

ECPC 2018

**EGYPTIAN COLLEGIATE
PROGRAMMING CONTEST**

International Collegiate Programming Contest

The Egyptian Collegiate Programming Contest

Arab Academy for Science, Technology & Maritime Transport

October, 19th 2018



**The International Collegiate Programming Contest
Sponsored by ICPC Foundation**

ACPC

**ARAB COLLEGIATE
PROGRAMMING CONTEST**

**The Egyptian Collegiate Programming Contest
(Qualification Contest Problems)**



**Arab Academy for Science, Technology & Maritime
Transport
Alexandria, Egypt
October, 2018**

Problem A. Prime Prototypes

Input file: prime.in
Output file: standard output
Balloon Color: Silver

Defining a number to be prime of type k , means that it is equal to multiplying exactly k distinct prime numbers. For example..

- 17, 23, 5 are primes of type 1.
- 15, 77, 143 are primes of type 2, since $15 = 3 \cdot 5$, $77 = 7 \cdot 11$ and $143 = 11 \cdot 13$
- 4, 20 are not primes of any type, since $4 = 2 \cdot 2$ (not distinct prime factors).

Given Q queries, each query is on the form: $L \ R \ a \ b$.

For each query, find the largest number x between L and R inclusive where x is prime of type k , where $a \leq k \leq b$, if there is no solution print -1.

Input

The Input starts with a line containing a single integer $Q \leq 10^5$, the number of queries. Each of the following Q lines represents a query in the format mentioned above. $1 \leq L \leq R \leq 1000000$ and $1 \leq a \leq b \leq 1000$

Output

The output should contain Q lines, in each line you should write the answer to the corresponding query.

Example

prime.in	standard output
3	19
2 20 1 3	39
10 40 1 4	966
15 1000 4 7	

Note

100656

Explanation:

1. 19 is prime of type 1
2. 39 is prime of type 2 $\Leftrightarrow 39 = 3 \cdot 13$
3. 966 is prime of type 4 $\Leftrightarrow 966 = 2 \cdot 3 \cdot 7 \cdot 23$

Problem B. Mirror

Input file: mirror.in
Output file: standard output
Balloon Color: Blue

"Mirror mirror on the wall, which is the easiest of them all?" ECPC contestants were wondering. The mirror never replied. It was lost.

It is said that the mirror can be found again if a puzzle is solved. The puzzle says that we have a 2D grid of size ∞ rows \times ∞ columns. Each cell contains a lowercase English letter. Our mirror was put before one of its columns. So any column before that column is just a mirrored image of the corresponding column on other side.

The guardians could restore a small portion of that Infinite grid of size $N \times M$. Can you determine which column the mirror can be possibly behind? If there are multiple columns, find the first column from the left. *The mirror can not be behind the first column.*

Input

The first line of input contains the number of test cases T .

Then T test cases will follow, Each will start with two integers N, M ($1 \leq N, M \leq 100$). Then N lines will follow, each containing M lowercase English letters.

Output

For each test case, print one number the smallest column index (1-based), behind it the mirror was possibly put. If the mirror can't be put behind any column print -1.

Example

mirror.in	standard output
1 5 6 baabxy xxxxxc ymmym hjjhfd juujhd	3

Note

Explanation of the test case:

The restored grid was:

baabxy
xxxxxc
ymmym
hjjhfd
juujhd

The mirror was possibly be behind the 3rd column, as the 2nd column equals the 3rd and the 1st column equals the 4th and the corresponding columns of the 5th and 6th were lost.

Problem C. Mariam and Kumar

Input file: kumar.in
Output file: standard output
Balloon Color: Red

X
—
X 4

Mariam is a talented student in robots programming. She programmed a robot (Kumar) that moves forward and backward on straight and curved paths. She is so attached to Kumar and sometimes, when she is bored, she likes to imitate her robot by moving forward and backward but in a specific manner.

The floor of Mariam's bedroom is tiled with white and yellow tiles. She stands on one of the tiles and starts to walk along the row she is standing on. She first specifies the direction of walking, and decides on a number n and starts to walk n steps.

If she reaches the wall, she turns back and continues to walk in the opposite direction. She continues until she takes n steps. Note that turning back besides a wall does not count as a step. She counts how many yellow tiles she steps on.

For example, the below scenario shows a row in the floor. The colors of the tiles are shown with the characters 'Y' and 'W' for yellow and white tiles respectively. If she starts at tile 3 facing to the right, and decides to take 7 steps, she finally stops at tile 2. During this walk, she steps 3 times on yellow tiles.

