1 Component

Given a tree with weight assigned to nodes, find out minimum total weight connected component with fixed number of node.

1.1 Input

The first line contains a single integer n.
The second line contains n integers $w_1, w_2, \ldots, w_n$. w_i denotes the weight of the node i.
The following $(n-1)$ lines with two integers a_i and b_i, which denote the edge between a_i and b_i.
Note that the nodes are labled by $1, 2, \ldots, n$.
$(1 \le n \le 2 \cdot 10^3, 1 \le w_i \le 10^5)$

1.2 Output

n integers $c_1, c_2, \ldots, c_n$. c_i stands for the minimum total weight component with i nodes.

1.3 Sample input

```
3
1 2 3
1 2
2 3
```

1.4 Sample output

```
1 3 6
```

1.5 Source

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2 Cut

Cut(in another word, remove) edges the given tree T so that each connected component has even number of nodes.

Find out the maximum number of removed edges.

2.1 Input

The first line contains one integer n, which denotes the number of nodes of tree T.

The following $(n-1)$ lines with two integers a_i, b_i, which denotes edge (a_i, b_i).

Note that the nodes are labled by $1, 2, \ldots, n$.

$(1 \leq n \leq 10^5$, n is even)

2.2 Output

The only integer shows the maximum number of removed edges.

2.3 Sample input

```
4
1 2
2 3
3 4
```

2.4 Sample output

```
1
```

2.5 Note

Only edge $(2, 3)$ can be removed.

2.6 Source

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3 Matching

Compute the maximum cardinality matching of given undirected graph G.

3.1 Input

The first line contains one integer n, which denotes the number of nodes.
The following n lines denotes the adjacency matrix A of graph G.
$(1 \leq n \leq 100,\ A_{i,j} \in \{0, 1\},\ A_{i,i} = 0,\ A_{i,j} = A_{j,i})$

3.2 Output

The only integer equals to the size of maximum cardinality matching.

3.3 Sample input

```
3
0 1 1
1 0 1
1 1 0
```

3.4 Sample output

```
1
```

3.5 Note

One of possible matchings is to pair node 1 and 2, leaving node 3 alone.

3.6 Source

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4 Multiplication

If $C = A \diamond B$, then

$$C[k] = \sum_{\max(i,j)=k} A[i] \cdot B[j] \bmod (10^9 + 7)$$

.

Work out sequence $C = A \diamond B$ for given sequence A and B.

4.1 Input

The first line contains a integer n, which denotes the length of sequence A, B.
The second line contains n integers $a_1, a_2, \ldots, a_n$, which denote sequence A.
The thrid line contains n integers $b_1, b_2, \ldots, b_n$, which denote sequence$B$.
$(1 \leq n \leq 10^5, 0 \leq a_i, b_i \leq 10^9)$

4.2 Output

n integers, which denotes sequence C.

4.3 Sample input

```
2
1 2
3 4
```

4.4 Sample output

```
3 18
```

4.5 Source

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5 Path

Check if there exists a path of length l in the given tree with weight assigned to each edges.

5.1 Input

The first line contains two integers n and q, which denote the number of nodes and queries, repectively.

The following $(n-1)$ with three integers a_i, b_i, c_i, which denote the edge between a_i and b_i, with weight c_i.

Note that the nodes are labled by $1, 2, \ldots, n$.

The last line contains q integers $l_1, l_2, \ldots, l_q$, denote the queries.

$(1 \leq n, q \leq 10^5, 1 \leq c_i \leq 2)$

5.2 Output

For each query, print the result in seperated line. If there exists path of given length, print "Yes". Otherwise, print "No".

5.3 Sample input

```
4 6
1 2 2
2 3 1
3 4 2
0 1 2 3 4 5
```

5.4 Sample output

```
Yes
Yes
Yes
Yes
No
Yes
```

5.5 Source

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6 Permanent

Compute

$$\mathrm{perm}(A) = \sum_{\sigma \in S_n} \prod_{i=1}^{n} A_{i,\sigma(i)} \bmod m$$

where S_n is the set of all permutations of $\{1, 2, \ldots, n\}$.

