Divisor Exploration

HackerRank

You are given D datasets where each dataset is in the form of two integers, m and a, such that:

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

For each dataset, find and print the following on a new line:

$$\sum_{d|n} \sigma_0(d)$$

where $\sigma_0(x)$ is the count of divisors of x. As the answer can be quite large, print the result of this value modulo $(10^9 + 7)$.

Input Format

The first line contains an integer, D, denoting the number of datasets.
Each line i of the D subsequent lines contains two space-separated integers describing the respective values of m_i and a_i for dataset i.

Constraints

- $1 \le D \le 10^5$
- $1 \le m \le 10^5$
- $0 \le a \le 10^5$

Output Format

For each dataset, print a single integer denoting the result of the summation above modulo $(10^9 + 7)$ on a new line.

Sample Input

```
3
2 0
3 0
2 4
```

Sample Output

```
18
180
588
```

Explanation

For the first dataset where $m = 2$ and $a = 0$,

$$
\begin{aligned}
n &= 2^1 \times 3^2 \\
&\Rightarrow 2 \times 9 \\
&\Rightarrow 18
\end{aligned}
$$

18 has the following divisors: $\{1, 2, 3, 6, 9, 18\}$. Therefore, the result is:

$$
\begin{aligned}
&\sigma_0(1) + \sigma_0(2) + \sigma_0(3) + \sigma_0(6) + \sigma_0(9) + \sigma_0(18) \\
&\Rightarrow 1 + 2 + 2 + 4 + 3 + 6 \\
&\Rightarrow 18
\end{aligned}
$$

Thus we print the value of $18 \ \% \ (10^9 + 7) = 18$ on a new line.