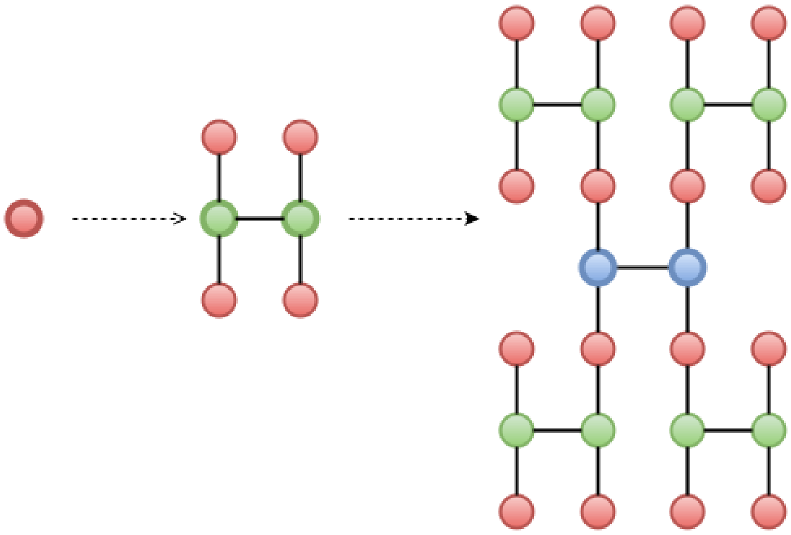
HackerRank City

HackerRank-city is an acyclic connected graph (or tree). Its not an ordinary place, the construction of the whole tree takes place in N steps. The process is described below:

- It initially has 1 node.
- At each step, you must create 3 duplicates of the current tree, and create 2 new nodes to connect all 4 copies in the following `H` shape:



At each i^{th} step, the tree becomes 4 times bigger plus 2 new nodes, as well as 5 new edges connecting everything together. The length of the new edges being added at step i is denoted by input A_i.

Calculate the sum of distances between each pair of nodes; as these answers may run large, print your answer modulo 1000000007.

Input Format

The first line contains an integer, N (the number of steps). The second line contains N space-separated integers describing A_0, $A_1, \ldots, A_{N-2}, A_{N-1}$.

Constraints

$1 \leq N \leq 10^6$
$1 \leq A_i \leq 9$

Subtask

For 50% score $1 \leq N \leq 10$

Output Format

Print the sum of distances between each pair of nodes modulo 1000000007.

Sample Input 0

```
1
1
```

Sample Output 0

```
29
```

Sample Input 1

```
2
2 1
```

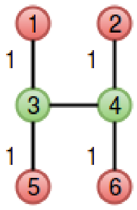
Sample Output 1

```
2641
```

Explanation

Sample 0

In this example, our tree looks like this:



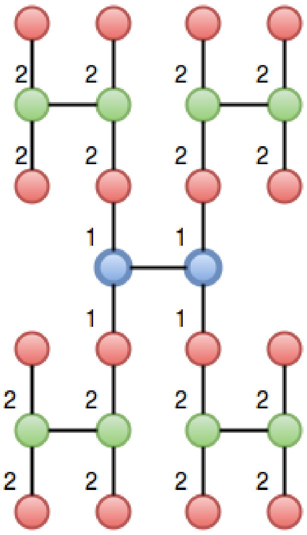
Let $d(u, v)$ denote the distance between nodes u and v.

$$d(1,2)+d(1,3)+d(1,4)+d(1,5)+d(1,6)\ +d(2,3)+d(2,4)+d(2,5)+d(2,6)+d(3,4)$$
$$+d(3,5)+d(3,6)+d(4,5)+d(4,6)+d(5,6)=$$
$$3+1+2+2+3+2+1+3+2+1+1+2+2+1+3=29\ .$$

We print the result of $29\ \%\ 1000000007$ as our answer.

Sample 1

In this example, our tree looks like this:



We calculate and sum the distances between nodes in the same manner as *Sample 0* above, and print the result of our $answer\ \%\ 1000000007$, which is 2641.