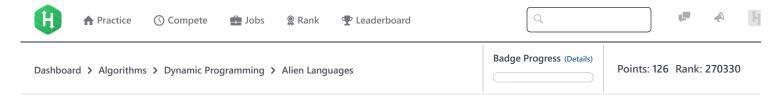
16/11/2017 HackerRank



# Alien Languages



Problem
---------

Sophia has discovered several alien languages. Suprisingly, all of these languages have an alphabet, and each of them may contain thousands of characters! Also, all the words in a language have the same number of characters in it.

However, the aliens like their words to be aesthetically pleasing, which for them means that for the  $i^{th}$  letter of an n-letter alphabet (letters are indexed  $1 \dots n$ ):

- if 2i > n, then the  $i^{ ext{th}}$  letter may be the last letter of a word, or it may be immediately followed by any letter, including itself.
- if  $2i \le n$ , then the  $i^{ ext{th}}$  letter can not be the last letter of a word and also can only be immediately followed by  $j^{ ext{th}}$  letter if and only if  $j \ge 2i$ .

Sophia wants to know how many different words exist in this language. Since the result may be large, she wants to know this number, modulo **100000007**.

## **Input Format**

The first line contains *t*, the number of test cases. The first line is followed by *t* lines, each line denoting a test case. Each test case will have two space-separated integers *n*, *m* which denote the number of letters in the language and the length of words in this language respectively.

#### **Constraints**

- $1 \le t \le 5$
- $1 \le n \le 10^5$
- $1 \le m \le 5 \cdot 10^5$

#### **Output Format**

For each test case, output the number of possible words modulo 100000007.

#### Sample Input

- 3
- 3
  3
- 3 3

### **Sample Output**

- 1 3
- 6

## **Explanation**

For the first test case, there's one letter ('a') and all the words consist of  $\bf 3$  letters. There's only one possibility which is "aaa".

For the second test case, there are two letters ('a' and 'b') and all the words are of 3 letters. The possible strings are "abb", "bab", & "bbb". The words can end only with 'b' because  $2 \cdot index(b) = 2 \cdot 2 > 2$  and for 'a', it's  $2 \cdot index(a) = 2 \cdot 1 \le 2$ . "aab" is not allowed because 'a' can not be followed

16/11/2017 HackerRank

immediately by 'a'. For a word of length 4 and alphabet of size 2, "abab" would be allowed.

For the third test case, there are three letters ('a', 'b' and 'c') and all of the words are 2 letters. The words can only end with 'b' or 'c'. The possible words are "ab", "ac", "bb", "cc", "bc", "cb".

f in Submissions:<u>558</u> Max Score:60 Difficulty: Hard Rate This Challenge: なななななな



<u>1 Upload Code as File</u> ☐ Test against custom input ☐ Run Code ☐ Submit Code

Join us on IRC at #hackerrank on freenode for hugs or bugs.

Contest Calendar | Blog | Scoring | Environment | FAQ | About Us | Support | Careers | Terms Of Service | Privacy Policy | Request a Feature