Assignment-4

A) Efficient Matrix Product

We define matrix product modulo M of two 2×2 matrices A and B as follows:

$C = (A \times B) \bmod M$

$C_{11} = (A_{11} \times B_{11} + A_{12} \times B_{21}) \bmod M$

$C_{12} = (A_{11} \times B_{12} + A_{12} \times B_{22}) \bmod M$

$C_{21} = (A_{21} \times B_{11} + A_{22} \times B_{21}) \bmod M$

$C_{22} = (A_{21} \times B_{12} + A_{22} \times B_{22}) \bmod M$

Now, given N 2×2 matrices, accommodate for the following 2 types of queries.

Type-1 Query: 1 l r

For each query of $type - 1$, print the product of all the matrices in the range-$[l, r]$ modulo $10^9 + 7$.

Type-2 Query: 2 i A_{11} A_{12} A_{21} A_{22}

For each query of $type - 2$, update the ith matrix to A.

Input

First line contains one integer N, denoting the array size.

Then follow N lines containing 4 integers, $A[i]_{11}$, $A[i]_{12}$, $A[i]_{21}$, $A[i]_{22}$ each describing the ith matrix, $A[i]$.

Next line contains one integer q, denoting the number of queries to follow.

Then follow q lines, each describing a query of type-1 or type-2.

$Type - 1$ Query format: 1 l r

$Type - 2$ Query format: 2 i a_{11} a_{12} a_{21} a_{22}

Output

For each query of $type - 1$, output a line containing 4 integers, X_{11}, X_{12}, X_{21}, X_{22} separated by spaces where X_{ij} represent the entries of the matrix X formed by the product of all the matrices in the range- $[l, r]$ modulo $10^9 + 7$.

Constraints

$1 \leq N \leq 10^5$, Array size

$1 \leq q \leq 10^5$, Number of queries

$1 \leq a_{ij} \leq 10^5$, Matrix entries(initial matrix and the type-2 query)

$1 \leq l \leq r \leq 10^5$, Number of queries

Sample Input 1

```
6
7 7 4 3
7 3 4 5
1 6 7 3
3 4 2 3
7 4 4 7
2 4 3 6
6
1 1 2
2 5 6 7 6 1
1 1 2
2 1 2 6 6 7
1 3 4
2 6 5 6 2 3
```

Sample Output 1

```
77 56 40 27
77 56 40 27
15 22 27 37
```

Limits

Time: 2 seconds

Memory: 256 MB