

Umbrellas

Rain is coming over the city! The city can be imagined as a grid with R rows and C columns. Rows are numbered from 1 at the top to R at the bottom, and columns are numbered from 1 to C . Above row 1 is the sky, and below row R is the ground.

There are umbrellas placed in the city. Each umbrella is located in exactly one row and covers a consecutive interval of columns. Umbrella i is described by the triple (r_i, a_i, b_i) : it is located in row r_i and covers columns from a_i to b_i . Every umbrella has even width, meaning that $b_i - a_i + 1$ is even.

Rain falls from the sky: from each column from 1 to C , exactly one raindrop falls straight down. A drop falling from column c passes through rows $1, 2, \dots, R$ in order. If a drop reaches an umbrella in some row, and that umbrella covers columns from a to b with width $w = b - a + 1$:

- If the drop is on the left half of the umbrella (columns from a to $a + w/2 - 1$), it slides to the left and continues falling from column $a - 1$.
- If the drop is on the right half of the umbrella (columns from $a + w/2$ to b), it slides to the right and continues falling from column $b + 1$.

After sliding off an umbrella, the drop continues falling downward through the remaining rows and may hit other umbrellas.

In the end, every drop lands on the ground at some column. Some drops may end up outside the grid, at column 0 or column $C + 1$.

For each of Q queries, given as an interval $[L_j, D_j]$, determine how many raindrops land on the ground in columns from L_j to D_j , inclusive.

Input

The first line contains four integers R , C , N and Q : the number of rows in the grid, the number of columns, the number of umbrellas and the number of queries.

Each of the next N lines contains three integers r_i , a_i and b_i describing the i -th umbrella: the row in which it is located, and the first and last column it covers.

Each of the next Q lines contains two integers L_j and D_j describing the j -th query.

Constraints

- $1 \leq R \leq 100$
- $1 \leq C \leq 10^9$
- $0 \leq N \leq 200\,000$
- $1 \leq Q \leq 200\,000$
- $1 \leq r_i \leq R$
- $1 \leq a_i \leq b_i \leq C$
- $b_i - a_i + 1$ is even for every umbrella
- Any two umbrellas in the same row have at least one empty column between them
- $1 \leq L_j \leq D_j \leq C$

Note: Use `ios::sync_with_stdio(false)` and `cin.tie(nullptr)` for faster input.

Subtasks

Subtask 1 (5 points)

- $C \leq 1\,000\,000$
- $N = 0$
- $Q \leq 1\,000$

Subtask 2 (6 points)

- $C \leq 1\,000\,000$
- $N \leq 1$
- $Q \leq 1\,000$

Subtask 3 (10 points)

- $C \leq 1\,000\,000$
- $N \leq 10\,000$
- All umbrellas are located in the same row.
- $Q \leq 1\,000$

Subtask 4 (10 points)

- $N \leq 10\,000$
- $C \leq 1\,000$
- $Q \leq 1\,000$

Subtask 5 (7 points)

- $C \leq 1\,000\,000$
- $N \leq 10\,000$

- $Q \leq 1\,000$

Subtask 6 (22 points)

- $C \leq 1\,000\,000$
- $N \leq 10\,000$
- $Q \leq 100\,000$

Subtask 7 (40 points)

- No additional constraints.

Output

For each query, print one integer on a separate line: the number of raindrops that land on the ground in columns from L_j to D_j .

Examples

Input 1

```
3 9 1 3
2 4 7
1 3
4 7
8 9
```

Output 1

```
5
0
4
```

Explanation 1

The grid has 3 rows and 9 columns. There is one umbrella in row 2 covering columns 4 through 7, with width 4. The left half of the umbrella consists of columns 4 and 5, and the right half consists of columns 6 and 7.

	1	2	3	4	5	6	7	8	9
Row 1:	.	.	.	.	.	.	.	.	.
Row 2:	.	.	.	L	L	R	R	.	.
Row 3:	.	.	.	.	.	.	.	.	.
Ground:	1	2	3	4	5	6	7	8	9

Drops from columns 1, 2 and 3 do not hit the umbrella and fall straight to the ground. Drops from columns 4 and 5 hit the left half of the umbrella and slide to column 3. Drops from columns 6 and 7 hit the right half of the umbrella and slide to column 8. Drops from columns 8 and 9 do not hit the umbrella and fall straight to the ground.

On the ground, 3 drops land on column 3 (the original drops from columns 3, 4 and 5), 3 drops land on column 8 (the original drops from columns 6, 7 and 8), and one drop lands on each of columns 1, 2 and 9.

- Query $[1, 3]$: columns 1, 2 and 3 receive a total of $1 + 1 + 3 = 5$ drops.
- Query $[4, 7]$: columns 4 through 7 receive no drops.
- Query $[8, 9]$: columns 8 and 9 receive a total of $3 + 1 = 4$ drops.

Input 2

```
3 9 2 3
1 4 7
2 1 6
1 3
4 7
8 9
```

Output 2

```
0
0
4
```

Explanation 2

The umbrella in row 1 covers columns 4 through 7, and the umbrella in row 2 covers columns 1 through 6.

	1	2	3	4	5	6	7	8	9
Row 1:	.	.	.	L	L	R	R	.	.
Row 2:	L	L	L	R	R	R	.	.	.
Row 3:	.	.	.	.	.	.	.	.	.
Ground:	1	2	3	4	5	6	7	8	9

Drops from columns 1, 2 and 3 pass through row 1 without an obstacle. In row 2, they hit the left half of the lower umbrella (columns 1, 2 and 3) and slide to column 0, outside the grid.

Drops from columns 4 and 5 hit the left half of the upper umbrella in row 1 and slide to column 3. In row 2, they hit the left half of the lower umbrella and slide to column 0, outside the grid.

Drops from columns 6 and 7 hit the right half of the upper umbrella in row 1 and slide to column 8. They pass through row 2 without an obstacle and land on column 8.

Drops from columns 8 and 9 do not hit any umbrella and land on columns 8 and 9.

- Query $[1, 3]$: columns 1 through 3 receive no drops, because all of those drops ended at column 0.
- Query $[4, 7]$: columns 4 through 7 receive no drops.
- Query $[8, 9]$: columns 8 and 9 receive a total of $3 + 1 = 4$ drops.