Waterloo 2022 Fall C - Squaring the Triangle

Time limit: 5.0s **Memory limit:** 256M

2022 Fall Waterloo Local Contest, Problem C

Wesley creates a graph G that contains N vertices. For each pair of vertices $\{u, v\}$, there is a probability of $\frac{p}{q}$ that an edge exists between u and v. The probabilities are independent of each other.

Let $\triangle(G)$ denote the number of triangles in G. A triangle is a set of 3 vertices that are connected by 3 edges.

Please help Wesley find the expected value of $(\triangle(G))^2$.

Input Specification

Line 1 contains integer T $(1 \leq T \leq 10^6)$, the number of cases.

T lines follow. The i^{th} line contains integers N, p, q $(3 \leq N \leq 10^6, 1 \leq p < q \leq 10^6)$, separated by spaces.

Output Specification

Output T lines, one line for each case.

Suppose the answer to the i^{th} case is $\frac{P}{Q}$, in lowest terms. Output $PQ^{-1} \pmod{10^9 + 7}$. That is, output a number R such that $0 \leq R < 10^9 + 7$ and $P \equiv RQ \pmod{10^9 + 7}$.

Sample Input

```
2
3 1 2
4 1 2
```

Sample Output

```
125000001
875000007
```

Note

The original problem did not have a sample.