6.1 Input

The first line contains two integers n and m. The following n lines denotes the matrix A. ($1 \le n \le 20$, $1 \le m \le 10^9$, $0 \le A_{i,j} \le 10^9$)

6.2 Output

The only integer denotes $\mathrm{perm}(A)$.

6.3 Sample input

```
2 1000000000
1 2
3 4
```

6.4 Sample output

```
10
```

6.5 Note

$$\mathrm{perm}(A) = A_{1,1} \cdot A_{1,2} + A_{1,2} \cdot A_{2,1} = 10$$

6.6 Source

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7 Product

For set A, let

$$v(A) = \sum_{S \subset A, |S| \equiv 1 \pmod 2} (\prod_{x \in S} x)$$

Initially, A is empty. Your task is to insert and delete element keeping track of value of $v(A)$.

7.1 Input

The first line contains the only integer q, which denotes the number of operations.

The following q lines, which is either "insert x" or "delete x".

For convinience, one can assume that A is a multiset and there are no delete operations for non-exist elements.

$(1 \leq q \leq 10^5, 2 \leq x \leq 10^9)$

7.2 Output

After each operation, print a single integer showing $v(A) \bmod (10^9 + 7)$.

7.3 Sample input

```
4
insert 2
insert 3
insert 4
delete 3
```

7.4 Sample output

```
2
5
33
6
```

7.5 Note

After 4 is inserted, $A = \{2, 3, 4\}$. Thus, $v(A) = 2 + 3 + 4 + 2 \cdot 3 \cdot 4 = 33$.

7.6 Source

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8 Transform

One can transform x into $x + d$ if d is divisor of x. Find out the minimum number of steps to transform a into b.

8.1 Input

Two integers a and b.
$(1 \leq a, b \leq 10^5)$

8.2 Output

The only integer denotes the minimum number of steps. Print -1 if impossible.

8.3 Sample input

```
1 6
```

8.4 Sample output

```
3
```

8.5 Note

$1 \rightarrow 2 \rightarrow 4 \rightarrow 6$ or $1 \rightarrow 2 \rightarrow 3 \rightarrow 6$.

8.6 Source

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9 Triangles

How many triple of points $A(x_A, y_A), B(x_B, y_B), C(x_C, y_C)$ which:

- $x_A, y_A, x_B, y_B, x_C, y_C \in \mathbb{Z}$
- $0 \le x_A, x_B, x_C < n, 0 \le y_A, y_B, y_C < m$
- $S_{\triangle ABC} \notin \mathbb{Z}$? ($S_\triangle$ denotes the area of triangle)

9.1 Input

Two integers n and m.
$(1 \le n, m \le 10^9)$

9.2 Output

The only integer denotes the number possible triples, modulo $10^9 + 7$.

9.3 Sample input

```
2 2
```

9.4 Sample output

```
24
```

9.5 Note

There are 4 triangles. Each of them is counted 6 times.

9.6 Source

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10 Xor

For given multisets A and B, find minimum non-negative x which $A \oplus x = B$.
Note that for $A = \{a_1, a_2, \ldots, a_n\}$, $A \oplus x = \{a_1 \oplus x, a_2 \oplus x, \ldots, a_n \oplus x\}$. $\oplus$ stands for exclusive-or.

10.1 Input

The first line contains a integer n, which denotes the size of set A (also for B).
The second line contains n integers $a_1, a_2, \ldots, a_n$, which denote the set A.
The thrid line contains n integers $b_1, b_2, \ldots, b_n$, which denote the set B.
($1 \le n \le 10^5$, n is odd, $0 \le a_i, b_i < 2^{30}$)

10.2 Output

The only integer denotes the minimum x. Print -1 if no such x exists.

10.3 Sample input

```
3
0 1 3
1 2 3
```

10.4 Sample output

```
2
```

10.5 Source

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11 /bin/cat

The cat utility reads files, writing them to the standard output.

