Problem F. Fancy Formulas

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

You are given a prime p and a pair of integers (a, b) such that **their sum is not divisible by** p. In one operation, you can do one of the following:

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

You have to answer q queries. In the i-th query, find the smallest 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.

Note that the order of numbers matters. For example, for $p = 3$, the distance between $(1, 2)$ and $(2, 1)$ is 1, not 0.

Input

The first line contains two integers p and q ($2 \le p \le 10^9 + 7$, p is prime, $1 \le q \le 10^5$): the prime and the number of queries to answer.

The i-th of the next q lines contains four integers a_i, b_i, c_i, d_i ($0 \le a_i, b_i, c_i, d_i < p$, and $a_i + b_i$ **is not divisible by** p).

Output

For each query, if it is impossible to transform (a_i, b_i) into (c_i, d_i), output -1. Otherwise, output the smallest number of operations required to achieve this goal.

Example

standard input	standard output
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	2 1 2 -1 -1 0 0 0 1 -1