Divisor Exploration 3

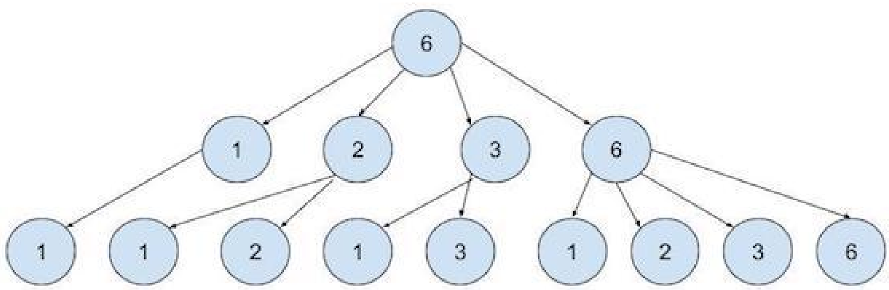
You are given q queries where each query is in the form of three integers, m, a and d, such that:

$$n = \prod_{i=1}^{m} p_i^{a+i}, \text{ where } p_i \text{ is the } i^{th} \text{ prime.}$$

Using this value of n along with the given d, create a tree T as follows :-

- The value n is the root of the tree.
- A node is expanded such that all it's divisors are it's children.
- Continue expanding till the tree has depth d.

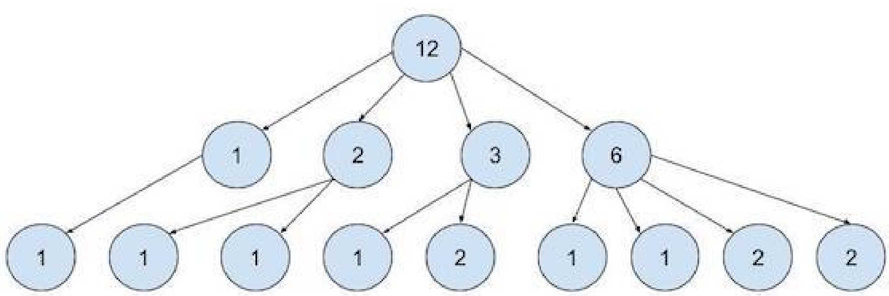
For example, if $n = 6$ and $d = 2$, then the tree will look like the following:



Once the tree is built, we create another tree U as follows :-

- Every leaf node $x \in T$, is transformed to $\phi(x)$. Here $\phi()$ is the totient function.
- Every non-leaf node is equal to the sum of the values of it's children.

From our previous example tree, after constructing a new tree, we get the following tree.



Print the value at the root of tree U after taking modulo with $(10^9 + 7)$.

Input Format

The first line of the input contains a single integer q ($q \leq 50$).
Following q lines contain three integers given by m, a and d.

Constraints

For 30% points:

- $1 \leq m \leq 100$
- $0 \leq a \leq 100$
- $1 \leq d \leq 100$

For Full Points:

- $1 \leq m \leq 1000$
- $0 \leq a \leq 1000$
- $1 \leq d \leq 1000$

Output Format

For each case, print the value at the root of tree U modulo $(10^9 + 7)$.

Sample Input 0

```
3
2 0 1
2 0 2
1 0 3
```

Sample Output 0

```
18
39
4
```

Explanation 0

In the first test case, the root of the divisor tree is 18. Root expands to 1 level deep. So in level 1 we have $1, 2, 3, 6, 9, 18$. Level 1 contains leaves. So their special values are $1, 1, 2, 2, 6, 6$. So root has special value of $1 + 1 + 2 + 2 + 6 + 6 = 18$.