11.1 Sample input

```
line from input file
```

11.2 Sample output

```
line from input file
```

12 Heap

Keep track of the minimum value of set S.

12.1 Input

The first line contains integer m, which denotes the number of oeprations.

The following m lines, each contains "insert x" or "delete x".

It is guaranteed that the elements in set S are distinct, all operations are valid and the set won't be empty after each operations.

($1 \le m \le 10^5$, $1 \le x \le 10^5$)

12.2 Output

m lines, each contains the minimum value after the i-th operator.

12.3 Sample Input

```
3
insert 1
insert 2
delete 1
```

12.4 Sample Output

```
1
1
2
```

13 Bracket sequence

Given string s made up with `(`, `)`, `?`, count the way to substitude `?` with `(` or `)` to form regular bracket sequence.

13.1 Input

A string s.
$(1 \leq |s| \leq 1000)$

13.2 Ouptut

An integer denotes the number of ways modulo $(10^9 + 7)$.

13.3 Sample input

```
????
```

13.4 Sample output

```
2
```

14 Binary search

Consider the following algorithm:

```
def solve(i, j)
    if i > j then
        return infinity
    if j - i <= 1 then
        return 0
    k = p[i][j]
    return max{solve(i, k), solve(k, j)} + w[k]
```

For given $w_1, w_2, \ldots, w_n$, determine p to minimize the value of $solve(1, n)$.

14.1 Input

The first line contains an integers n.
The second line contains n integers, $w_1, w_1, \ldots, w_n$.
$(2 \leq n \leq 10^2, 1 \leq w_i \leq 10^6)$

14.2 Ouptut

The only integer denotes the minimum return value.

14.3 Sample input

```
3
1 2 3
```

14.4 Sample output

```
2
```

14.5 Note

Let $p(1, 3) = 2$

15 Clique divide

Divide the given undirected graph G into two possible empty clique.
Note that $G = \langle V, E \rangle$ is clique iff $\forall x, y \in V \implies (x, y) \in E$.

15.1 Input

The first line contains two integer n, m, which denote the number of vertices and edges.
The following line contains two integer a_i, b_i, which denote the edge (a_i, b_i).
$(1 \leq n \leq 10^3, 0 \leq m \leq \frac{n(n-1)}{2})$

15.2 Output

Print `-1` if there is no valid division. Otherwise, print the clique in seperated lines. The first number s_i of each line denotes the size of clique, and the following s_i integers which denote the clique.

15.3 Sample input 1

```
3 3
1 2
2 3
3 1
```

15.4 Sample output 1

```
0
3 1 2 3
```

15.5 Sample intput 2

```
4 2
1 2
3 4
```

15.6 Sample output 2

```
2 3 4
2 1 2
```

15.7 Sample input 3

```
3 0
```

15.8 Sample output 3

```
-1
```

16 Cyclic string

The k-th cyclic shift c_k of string $s_1, s_2, \ldots, s_n$ is $s_k, s_{k+1}, \ldots, s_n, s_1, \ldots, s_{k-1}$.
Find out the k-th elements of $c_1, c_2, \ldots, c_n$ under lexicographic order.

16.1 Input

The first line contains two integers n, k.
The second line contains string s of length n. The string contains nothing except '0' and '1'.
$(1 \leq k \leq n \leq 10^5)$

16.2 Ouptut

The requested string.

16.3 Sample input

```
3 1
010
```

16.4 Sample output

```
001
```

17 Longest path on DAG

Find the longest path on directed acyclic graph G.

17.1 Input

The first line contains two integers n, m, which denote the number of vertices and edges.

The following m lines contains two integer a_i, b_i, which denote edge $a_i \to b_i$.

$(1 \le n \le 10^5, 1 \le m \le 10^6, 1 \le a_i < b_i \le n)$

17.2 Ouptut

The first line contains an integer l, which denotes the length of longest path.

The second line contains $l + 1$ integers, which denote the longest path with smallest lexicographic order.

