USA Computing Olympiad

USACO 2024 December Contest, Bronze
Problem 2. Farmer John's Cheese Block

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Contest has ended.

Submitted; Results below show the outcome for each judge test case

1	2	3	4	5	6	7	8	9	10	11	12
* 34.8mb 95ms	* 39.0mb 179ms	* 39.7mb 182ms	* 39.6mb 176ms	* 39.7mb 180ms	* 39.5mb 179ms	* 39.5mb 184ms	* 70.4mb 1607ms	* 71.0mb 1617ms	* 70.7mb 1650ms	* 70.5mb 1616ms	* 71.1mb 1613ms

13	14	15	16
* 70.4mb 1585ms	* 70.7mb 1534ms	* 58.7mb 1488ms	* 62.1mb 1517ms

English (en)

Farmer John has a block of cheese in the shape of a cube. It lies on the 3-dimensional coordinate plane, extending from $(0,0,0)$ to (N,N,N) ($2 \le N \le 1000$). Farmer John will perform a series of Q ($1 \le Q \le 2 \cdot 10^5$) update operations to his cheese block.

For each update operation, FJ will carve out the 1 by 1 by 1 block of cheese extending from integer coordinates (x,y,z) to $(x+1,y+1,z+1)$, where $0 \le x,y,z < N$. It is guaranteed that there will exist a 1 by 1 by 1 block of cheese at the location FJ carves. Since FJ is playing Moocraft, gravity does not cause parts of the cheese to fall if cheese below is carved.

After each update, output the number of distinct configurations that FJ can stick a 1 by 1 by N brick in the cheese block such that no part of the brick overlaps with any remaining cheese. Every vertex of the brick must have integer coordinates in the range $[0,N]$ for all three axes. FJ may rotate the brick however he wants.

INPUT FORMAT (input arrives from the terminal / stdin):

The first line contains N and Q.

The following Q lines contain x, y, and z, the coordinates to be carved.

OUTPUT FORMAT (print output to the terminal / stdout):

After each update operation, output an integer, the number of configurations.

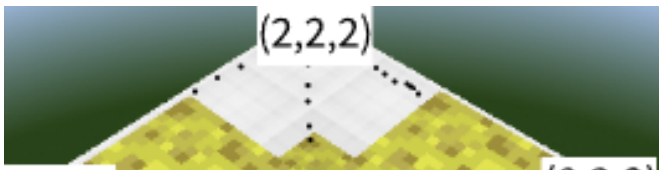
SAMPLE INPUT:

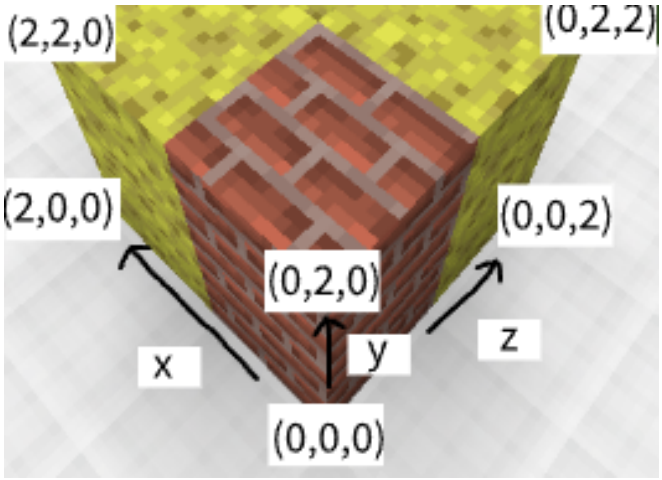
```
2 5
0 0 0
1 1 1
0 1 0
1 0 0
1 1 0
```

SAMPLE OUTPUT:

```
0
0
1
2
5
```

After the first three updates, the $1 \times 2 \times 1$ brick spanning $[0,1] \times [0,2] \times [0,1]$ does not overlap with the remaining cheese, so it contributes toward the answer.





SCORING:

- Inputs 2-4: $N \leq 10$ and $Q \leq 1000$
- Inputs 5-7: $N \leq 100$ and $Q \leq 1000$
- Inputs 8-16: No additional constraints

Problem credits: Chongtian Ma, Alex Liang

Contest has ended. No further submissions allowed.

Previous Submissions:

Sun, Dec 15, 2024 19:18:00 EST (Java)