn on the balloons.

Output

Print the maximum sum considering the above idea.

Samples

Input	Output
4 8 21 5 66 5 12 99 21 45 33	1980 8151

Input	Output
For the first case. At first, he will shoot on the third balloon then 21 and 66 will be multiplied by each other (21×\times×66=1386). Then he will shoot on the second balloon then 8 and 66 will be multiplied by each other (8×\times×66=528). Then he will shoot on the first balloon at that time only one balloon at the right is there with the value 66 he will add it with all previous multiplication values. i.e. 1386+528+66=1980	

C. Numbers Remain in a Number Line

Limits 1s, 512 MB

In this problem you will be given different numbers in a linear number line in ascending order representing any natural numbers up to 10^17. Your task is to find a group of four such numbers where difference between the first and fourth number will be maximum and less than or equal a given range. Also difference between the second and third number will be minimum. And the difference between maximum and minimum difference must be divisible by the minimum difference. If you can find such a group of four number then discard all the number in between the first and fourth number in the number line of that group (including the first and fourth number). You may find multiple group that satisfy the above scenario. Find the total number of remaining numbers in the number line after discarding the numbers of all such group.

Input

The input contains two line in each case. In first line there will be two input indicate total number of different number on a number line and a given range (where 1 ≤ range ≤ 10^17). You will be given minimum 1 and up to 10^5 numbers form the number line for each case. There will be at most ten (10) such test cases.

Output

Print the total number of remaining numbers in the number line after discarding the numbers of all such group that satisfy the above scenario.

Samples

Input	Output
12 30 1 3 6 9 12 15 17 24 28 33 35 39 13 42 3 8 10 20 40 50 51 54 65 72 88 93 134	8 9

Input	Output
In the first case, inside range 30 there is a group (1, 15, 17, 28). Now difference between the first and fourth number is 27 and difference between the second and third number is 2. Now difference between maximum and minimum difference is 25 which is not divisible by the minimum difference 2. Another group can be (3, 15, 17, 33). Here difference between the first and fourth number is 30 and difference between the second and third number is 2. Now difference between maximum and minimum difference is 28 which is divisible by the minimum difference 2. Now remove all the numbers in the range of 3 to 33. So remaining numbers are 1, 2, 34, 35, 36, 37, 38, 39 in total 8.	

D. A Tour to Bandarban

Limits 1s, 512 MB

Atik and Faisal are two friends who love to travel. They travel along with their other friends Maruf, Rifat, Surid, Evan, Shahin, and many others. They read in a university and try to save their daily cost to travel. Usually, they travel in every trimester break. They really enjoy it very much.

One day, Atik and Faisal planned to travel deep places of Bandarban, where people usually not prefer to go due to a very tough road. Those places cannot be travel without a local guide, because anyone who comes outside won't be able to remember the roads or find the path.

But Faisal said to Atik, "Let's discover this place and make some adventure". Atik agreed. They started to walk. After the light was gone, they prepare their tent to camp in the middle of a jungle and eat some dry food they carried.

The next day morning they again started to walk and discover that they lost their way. No phone signal as well as GPS is working. So they totally lost their way. At this point, they started to panic and try to search for a way to return but all day long, they could not found any way to return.

Now they decided to send SOS by creating smoke. There are K places they want to create smokes. A NxM matrix will denote their circumstance. 0 denotes places with very long grass and might have little spike trees, they can clean any one of them and prepare a tent but they cannot walk on those. And 1 denotes the path they can walk.

Input

For each case first line you will be given, K N M (where 1 <= K <= 5 and 2 <= N, M <= 20)
There will be N rows and M columns with values 0 and 1 as described.
Following that, K line will be given (0 indexed). Each line contains the coordinates Xi, Yi (2 <= Xi, Yi <= 20) (Valid in the matrix) of SOS transmitting area.

Output

Your task is to help Atik and Faisal to determine a place where they can tent and can reach every SOS transmitting area with minimal distance, because fire needs to continue burning, otherwise smoke will be faded. If there is no path to reach every SOS transmitting area, print -1.

Samples

Input	Output
4 4 3 1 0 1 1 1 1 1 1 0 1 1 0 3 0 2 1 0 2 0 0 2 5 4 1 1 0 0 0 0 1 0 0 1 0 0 0 0 1 1 1 0 1 1 0 0 4 2	4 -1

F. Ways to Eat

Limits 1s, 512 MB

Snorlax has been invited to a buffet. In the buffet, Snorlax is given NNN chesto berries, MMM pecha berries and KKK rawst berries.