1 2 3 4 5 6
Y W W Y W Y

Input

The input file contains T test cases. The first line of input has only the integer T . Each test case contains two lines. The first line contains two integers m ($3 \leq m \leq 100$), which is the number of tiles in the row Mariam is standing on, and n ($1 \leq n \leq 1000$), which is the number of steps Mariam takes. The second line contains m integers describing the tiles in the row and is in the following format: $a_1 a_2 \dots a_m$.

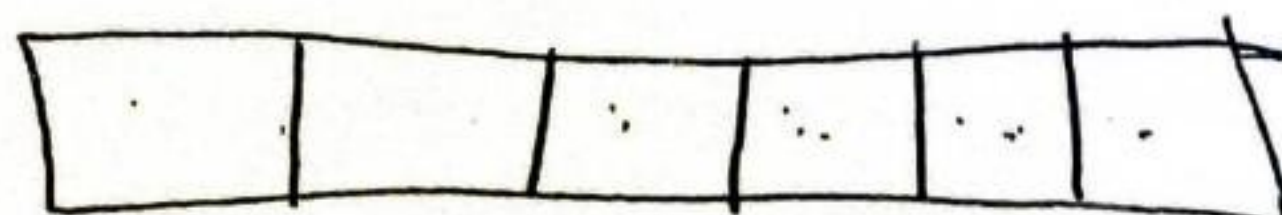
Each a_i is either 0, 1, 2, or 3. If $a_i = 0$, then a_i has a yellow tile, and $a_i > 0$ indicates that a_i has a white tile. If $a_i = 2$, then Mariam is starting from the tile a_i , facing to the right, and if $a_i = 3$ then she is starting from the tile a_i , facing to the left. The numbers are separated by space characters. You may assume that exactly one of the numbers is 2 or 3. Note that it is implied that Mariam always starts from a white tile.

Output

For each test case, write a single line in the output having a single number which is the number of times Mariam steps on a yellow tile.

Example

kumar.in	standard output
1 6 7 → 4 0 1 2 0 1 0	3



Problem D. Ibn Battuta

Input file: battuta.in
Output file: standard output
Balloon Color: Yellow

"Ibn Battuta was a Berber Muslim Moroccan scholar and explorer who widely travelled the medieval world." Badry was reading on Wikipedia.

Badry thought about traveling. What is the minimum total distance to travel a sequence of cities in a given order.

Given the sequence of cities, calculate the minimum total distance to go from the 1st city to the 2nd and from the 2nd to the 3rd and so on .. in the given order. It's guaranteed that each city will appear only one time in the sequence.

The cities are given as position in (x, y) coordinates.

Badry can move up (from (x, y) to (x, y-1)), down (from (x, y) to (x, y+1)), left (from (x, y) to (x-1, y)) and right (from (x, y) to (x+1, y)).

Input

The first line of input contains the number of test cases T . Each test case starts with a line containing one integer N the number of cities. where $1 \leq N \leq 10^5$.

Then a line with N numbers will follow describing the sequence of the cities to be traversed.

Then N lines will follow, each containing 2 integers X and Y ($0 \leq X, Y \leq 10^9$) describing the position of the cities. (The first line is the position of city number 1, the second is city number 2 and so on..)

Output

For each test case, print one line containing the minimum total distance as required.

Example

battuta.in	standard output
2	11
3 → number of cities	26
1 2 3 → الترتيب	
0 0	
5 2	
3 4	
5	
5 2 1 3 4	
0 0	
0 10	
2 5	
3 3	
5 9	

Problem E. Construct the palindrome

Input file: palindrome.in
Output file: standard output
Balloon Color: Cyan

Construct a palindrome of length N that has exactly K palindromic suffixes.

Input

The first line of input is the number of test cases T . Each test case contains 2 Integers N and K , where $1 \leq N \leq 100$ and $K \leq \max(1, N/2)$.

Output

For Each test case output a single line containing any valid palindromic string consisting of small English letters only or 'No' if there is no valid string.

Example

palindrome.in	standard output
1	abaaba
6 3	

string which reads the same backwards as forward,

abba → palindrome
abc → not palindrome

4 2
↓
ab

abba

8 4

abaa, aabaa

Problem F. Tawla

Input file: tawla.in
Output file: standard output
Balloon Color: Orange

X

N

Medo and his friends were playing tawla in some downtown cafe. They invented a new dice with N faces. Imagine a regular dice having six faces, instead this custom dice will have N faces, where each face will have exactly one unique number from 1 to N . They made a game with only one rule. If someone throws the dice and gets a number that is divisible by 6, they will win.

Given N , for a N faces dice, how many faces will lead to winning?

