Bimodal Automata

You have a bimodal automata that takes pair of integers (a, b) as input and applies some operations on it. You can change the mode of automata in each step to do one the following operations:

- Replace (a, b) with $((a + p - b) \mod p, (2 \cdot b) \mod p)$
- Replace (a, b) with $((2 \cdot a) \mod p, (b + p - a) \mod p)$

You are given q queries with constant prime number p . In each query you are given initial value of pair (a_i, b_i) such that **their sum is not divisible by p** and desired value of pair (c_i, d_i). You have to find the **minimum number of operations needed** to transform the pair (a_i, b_i) into the pair (c_i, d_i), or determine that it is impossible.

Submit Solution

Points: 1

Time limit: 1.0s
Java 8: 4.0s
Python: 8.0s

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Input Format

- The first line contains two integers p and q, where the prime number and the number of queries.
- The i^{th} of the next q lines contains four integers a_i, b_i, c_i, d_i, where $a_i + b_i$ is not divisible by p.

Constraints

- $2 \leq p \leq 10^9 + 7$
- $1 \leq q \leq 10^5$
- $0 \leq a_i, b_i, c_i, d_i \leq p$

It is guaranteed that p is a prime number, where it has exactly two divisors.

Output Format

For each query, print the minimum number of operations to transform given initial pair (a_i, b_i) to desired pair (c_i, d_i) with defined operations. If it is impossible to accomplish the task, print -1.

Sample Input 0

Copy

```
5 10
2 1 3 0
2 1 4 4
1 3 4 0
0 2 0 4
3 3 1 2
0 1 0 1
0 3 0 3
0 1 0 1
1 2 4 4
1 0 1 1
```

Sample Output 0

```
2
1
2
-1
-1
0
0
0
1
-1
```

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