17.3 Sample input

```
4 4
1 2
1 3
2 4
3 4
```

17.4 Sample output

```
2
1 2 4
```

18 Degree of tree

Minimum spanning tree (MST) is well-known problems on undirected graph. Today's task is to find a spanning tree T of given graph G, which minimizes

$$\sum_{i=1}^{n} d_i \times w_i$$

(d_i denotes the degree of vertice i, and w_i denotes the given weight of vertice i).

18.1 Input

The first line contains n, m, which denote the number of vertices and edges.
The second line contains n integers $w_1, w_2, \ldots, w_n$.
The following m line contasin two integers a_i, b_i, which denote the edge (a_i, b_i).
($1 \leq n \leq 10^5, 1 \leq m \leq 10^6, 1 \leq w_i \leq 10^9, 1 \leq a_i, b_i \leq n$, graph G is connected)

18.2 Output

Single integer denotes the minimum cost.

18.3 Sample input

```
3 3
1 2 3
1 2
2 3
3 1
```

18.4 Sample output

```
7
```

19 Divisor counting (Easy)

Let $\sigma(n)$ denote the number of divisors of n.
Compute $\sigma(1) + \sigma(2) + \cdots + \sigma(n)$.

19.1 Input

An integer n.
$(1 \leq n \leq 10^8)$

19.2 Output

The sum.

19.3 Sample input

```
5
```

19.4 Sample output

```
10
```

20 Divisor counting

Let $\sigma(n)$ denote the number of divisors of n.
Compute $\sigma(1) + \sigma(2) + \cdots + \sigma(n)$.

20.1 Input

An integer n.
$(1 \leq n \leq 10^{14})$

20.2 Output

The sum.

20.3 Sample input

```
5
```

20.4 Sample output

```
10
```

21 Geometric sum

Compute $(a + a^2 + \dots a^n) \bmod m$.

21.1 Input

Three integers a, n, m.
$(1 \le a, n, m \le 10^{18})$

21.2 Output

The only integer denotes the result.

21.3 Sample input

```
2 2 1000000000
```

21.4 Sample output

```
6
```

22 Integer part

Find

$$\lceil(\frac{1+\sqrt{5}}{2})^n\rceil$$

.

Note that $\lceil x \rceil$ is the smallest integer not less thant x.

22.1 Input

n.
$1 \leq n \leq 10^9$

22.2 Output

$\lceil(\frac{1+\sqrt{5}}{2})^n\rceil \bmod (10^9+7)$.

22.3 Sample input

```
1
```

22.4 Sample output

```
2
```

23 Inverse

The inverse of permutation $(p_1, p_2, \ldots, p_n)$ is the number of pairs (i, j) which $i < j$ and $p_i > p_j$. Count the number of permutaion of $\{1, 2, \ldots, n\}$, whose inverse is k.

23.1 Input

Two integers n, k.
$(1 \le n \le 100, 0 \le k \le \frac{n(n-1)}{2})$

23.2 Ouptut

An integer denotes the numbers of permutaions modulo $(10^9 + 7)$.

23.3 Sample input

```
2 1
```

23.4 Sample output

```
1
```

24 Topological sorting

Find the lexicographicalally smallest topological sorting of given directed acyclic graph G.

24.1 Input

The first line contains n, m, which denote the number of vertices and edges.
The following m lines contain a_i, b_i, which denote edge $a_i \to b_i$.
$(1 \le n \le 10^5, 0 \le m \le 10^6, 1 \le a_i, b_i \le n)$

24.2 Output

n integers denotes the desired sorting.

24.3 Sample input

```
3 2
1 3
2 3
```

24.4 Sample output

```
1 2 3
```

24.5 Note

Both $1 \to 2 \to 3$ and $2 \to 1 \to 3$ are valid topological sortings.

25 Party of liars

The party consists of n people, some of whom are liars. **Liar always tells a lie**, while the others tell the truth.

People i states that "There are a_i liars in total."

What's the minimum possible number of liars in the party?

25.1 Input

The first line contains integer n.

The second line contains n integers $a_1, a_2, \ldots, a_n$.

