

DMOPC '14 Exam Time P6 - Math Homework

Time limit: 1.0s **Memory limit:** 64M

One morning, you realize that [binary matrices](#) are irresistible. You just can't stop thinking about them. You realize that you had inherited your love of binary matrices from your math teacher, Mr. Sidhu!

Thinking back a little, this is because Mr. Sidhu had left you a homework problem to be completed by last period today. And you didn't even start on it! Luckily, you have a few minutes before class starts. You take a look at the problem again:

Determine the number of binary matrices of size $R \times C$ that have at least one $\boxed{1}$ entry in each row and column, modulo $10^9 + 7$.

Since there are a lot of problems of this form, specifically T of these problems, you would like to write a program that solves these quickly, or risk getting a mark below 100 in math!

Input Specification

The first line of input will have the number of test cases, T . The next T lines will each contain a test case.

Each test case is one line with R and C separated by a single space.

Output Specification

For each test case, output the answer. Remember to take it modulo $10^9 + 7$.

Constraints

There will be 5 subtasks each worth 20% of the points for this problem.

- $T \leq 16; R \leq 4; C \leq 4$
- $T \leq 36; R \leq 6; C \leq 6$
- $T \leq 500; R \leq 500; C \leq 500$
- $T \leq 10; R \leq 10^9; C \leq 6$
- $T \leq 10; R \leq 10^9; C \leq 3\,000$

In all subtasks, $T, R, C \geq 1$.

Tips

Optimize your program to run as fast as possible, even if you think it has the correct complexity.

Sample Input

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

Sample Output

```
1
7
25
25
```

Explanation

The seven matrices for the $R = C = 2$ case are:

```
11
11

11
10

11
01

10
11

01
11

01
10

10
01
```