

## Problem A. Spreadsheets

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

Petya is developing his own spreadsheet editor. His editor will use the following naming for columns: the first 26 columns will be named by the letters of the alphabet: A, B, C, ..., Z. The following columns, starting from column 27, will be named using pairs of letters: AA, AB, ..., AZ, BA, BB, ..., BZ, ..., ZZ. Then triples of letters will be used: AAA, AAB, AAC, ..., then strings of four letters, and so on.

Now Petya needs to get the name of the column by its number. Help him to create the corresponding piece of code.

### Input

Input data contains several test cases. The first line of input contains an integer  $t$  — the number of test cases ( $1 \leq t \leq 1000$ ).

The following  $t$  lines contain one integer  $k$  each ( $1 \leq k \leq 10^9$ ).

### Output

For each test case output the name of the  $k$ -th column in the spreadsheet editor.

### Example

| standard input | standard output |
|----------------|-----------------|
| 4              | A               |
| 1              | J               |
| 10             | CV              |
| 100            | ALL             |
| 1000           |                 |

## Problem B. Mortal Combat

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

Vasya has started playing a new video game. In the end of the first level he is taking a combat with the level boss. He needs to win the combat to continue playing. Vasya has a squad of  $n$  heroes, the  $i$ -th of them has  $h_i$  hit points and  $a_i$  attack points. The boss has  $H$  hit points and  $A$  attack points.

The combat goes as follows.

- If Vasya has no more heroes, he loses the game.
- If he still has at least one hero, he can choose any one and send it to fight against the boss;
- If Vasya has chosen the  $i$ -th hero, the combat proceeds as follows:
  - The hero attacks the boss and reduces its hit points by  $a_i$ ;
  - If the boss is still alive — has strictly positive hit points — it attacks the hero and reduces its hit points by  $A$ ;
  - While the hero and the boss are both still alive, the attacks are repeated.
- If the boss is dead, the combat is over, Vasya wins. In the other case all of the actions are repeated.

Vasya doesn't want to lose many heroes at the very first level of the game. So he wants to plan the combat to lose the minimum possible number of heroes. Help him to find what is the minimal number of heroes that he can lose but still defeat the boss. If Vasya cannot defeat the boss even losing all of his heroes, output  $-1$ .

Let us consider sample test cases.

In the first test case the optimal plan is the following: first send hero 2 to the combat. It attacks the boss three times, reduce its hit points by 12, and then dies. After that Vasya must send hero 3 to the combat, it immediately reduces the hit points of the boss by 6, and the boss dies. Therefore Vasya loses one hero only.

In the second test case Vasya cannot kill the boss, no matter in which order he sends his heroes to the combat.

### Input

Input data contains multiple test cases. The first line contains one integer  $t$  — the number of test cases ( $1 \leq t \leq 1000$ ).

Each of the  $t$  test cases is described in the following way. The first line of the description contains three integers  $n$ ,  $H$  and  $A$  — the number of heroes Vasya has, the number of hit points of the boss, and the number of attack points of the boss ( $1 \leq n \leq 10^5$ ,  $1 \leq H, A \leq 10^9$ ).

Each of the following  $n$  lines contains two integers  $h_i$ ,  $a_i$  — number of hit points and attack points of the  $i$ -th hero ( $1 \leq h_i, a_i \leq 10^9$ ).

The sum of values of  $n$  in all test cases of one input data doesn't exceed  $10^5$ .

### Output

For each test case output either the minimal number of heroes that Vasya must lose to defeat the boss, or  $-1$  if Vasya cannot defeat the boss.

## Example

| standard input | standard output |
|----------------|-----------------|
| 2              | 1               |
| 4 18 4         | -1              |
| 4 5            |                 |
| 9 4            |                 |
| 1 6            |                 |
| 3 3            |                 |
| 4 27 4         |                 |
| 4 5            |                 |
| 9 4            |                 |
| 1 6            |                 |
| 3 3            |                 |

## Problem C. A Bit Palindromic Numbers

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

Let us call the integer number a bit palindromic, if its first digit is the same as its last digit. We use decimal notation without leading zeroes. Your task is to count how many a bit palindromic numbers are there between  $l$  and  $r$ , inclusive.

The following numbers are a bit palindromic in the first sample test: 8, 9, 11, and 22.

The numbers in the second sample test — 1251 and 1261.

### Input

Input data contains multiple test cases. The first line contains one integer  $t$  — the number of test cases ( $1 \leq t \leq 5 \cdot 10^4$ ).

Each test case is described by a single line that contains two integers:  $l$  and  $r$  ( $1 \leq l \leq r \leq 10^{18}$ ).

### Output

For each test case output one integer: how many a bit palindromic numbers are there in the given range.

### Example

| standard input | standard output |
|----------------|-----------------|
| 3              | 4               |
| 8 25           | 2               |
| 1251 1266      | 0               |
| 12 21          |                 |

## Problem D. Tree and Polynomials

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

Nick is a freshman. He studies trees in his Algorithms class. He studies polynomials in his Algebra class. And he likes to create and combine. He has recently come up with a problem he cannot solve. Help him!