Input

The first line of input contains the number of test cases T . Each of the next T lines will contain one integer N ($1 \leq N \leq 10^9$).

Output

For each test case, print one line containing one integer, the answer required.

Example

tawla.in	standard output
3	1
6	0
5	2
13	

Problem G. Speed

Input file: speed.in
Output file: standard output
Balloon Color: White

During the preparation of the ECPC18, some volunteers were having fun after a long day of work. They moved to some circular track and they ran from the same starting point.

There were four volunteers Alex, Katy, Mahdi, and Noura. They all have unique speeds.

Given their speed, can you tell who will be first and who will be second to finish the race (reach the starting point again)?

Input

The first line of input contains the number of test cases T . Each of the next T lines will contain 4 integers, $(1 \leq A, K, M, N \leq 10^9)$ – The speed of Alex, Katy, Mahdi, and Noura respectively.

Output

For each test case, print one line containing two strings (space separated) the names of the first and the second finishers exactly as they appear in the statement without quotations.

Example

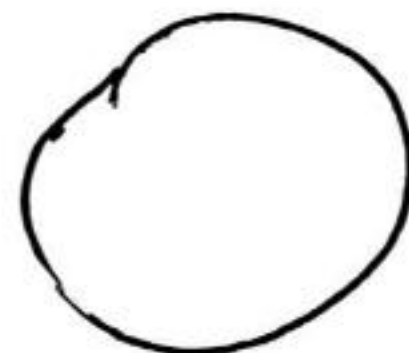
speed.in	standard output
4	Noura Mahdi
1 2 3 (4)	Alex Katy
(14) 9 2 5	Mahdi Alex
10 4 (59) 2	Katy Mahdi
3 (100) 99 4	

Handwritten diagram showing the mapping of input values to names:

1 2 3 4

↑ ↑ ↑ ↑

A K M N



Problem H. ZigZag number

Input file: zigzag.in
Output file: standard output
Balloon Color: Black

Zig-Zag number is a number with Zig-Zag digits. If the number digits are $a_k a_{k-1} a_{k-2} a_{k-3} \dots a_1$ then $a_k \geq a_{k-1} \leq a_{k-2} \geq a_{k-3}$ and so on. eg: 656565, 11111 and 41325 are Zig-Zag numbers but 565656, 12345 and 54321 are not. Count how many Zig-Zag number with k digits. Note the Zig-Zag number shouldn't have leading zeros.

Input

The first line of input is the number of test cases T . Each test case contains a single line containing a single integer $1 \leq k \leq 10^{18}$

Output

For Each test case output a single line containing the answer mod $10^9 + 7$

Example

zigzag.in	standard output
3	54
2	375
3	2475
4	

New constraint is

$2 \leq k \leq 10^{18}$ k is Bigger than

(- - -)

