Kick Start 2018 - Round B

Sherlock and the Bit Strings

Problem

Sherlock and Watson are playing a game involving bit strings, i.e., strings consisting only of the digits `0` and `1`. Watson has challenged Sherlock to generate a bit string S of **N** characters S_1, S_2, ..., $S_{\mathbf{N}}$. The string must obey each of **K** different constraints; each of these constraints is specified via three integers $\mathbf{A_i}$, $\mathbf{B_i}$, and $\mathbf{C_i}$. The number of `1`s in the substring $S_{\mathbf{A_i}}$, $S_{\mathbf{A_i} + 1}$, ..., $S_{\mathbf{B_i}}$ must be equal to $\mathbf{C_i}$.

Watson chooses the constraints in a way that guarantees that there is at least one string of the right length that obeys all of the constraints. However, since there could be multiple such strings, Watson wants Sherlock to choose the string from this set that is $\mathbf{P}^{th}$ in lexicographic order, with **P** counted starting from 1.

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case begins with one line containing three integers **N**, **K**, and **P**, as described above. Then, there are **K** more lines; the i-th of these contains three integers $\mathbf{A_i}$, $\mathbf{B_i}$ and $\mathbf{C_i}$, representing the parameters of the i-th constraint, as described above.

Output

For each test case, output one line containing `Case #x: y`, where `x` is the test case number (starting from 1) and `y` is the $\mathbf{P}^{th}$ lexicographically smallest bit string among all possible strings following the **K** specified constraints.

Limits

$1 \le \mathbf{T} \le 100$.
Time limit: 20 seconds per test set.
Memory limit: 1 GB.
$1 \le \mathbf{N} \le 100$.
$1 \le \mathbf{K} \le 100$.
$1 \le \mathbf{P} \le \min(10^{18}$, the number of bit strings that obey all of the constraints).
$1 \le \mathbf{A_i} \le \mathbf{B_i} \le \mathbf{N}$ for all $1 \le i \le \mathbf{K}$.
$0 \le \mathbf{C_i} \le \mathbf{N}$, for all $1 \le i \le \mathbf{K}$.
$(\mathbf{A_i}, \mathbf{B_i}) \ne (\mathbf{A_j}, \mathbf{B_j})$, for all $1 \le i < j \le \mathbf{K}$.

Small dataset (Test set 1 - Visible)

$\mathbf{A_i} = \mathbf{B_i}$ for all $1 \le i \le \mathbf{K}$.

Large dataset (Test set 2 - hidden)

$\mathbf{B_i} - \mathbf{A_i} \le 15$ for all $1 \le i \le \mathbf{K}$.

Sample

Note: there are additional samples that are not run on submissions down below.

Sample Input

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

Sample Output

```
Case #1: 011
Case #2: 000
```

In Sample Case #1, the bit strings that obey the only constraint in lexicographically increasing order are [010, 011, 110, 111].

In Sample Case #2, the bit strings that obey the only constraint in lexicographically increasing order are [000, 001, 100, 101].

Additional Sample - Test Set 2

The following additional sample fits the limits of Test Set 2. It will not be run against your submitted solutions.

Sample Input

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

Sample Output

```
Case #1: 0101
```

In Sample Case #1, the bit strings that obey the given constraints in lexicographically increasing order are [0101, 1010].