You are given a rooted tree with  $n$  vertices, numbered from 1 to  $n$ . There is a value in each vertex, initially all values are equal to 0. For a vertex  $v$  let us denote as  $d[v]$  the depth of the vertex  $v$  — the number of vertices on a path from the root of the tree to  $v$ , in particular the root itself has depth equal to 1.

You are also given  $k$ . You must process queries of two types.

1. You are given a vertex  $v$  and a polynomial  $q(t) = q_0 + q_1t + q_2t^2 + \dots + q_kt^k$ . For each vertex  $u$  in a subtree of the vertex  $v$  you must add  $q(d[u])$  to the value in that vertex.
2. You are given a vertex  $v$  and a polynomial  $q(t) = q_0 + q_1t + q_2t^2 + \dots + q_kt^k$ . For each vertex  $u$  on a path from the root of the tree to  $v$ , inclusive, add  $q(d[u])$  to the value in that vertex.

All arithmetic operations are performed modulo  $10^9 + 7$ .

Help Nick to find the values in all vertices after all operations.

### Input

Input data contains multiple test cases. The first line of input data contains integer  $t$  — the number of test cases ( $1 \leq t \leq 10^5$ ).

The description of test cases follow. Each description starts with two integers:  $n$  — the number of vertices in a tree, and  $k$  — the maximal degree of the polynomials ( $1 \leq n \leq 10^5$ ,  $1 \leq k \leq 20$ ).

The following  $n$  integers  $p_1, p_2, \dots, p_n$  describe the tree,  $p_i$  is the number of a parent of the vertex  $i$ , or 0, if  $i$  is the root. It is guaranteed, that  $p_i$  describe the correct rooted tree.

The integer  $q$  follows — the number of queries ( $1 \leq q \leq 10^5$ ). The following  $q$  lines contain queries, each query is specified by an integer  $t$ , equal to 1 or 2 — the type of the query, followed by  $v$  — the vertex in the query, and then  $k+1$  integers  $q_0, q_1, \dots, q_k$  — coefficients of the polynomial in the query ( $0 \leq q_i < 10^9 + 7$ ).

It is guaranteed that the sum of values of  $n$  in all test cases of one input data doesn't exceed  $10^5$ . Similarly, the sum of values of  $q$  in all test cases of one input data doesn't exceed  $10^5$ .

### Output

For each test case output  $n$  integers, for each vertex print the value in this vertex after all queries. Remember to perform all operations modulo  $10^9 + 7$ .

### Example

| standard input                                                  | standard output |
|-----------------------------------------------------------------|-----------------|
| 1<br>4 2<br>2 4 2 0<br>3<br>1 2 0 1 0<br>2 3 1 0 0<br>2 1 0 0 1 | 12 7 4 2        |

## Problem E. Nice Report

Input file:            **standard input**  
Output file:           **standard output**  
Time limit:            6 seconds  
Memory limit:          256 megabytes

Andrew is analyzing subscription graph in one social network. This graph is directed: if the user  $a$  is subscribed to the user  $b$ , it is **not** always the case that the user  $b$  is in turn subscribed to the user  $a$ .

Andrew's boss has asked him to find for each user  $x$  the number of users  $y$  such that it is possible to reach user  $y$  from user  $x$  in the subscription graph.

There is no reason to find the exact values, they look ugly and are non-relevant almost immediately, so Andrew wants to find approximate values. Find values that differ from the correct ones at most by a factor of two.

### Input

The first line of input contains two integers  $n$  and  $m$  ( $1 \leq n, m \leq 200\,000$ ) — the number of users of the social network and the number of direct subscriptions.

The following  $m$  lines describe subscription graph, the  $i$ -th of these lines contains two integers  $a_i$  and  $b_i$  ( $1 \leq a_i, b_i \leq n$ ,  $a_i \neq b_i$ ), it means that the user  $a_i$  is subscribed to the user  $b_i$ . Each ordered pair  $(a_i, b_i)$  occurs at most once in the input data.

### Output

Output  $n$  integers  $q_i$  — for each user print approximate number of users  $y$  such that it is possible to reach user  $y$  from user  $i$  in the subscription graph. If the correct number of such users is  $z_i$ , the following inequalities must be satisfied to have the answer accepted:  $q_i \leq 2z_i$  and  $z_i \leq 2q_i$ . Moreover, you are allowed to bypass this restriction and output any  $q_i$  for no more than 10 users.

Note: judges use exact values to check your answers. However, judges don't promise that it is possible to find exact values in each test case given time and memory constraints of this problem. They recommend to try to find approximate value.

In the given example it is possible to reach all five users from the user 1. But the given answer 7 is acceptable, it differs from 5 less than by a factor of two. Similarly, the answer 2 is acceptable for the user 4.

### Example

| standard input | standard output |
|----------------|-----------------|
| 5 6            | 7               |
| 1 2            | 3               |
| 1 3            | 2               |
| 2 4            | 2               |
| 2 5            | 1               |
| 3 5            |                 |
| 4 2            |                 |