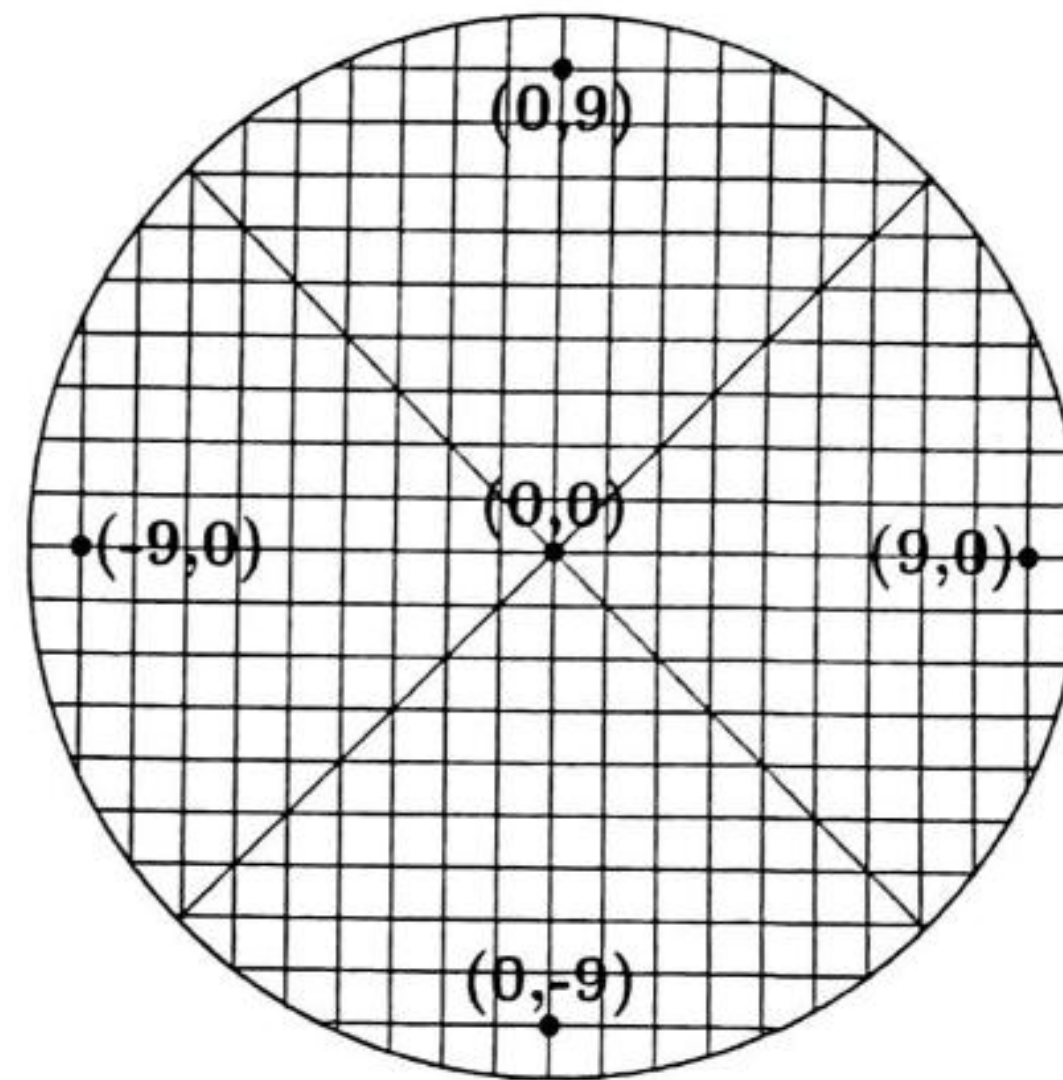
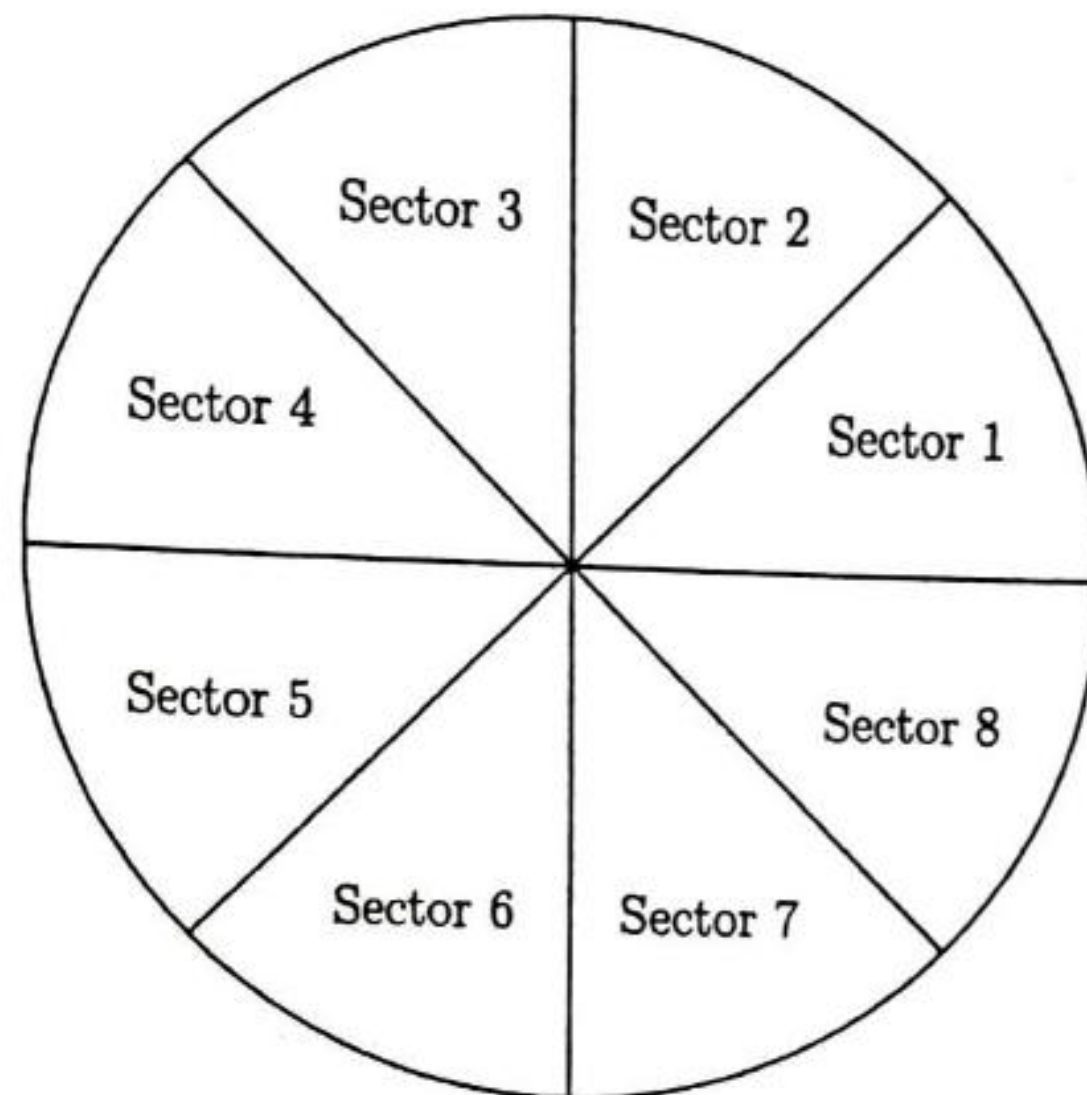
}



