# Expected Diameter

Input file: `standard input`
Output file: `standard output`
Time limit: 15 seconds
Memory limit: 256 megabytes

If you have some experience preparing problems for a contest, you might find the following fact counterintuitive: a random tree, chosen uniformly from all unrooted labelled trees with $n$ nodes, has expected diameter $\Theta(\sqrt{n})$.

Why is this so unintuitive? Well, because if you've already prepared a tree problem before, then you might know that one of the simplest ways to generate a random tree (not necessarily uniformly random) is the following procedure, which we can call the "lopsided random generator":

- For each $i$ from 2 to $n$:
  - Choose a $j$ between 1 and $i-1$ randomly, and add the edge $(i, j)$.
- Relabel the nodes by choosing a random permutation of $1, 2, \ldots, n$.

Although this is not at all a uniformly random choice of a unrooted labelled tree with $n$ nodes—recall that there are $n^{n-2}$ such trees by Cayley's formula—you might intuitively think that this is "close enough" to being uniformly random, and should give you the correct expected diameter. And the expected diameter of a tree generated with this procedure is $\Theta(\log n)$ (well, at least I think it is). However, this is incorrect! As it turns out, this procedure gives a highly lopsided probability distribution among the $n^{n-2}$ trees, enough to change the expected diameter.

Let's put this newfound knowledge to the test. Suppose a random weighted, unrooted labelled tree with $n$ nodes is chosen as follows:

- First, choose an unweighted unrooted labelled tree with $n$ nodes uniformly randomly from the $n^{n-2}$ such trees.
  - **Important Note:** The choice of unweighted unrooted labelled tree is **uniform** across the $n^{n-2}$ distinct such trees; the "lopsided random generator" procedure described above will not be used.
- Next, for each edge, give it a weight of 1 with probability $p_1$, and 2 with probability $p_2$. Note that $p_1 + p_2 = 1$.

Given $n$, what is the expected diameter of a tree chosen this way? Find this number "modulo 998244353"; that is:

- Let $m = 998244353$.
- It can be shown that the answer is rational (assuming $p_1$ and $p_2$ are).
- Write the answer as $u/v$ in lowest terms and with $v$ positive.
- It can be shown (under the constraints of this problem) that there's a unique integer $r$ such that $0 \le r < m$ and $rv \equiv u$ modulo $m$. Your goal is to find this unique $r$.

**Notes:**

- An **unrooted labelled tree with $n$ nodes** is a connected acyclic undirected graph whose nodes are $1, 2, \ldots, n$.
- The **diameter** of a weighted graph is the largest weight of any simple path in it.
- A **simple path** is a path with no repeated nodes; that is, a sequence of distinct nodes $s_0, s_1, \ldots, s_k$ such that there is an edge $(s_i, s_{i+1})$ for each $i$.
- The weight of a simple path is the sum of the weights of the edges in it.

## Input

The input consists of a single line containing three space-separated integers $n$, $x$ and $y$. The probabilities $p_1$ and $p_2$ are now defined as:

$$p_1 = x/y$$
$$p_2 = 1 - p_1$$

- $1 \leq n \leq 2000$
- $0 \leq x \leq y \leq 1000$

## Output

Output a single line containing the integer denoting the answer.

## Examples

| standard input | standard output |
|---|---|
| 2 1 3 | 665496237 |
| 3 2 3 | 665496238 |

## Note

For $n = 2$, there is only $2^0 = 1$ unweighted tree, and 2 weighted trees, each with diameters 1 and 2, with probabilities $1/3$ and $2/3$, respectively. The expected diameter is then $5/3$, and the answer is $r = 665496237$ because it is the unique integer satisfying:

- $0 \leq r < 998244353$
- $3r \equiv 5$ modulo 998244353.

For $n = 3$, there are $3^1 = 3$ unweighted trees, and 12 weighted trees.