$(1 \leq n \leq 10^5,\ 0 \leq a_i \leq n)$

25.2 Output

The minimum possible number of liars, or -1 for impossible.

25.3 Sample input

```
2
1 2
```

25.4 Sample output

```
1
```

26 Light off

There are $n \times m$ lights on the plane. Initially, some of them are on, while the others are off. You can change the states of the light and its adjacent lights in one turn.

Find the minimum number of turns to turn off all the lights.

26.1 Input

The first line contains two integers n, m.

The following n lines, each contains m characters. The j-th character of the i-th line denotes the state of light (i, j). 0 stands for OFF, and 1 stands for ON.

It is guaranteed that all datas are solvable.

$(1 \leq n, m \leq 22)$

26.2 Ouptut

An integer denotes the minimum number of turns.

26.3 Sample input

```
2 2
10
01
```

26.4 Sample output

```
2
```

26.5 Note

```
10 -> 01 -> 00
01 -> 11 -> 00
```

27 Packing

The cost of set $\{(a_1, b_1), (a_2, b_2), \ldots, (a_n, b_n)\}$ is defined as

$$\max\{a_i\} \times \max\{b_i\}$$

Partition set $\{(a_1, b_1), (a_2, b_2), \ldots, (a_n, b_n)\}$ into several non-empty subsets to minimize the sum of the cost of subsets.

27.1 Input

The first line contains an integer n.
n lines follow. Each of them contains two integer a_i, b_i.
$(1 \le n \le 1000, 1 \le a_i, b_i \le 1000)$

27.2 Ouptut

Single integer denotes the minimum value.

27.3 Sample input

```
3
1 1
1 3
3 1
```

27.4 Sample output

```
6
```

27.5 Note

Partition $\{\{(1, 1), (1, 3)\}, \{(3, 1)\}\}$ gives the cost of $1 \times 3 + 3 \times 1 = 6$.

28 Count pair

Given $a_1, a_2, \ldots, a_n$, count the number of pair (i, j) which $i < j$ and $a_i + a_j \leq m$.

28.1 Input

The first line contains two integers n, m.
The second line contains n integers $a_1, a_2, \ldots, a_n$.
$(1 \leq n \leq 10^5, 1 \leq a_i, m \leq 10^9)$

28.2 Ouptut

An integer denotes the number of pairs.

28.3 Sample input

```
3 3
1 2 3
```

28.4 Sample output

```
1
```

29 Perfect labeling

Given connected undirected graph $G = \langle V, E \rangle$, find mapping $f : V \mapsto \mathbb{N}$ satisfying:

- $\forall (u, v) \in E, |f(u) - f(v)| = 1$
- $\max_{u,v \in V}\{f(u) - f(v)\}$ is maximized.

29.1 Input

The first line contains two integer n, m, which denote the number of vertices and edges.
The following line contains two integer a_i, b_i, which denote the edge (a_i, b_i).
$(1 \le n \le 10^2, 0 \le m \le \frac{n(n-1)}{2}, 1 \le a_i, b_i \le n)$

29.2 Output

Print `-1` if there is no valid mapping. Otherwise, print the value of $f(v_1), f(v_2), \ldots, f(v_n)$.

29.3 Sample input 1

```
3 3
1 2
2 3
3 1
```

29.4 Sample output 1

```
-1
```

29.5 Sample intput 2

```
4 4
1 2
2 3
3 4
4 1
```

29.6 Sample output 2

```
0 1 2 1
```

30 Pig

A little pig called zxybazh wants to make a calculator to make out the answer of $\sum_{x=1}^{n} \varphi(x)$
$\varphi(x)$ means the number of integers that are less than x and are coprime to x.

30.1 input

A single integer n from input
$(1 \leq n \leq 10^6)$

30.2 Sample output

A single integer which is the answer.

30.3 Sample input

```
3
```

30.4 Sample output

```
4
```

31 Sequence difference

Given sequence $\{a_1, a_2, \dots, a_n\}$, find the longest segment (continuous subsequence) whose difference of maximum and minimum does not exceed d.

