# Jucied Log

## Description

Now, you are solving a problem about sequence.

Given a list of $N$ integers $a_1, a_2, \ldots, a_N$ and $Q$ operations, each operation is one of the following:

1. 1 $L$ $R$ $e$ : $\forall i \in [L, R]$, change $a_i$ to $\lfloor log_e a_i \rfloor$). Note that, if $a_i$ is 0, then $\lfloor log_e a_i \rfloor = 0$
2. 2 $x$ $y$: change $a_x$ to $y$.
3. 3 $L$ $R$: please calculate $\Sigma_{i=L}^{R} \Sigma_{j=i+1}^{R} \Sigma_{k=j+1}^{R} a_i a_j a_k \mod (10^9 + 9)$

## Input

The first line of the input contains two integers $N, Q$.

The second line contains $N$ space-separated integers $a_1, a_2, \ldots, a_N$.

Then, there are $Q$ lines, each line contains one operation. The format of the operation is mentioned in the description above.

- $1 \leq N, Q \leq 2 \times 10^5$
- $0 \leq a_i, y \leq 10^9$
- $1 \leq L \leq R \leq N$
- $1 \leq x \leq N$
- $2 \leq e \leq 10^9$

All numbers in the input are integers.

## Output

For operation 3, output the corresponding result.

## Sample Input

```
4 6
2 3 4 5
3 1 4
2 2 100
3 1 3
1 1 4 2
3 1 3
3 4 4
```

## Sample Output

```
154
800
12
0
```