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Scoreboard

Ends in 22h 51m 45s

Score: 0 / 100 points
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FAQ

My Clarifications

Problem A1: Perimetric - Chapter 1

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10 points

Problem | My Submissions

Note: This problem shares similarities with Chapters 2 and 3. The solution to any chapter may help with solving the others, so please consider reading all of them.

After a highly successful haul from the log drive, Connie the contractor is tasked with building a number of houses in the Great White North. For each job, the client has provided a floor plan consisting of N rectangular rooms, numbered from 1 to N. From a bird's-eye view, the rooms are arranged on a 2-dimensional plane, with axis-aligned walls. The southern wall of each room has y-coordinate 0.

The ith rectangular room has southwest corner $(L_i, 0)$ and northeast corner $(L_i + W, H_i)$. **In this chapter of the problem, all N rooms have the same width W, and have strictly increasing L values $(L_1 < L_2 < ... < L_N)$.** Since houses often have shared regions (such as a common living/dining area), these rooms may overlap with one another.

Unfortunately, log houses are quite susceptible to air leakage. Connie knows that she must install additional insulation to keep the houses warm and energy-efficient during the harsh Canadian winters. In order to determine the amount of insulation material required, Connie will first need to gather some metrics: the perimeters around various combinations of rooms.

Specifically, let P_i be the perimeter of the union of rooms $1..i$. Note that any given point is considered to be within the union if and only if it's within at least one of the rooms' rectangles (including right on an edge), and that the union might not form a single connected polygon. Please help compute the product $(P_1 * P_2 * ... * P_N)$. As this product may be very large, you should compute its value modulo 1,000,000,007.

In order to reduce the size of the input, the rooms' coordinates will not all be provided explicitly. Instead, you'll be given the first K values $L_{1..K}$ and $H_{1..K}$, as well as the two quadruples of constants (A_L, B_L, C_L, D_L) and

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$L_i = ((A_L * L_{i-2} + B_L * L_{i-1} + C_L) \text{ modulo } D_L) + 1$ for $i > K$
$H_i = ((A_H * H_{i-2} + B_H * H_{i-1} + C_H) \text{ modulo } D_H) + 1$ for $i > K$

Input

Input begins with an integer T, the number of floor plans. For each plan, there are 5 lines.

The first line contains the 3 space-separated integers N, K, and W.

The second line contains the K space-separated integers $L_{1..K}$.

The third line contains the 4 space-separated integers A_L, B_L, C_L, and D_L.

The fourth line contains the K space-separated integers $H_{1..K}$.

The fifth line contains the 4 space-separated integers A_H, B_H, C_H, and D_H.

Output

For the ith floor plan, print a line containing *"Case #i: "* followed by a single integer, the product $(P_1 * P_2 * ... * P_N)$ as defined above, modulo 1,000,000,007.

Constraints

$1 \leq T \leq 100$
$2 \leq N \leq 1,000,000$
$2 \leq K \leq N$
$1 \leq W \leq 20$
$0 \leq A_L, B_L, C_L, A_H, B_H, C_H \leq 1,000,000,000$
$1 \leq D_L, D_H \leq 500,000,000$
$1 \leq L_i \leq D_L$
$1 \leq H_i \leq D_H$
$L_1 < L_2 < ... < L_N$

The sum of N across all floor plans is at most 10,000,000.

Explanation of Sample

For the first floor plan, $L = [1, 2]$ and $H = [3, 3]$. The union of just the first room's rectangle is equivalent to that

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PROBLEMS

Perimetric

A1: Chapter 1 10 pt

A2: Chapter 2 15 pt

A3: Chapter 3 17 pt

B: Dislodging Logs 20 pt

C: Quarantine 38 pt

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of 3 and a height of 3 (with southwest corner (1, 0)), having a perimeter of 12. The answer is therefore $(10 * 12) \text{ modulo } 1{,}000{,}000{,}007 = 120$.

For the second floor plan, $P = [10, 20]$.

For the third floor plan, $P = [14, 18, 24, 36, 42]$.

For the fourth floor plan:
$L = [9, 14, 15, 19, 23, 27, 31, 35, 39, 43]$
$H = [12, 7, 16, 31, 30, 27, 16, 17, 2, 15]$
$P = [40, 50, 60, 98, 106, 114, 122, 130, 138, 146]$

Sample Input

```
5
2 2 2
1 2
0 0 0 100
3 3
0 0 0 100
2 2 2
10 20
0 0 0 100
3 3
0 0 0 100
5 5 3
2 4 5 9 12
0 0 0 100
4 3 6 3 2
0 0 0 100
10 3 8
9 14 15
0 1 3 53
12 7 16
5 2 1 38
50 10 17
4 9 10 26 28 59 97 100 105 10
1 0 7 832
130 12 82 487 12 30 214 104 1
21 81 410 605
```

Sample Output

```
Case #1: 120
Case #2: 200
Case #3: 9144576
Case #4: 803986060
Case #5: 271473330
```

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