D. Not Quick Transformation

time limit per test: 6 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Let a be an array consisting of n numbers. The array's elements are numbered from 1 to n, $even$ is an array consisting of the numerals whose numbers are even in a ($even_i = a_{2i}$, $1 \le 2i \le n$), odd is an array consisting of the numberals whose numbers are odd in a ($odd_i = a_{2i-1}$, $1 \le 2i - 1 \le n$). Then let's define the transformation of array $F(a)$ in the following manner:

- if $n > 1$, $F(a) = F(odd) + F(even)$, where operation " $+$ " stands for the arrays' concatenation (joining together)
- if $n = 1$, $F(a) = a$

Let a be an array consisting of n numbers $1, 2, 3, \ldots, n$. Then b is the result of applying the transformation to the array a (so $b = F(a)$). You are given m queries (l, r, u, v). Your task is to find for each query the sum of numbers b_i, such that $l \le i \le r$ and $u \le b_i \le v$. You should print the query results modulo mod.

Input

The first line contains three integers n, m, mod ($1 \le n \le 10^{18}$, $1 \le m \le 10^5$, $1 \le mod \le 10^9$). Next m lines describe the queries. Each query is defined by four integers l, r, u, v ($1 \le l \le r \le n$, $1 \le u \le v \le 10^{18}$).

Please do not use the `%lld` specificator to read or write 64-bit integers in C++. Use `%I64d` specificator.

Output

Print m lines each containing an integer — remainder modulo mod of the query result.

Examples

input

```
4 5 10000
2 3 4 5
2 4 1 3
1 2 2 4
2 3 3 5
1 3 3 4
```

output

```
0
5
3
3
3
```

input

```
2 5 10000
1 2 2 2
1 1 4 5
1 1 2 5
1 1 1 3
1 2 5 5
```

output

```
2
0
0
1
0
```

Note

Let's consider the first example. First let's construct an array $b = F(a) = F([1, 2, 3, 4])$.

- Step 1. $F([1, 2, 3, 4]) = F([1, 3]) + F([2, 4])$
- Step 2. $F([1, 3]) = F([1]) + F([3]) = [1] + [3] = [1, 3]$
- Step 3. $F([2, 4]) = F([2]) + F([4]) = [2] + [4] = [2, 4]$
- Step 4. $b = F([1, 2, 3, 4]) = F([1, 3]) + F([2, 4]) = [1, 3] + [2, 4] = [1, 3, 2, 4]$

Thus $b = [1, 3, 2, 4]$. Let's consider the first query $l = 2, r = 3, u = 4, v = 5$. The second and third positions in the array b do not have numbers in the range $[4, 5]$, so the sum obviously equals zero. Let's consider the second query $l = 2, r = 4, u = 1, v = 3$. The second and third positions have two numbers that belong to the range $[1, 3]$, their sum equals 5.