31.1 Input

The first line contains two integer n, d.
The second line contains n integers $a_1, a_2, \dots, a_n$.
$(1 \le n \le 10^6, 0 \le d, a_i \le 10^9)$

31.2 Output

The length of longest segment.

31.3 Sample input

```
3 1
1 3 2
```

31.4 Sample output

```
2
```

32 Sequence sum

Given sequence $\{a_1, a_2, \ldots, a_n\}$, find the k-th largest sum among all the continuous subsequence.

32.1 Input

The first line contains two integers n, k.
The second line contains n integeres $a_1, a_2, \ldots, a_n$.
$(1 \leq n \leq 10^5, 1 \leq k \leq \frac{n(n+1)}{2}, 1 \leq a_i \leq 10^4)$

32.2 Ouptut

The only integer denotes the k-th largest sum.

32.3 Sample input

```
3 4
1 2 3
```

32.4 Sample output

```
3
```

32.5 Note

There are 6 subsequences in total: $\{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{1, 2, 3\}$ with sum $\{1, 2, 3, 3, 5, 6\}$.

33 Square free

Test whether n is square free. n is square free if and only if for all $p > 1$, p^2 is not divisors of n.

33.1 Input

The first line contains an integer t, the number of test cases.
The following n lines, each contains an integer n.
$(1 \leq t \leq 10^2, 1 \leq n \leq 10^{18})$

33.2 Output

Print “Yes” if n is square free, or “No” otherwise.

33.3 Sample input

```
2
10
20
```

33.4 Sample output 1

```
Yes
No
```

34 String set

Maintain a set of strings, supporting the following two operations:

1. `+s`, which inserts string s into the set
2. `?s`, which queries the number of string starts with the string s

34.1 Input

The first line contains an integer m, which denotes the number of operations.
The following m lines denote the operations.
$(1 \leq m \leq 100000, 1 \leq |s| \leq 10, s_i \in \{a, b\})$

34.2 Ouptut

For each operations of the second kind, output the result in seperated lines.

34.3 Sample input

```
5
+a
+ab
?a
+a
?a
```

34.4 Sample output

```
2
3
```

35 Maximal subset

Subset S is valid iff $(\sum_{x \in S} x) \leq m$.
Subset S is maximal iff $\forall x \notin S$, $S \cup \{x\}$ is not valid.
Count the number of maximal valid subset of set A.

35.1 Input

The first line contains two integers n and m, which n is the size of set A.
The second line contains n integers $a_1, a_2, \ldots, a_n$, which denote the set A.
$(1 \leq n, m \leq 5000, 1 \leq a_i \leq 5000)$

35.2 Ouptut

An integer denotes the numbers of subsets modulo $(10^9 + 7)$.

35.3 Sample input

```
3 3
1 2 3
```

35.4 Sample output

```
2
```

35.5 Note

Set $\{1, 2, 3\}$ has 5 valid subsets: $\{\}, \{1\}, \{2\}, \{3\}, \{1, 2\}$, where $\{3\}, \{1, 2\}$ are maximal.

36 Sum of subset

Given (multi-)set $A = \{a_1, a_2, \ldots, a_n\}$, find non-empty subset $S \subset A$ whose sum is the multiple of n.

36.1 Input

The first line contains an integer n.
The second line contains n integers $a_1, a_2, \ldots, a_n$.
$(1 \leq n \leq 10^5, 1 \leq a_i \leq 10^9)$

36.2 Output

The first line contains an integer s, which denotes the size of chosen subset.
The second line contains s integers $i_1, i_2, \ldots, i_s$, which denote subset $S = \{a_{i_1}, a_{i_2}, \ldots, a_{i_s}\}$.

36.3 Sample input

```
3
3 2 1
```

36.4 Sample output

```
2
2 3
```

37 Sum of subset 2

Given (multi-)set $A = \{a_1, a_2, \ldots, a_{2n}\}$, find (possible) empty subset $S \subset A$ of size n whose sum is the multiple of n.