Snorlax will eat all the berries in turns. In each turn, Snorlax can mix the berries to make a potion and then eat that potion. The type of potion depends on the number of berries Snorlax used. Berries can be mixed according to the following methods, potion created by one method differs in type compared to potion created by another method.
i) 1 chesto berry => potion type A
ii) 1 chesto berry and 1 pecha berry => potion type B
iii) 1 chesto berry and 2 pecha berries => potion type C
iv) 1 chesto berry and 1 rawst berry => potion type D
v) 1 chesto berry and 2 rawst berries => potion type E

Slowking took note of Snorlax's weird way of eating. Now Slowking wonders in how many ways can Snorlax finish eating all berries. Two ways are different if the two sequences of potion types Snorlax ate in the two ways are different.

Given NNN, MMM and KKK, can you help Slowking figure out the number of ways Snorlax may eat to finish all berries? Note that Snorlax must finish all the berries, so a way is not valid if Snorlax can't finish all berries that way.

Input

Input will consist of just one single line with three space-separated integers NNN, MMM and KKK.

Constraints

0≤N≤1090 \le N \le 10^90 ≤ N ≤ 109
0≤M≤100 \le M \le 100 ≤ M ≤ 10
0≤K≤100 \le K \le 100 ≤ K ≤ 10

Output

Print a single integer as output. This integer should be the answer modulo 1000000007.

Samples

Input	Output
2 2 2	2

The 2 ways to eat are as followed.

Way 1:
1st turn: Snorlax eats potion type C (1 chesto and 2 rawst berries remaining)
2nd turn: Snorlax eats potion type E (no more berry remaining)

Way 2:
1st turn: Snorlax eats potion type E (1 chesto and 2 pecha berries remaining)
2nd turn: Snorlax eats potion type C (no more berry remaining)

Input	Output
1 1 0	1

The only way to eat in this case is by eating a potion of type B.

Input	Output
4 4 4	6

The following six strings represent the six ways in this test case, each character representing the type of potion in that turn.

CCEE
CECE
CEEC
ECCE
ECEC
EECC

G. The Pokémon

Limits 1s, 512 MB

One day, Barry Allen AKA The Flash was getting bored working in S.T.A.R. labs. Suddenly, he thought of passing his time playing Pokémon Go! So, he took his phone and rushed (or should one say Flashed!) to the nearest park where so many pokémons wander around. So, he starts the game and to his surprise, he notices a rare pokémon is just playing in an area surrounded by trees. The pokémon is the one and only Pikaaaaaaachuuuuuuuuu!!!!

Now, Barry gets excited to catch it. But the rules of Pokémon Go is slightly different in Barry's timeline you know? Because he just likes to change his timeline all the time! The rules in this case are that, to catch a pokémon, you have to choose a tree, start running from that tree to another, and from that one to another, and so on, eventually coming back to the tree you started running from, thus creating an enclosed area (it must be positive). If the pokémon you want to catch is strictly inside that area, then voila! You have caught the pokémon. Otherwise, you fail.

Now, Barry has the positions of the trees in the park along with the position of Pikachu. Inspite of being the Flash, Barry wants to finish this as soon as possible. Though Barry's speed is quite formidable, just for the sake of this game, we consider it just 1 unit/second. Now, given the positions of the tree and Pikachu, help Barry to determine the minimum time he needs to catch it.

Remember, Barry always runs in a straight line. And no 3 trees are on the same line.

Input

Input starts with an integer T($1 \le T \le 60$), denoting the number of test cases. Each case contains 2 integers X, Y ($-106 \le X, Y \le 106$) in the first line, position of Pikachu. The next line contains an integer N($1 \le N \le 100$), indicating the number of trees in the park. The next N lines each will contain 2 integers X, Y($-106 \le X, Y \le 106$), denoting the position of the trees.

Output

For each case of input, print the case number and the answer of that case. You have to print 6 digits after decimal point.

If Barry is unable to catch Pikachu, the answer should be -1.

Samples

Input	Output
2 1 1 3 0 0 5 0 0 5 1 1 2 1 0 100 50	Case 1: 17.071068 Case 2: -1