Problem I. Where's Abdo?

Input file: abdo.in
Output file: standard output
Balloon Color: Green

Abdo and his friends go to amusement parks a lot. These parks always have circular areas, split into sectors for the different entertainment places as shown in the example picture on the left:



While at the park, Abdo often gets lost from his friends. There are signs in each sector that have sector numbers on them. Abdo's friends can navigate the park using these signs.

However, Abdo does not see the signs. Not only is he addicted to texting on his phone, but Abdo also does not like to lift his head up. Luckily, the park's ground is also numbered. Considering the center of the park as the origin of a coordinate system, each meter square is numbered with an x and y value, as shown in the picture above on the right.

Abdo texts his x and y coordinates to his friends and waits for the rescue. Given the radius of a park's area, how many sectors it is divided into, and Abdo's x y coordinates, help his friends figure out in which sector Abdo is located.

Input

The first line of the input contains an integer T ($1 \leq T \leq 10^5$) — the number of trips to amusement parks, followed by T lines, each containing 4 integers: R ($1 \leq R \leq 100$) — the radius, S ($1 \leq S \leq 12$) — the number of sectors, and lastly X and Y ($0 \leq X^2 + Y^2 \leq R^2$) which are Abdo's coordinates. Abdo is never located at the borders between two sectors.

Output

For each trip, output one line in the form "Trip N: S" (without the quotes) where N is the trip number (starting from 1), and S is the number of the sector where Abdo is located.

Example

abdo.in	standard output
2	Trip 1: 2
10 8 1 4	Trip 2: 4
25 5 3 -20	

Problem J. Dehbi and his Friends

Input file: game.in
Output file: standard output
Balloon Color: Pink

Dehbi and his friends are playing a game.

The game is described as follows: She has x friends who are all located in different starting points, and they want to reach a destination while Dehbi is waiting for them.

Dehbi wants your help. She wants to know the first time while at least one of his x friends reaches him.

Input

First line contains two integers n and m that denotes the number of locations where Dehbi's friends stand and the number of roads respectively, ($2 \leq n \leq 10^5$), and ($1 \leq m \leq 10^5$).

Each of the next m lines will contain three integers u , v and w that represent a road (u, v) and its length, where $1 \leq w \leq 10^3$ and $1 \leq u, v \leq n$.

Next line contains x that represents the number of Dehbi's friends, ($1 \leq x \leq n$).

Next line contains x numbers that represent the initial starting locations of Dehbi's friends.

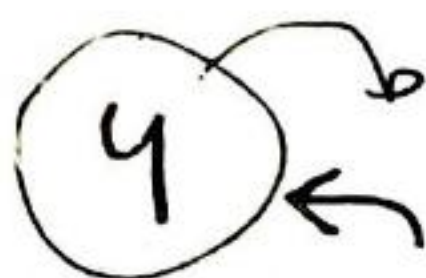
Last line will contain a single integer which is the final destination where Dehbi is waiting for his friends.

Output

If no one can reach him output -1, otherwise output the first time when one of her x friends will get to his place. In other words, the time needed by the fastest friend to reach him.

Example

game.in	standard output
<pre> 1 3 2 → m 1 3 4 ← n, m 2 3 10 ← roads 2 1 2 → 3 </pre> <p>friends</p> <p>dehbi wait</p>	4



1

3