37.1 Input

The first line contains an integer n.
The second line contains $2n$ integers $a_1, a_2, \ldots, a_{2n}$.
$(1 \le n \le 10^5, 1 \le a_i \le 10^9, \exists k \ge 0, n = 2^k)$

37.2 Output

n integers $i_1, i_2, \ldots, i_n$, which denote subset $S = \{a_{i_1}, a_{i_2}, \ldots, a_{i_n}\}$.

37.3 Sample input

```
2
1 2 3 4
```

37.4 Sample output

```
1 3
```

38 Trinomial coefficient

Suppose that $(1 + x + x^2)^n = \sum_{i=0}^{2n} c_i x^i$, find c_k.

38.1 Input

Two integers n, k.
$(1 \le n \le 10^9, 0 \le k \le 2n)$

38.2 Output

One integer c_k mod 3.

38.3 Sample input

```
2 2
```

38.4 Sample output

```
0
```

39 Walk of length

Find the shortest walk of length k for given directed weighted graph $G = \langle V, E \rangle$ and k.
Note that a walk of length k is sequence $v_0, v_1, \ldots, v_k$ which $(v_i, v_{i+1}) \in E$.

39.1 Input

The first line contains two integers n, m, which denote the number of vertices and edges.
The following m lines, each contain three integers u_i, v_i, w_i, which denote edge from u_i to v_i of weight w_i.
The next line contains an integer q, which denotes the number of queries.
The last q integers of the input file denote $k_1, k_2, \ldots, k_q$.
$(1 \le n \le 10^2, 1 \le m \le 10^4, 1 \le q \le 10^2, 1 \le u_i, v_i \le n, 1 \le w_i \le 10^9, 1 \le k_i \le 10^9)$

39.2 Output

q integers denotes the shortest walk of given k from the first vertice.
Please output `-1` if no such walk exists.

39.3 Sample input

```
2 2
1 2 1
2 1 3
4
1 2 3 4
```

39.4 Sample output

```
1 4 5 8
```

40 Work schedule

Given n tuples $\{(a_1, b_1), (a_2, b_2), \ldots, (a_n, b_n)\}$, find permutation p of $\{1, 2, \ldots, n\}$ to minimize

$$\sum_{1 \le i \le j \le n} a_{p_i} \cdot b_{p_j}$$

40.1 Input

The first line contains an integer n.
The following n lines contain two integers a_i, b_i.
$(1 \le n \le 10^5, 0 \le a_i, b_i \le 10^4)$

40.2 Output

The minimum value.

40.3 Sample input

```
2
1 2
2 1
```

40.4 Sample output

```
5
```

41 Work schedule 2

Given n tuples $\{(a_1, b_1), (a_2, b_2), \ldots, (a_n, b_n)\}$, find permutation p of $\{1, 2, \ldots, n\}$ to minimize

$$\max_{1 \le i \le n} \{ \sum_{1 \le j \le i-1} \{b_{p_j}\} - a_{p_i} \}$$

41.1 Input

The first line contains an integer n.
The following n lines contain two integers a_i, b_i.
$(1 \le n \le 10^5, 0 \le a_i, b_i \le 10^9)$

41.2 Output

The minimum value.

41.3 Sample input

```
2
1 1
2 2
```

41.4 Sample output

```
-1
```

42 Xor

Let $x_1, x_2, \ldots, x_n$ be n non-negative integers. There are q instructions:

1. `assert i j a`, declare that $x_i \oplus x_j = a$.
2. `query i j`, query the value of $x_i \oplus x_j$.

Note that $\oplus$ stands for exclusive-or.

42.1 Input

The first line contains two integer n, q.
The following q lines specific the instructions.
$(1 \leq n, q \leq 10^5, 1 \leq i, j \leq n, 0 \leq a < 2^{31})$ Assertions won't be conflicted.

42.2 Output

Print the value for each queries, or `-1` for undetermined.

42.3 Sample input

```
3 4
query 1 3
assert 1 2 1
assert 2 3 2
query 1 3
```

42.4 Sample output

```
-1
3
```