Jumping Jack: Prime Hole

locked

Problem Submissions

Time Limit: $C/C++$ $(1s)$, $Java$ $(2s)$
Memory Limit: $512MB$

Jumping Jack is an interesting but fairly simple game. There is a character named Jack who has to cross a special path. There is N number of bricks put one after another into the path, where the length of each brick is 1 unit. The bricks are of two types, good and bad bricks. When Jack crosses the path, if he steps on a bad brick, it immediately breaks and he falls down. So, in order to cross the path he has to jump over bad bricks and step only on the good bricks.

Jack can jump at most M bricks. That means if he stands on a brick x, he can jump to brick $x+1, x+2, \ldots, x+M$. Look at an example path: $<==--==->$. Here, $(=)$ represents a good brick and $(-)$ represents a bad brick. Consider both start $(<)$ and end $(>)$ points are good bricks but ignore them from the path as they are always fixed. So the length of the path is 8. Jack starts jumping from the start point $(<)$, steps on good bricks $(=)$ until he reaches to the end $(>)$ point. Jack can cross this path only if his jumping limit is at least 3.

A hole in the path is defined by a consecutive number of bad bricks. In the above example, there are three holes in the path of sizes 1, 2, and 1. To make the path even more interesting it is decided that the size of each hole will a prime number. We call such an interesting path a prime path. Since 1 is not a prime number, the example path $<==-==->$ is not a prime path. Also, note that a path with no hole in it is also considered a prime path. $<===>$, $<=---=>$, $<=---==->$ are some examples of prime path, where $<=-=>$, $<=--------==>$, $<=---=-->$ are not prime paths.

Given the length of the path N and the jumping limit of Jack M, how many different prime paths can we design so that Jack can always cross the path? Two paths are different if their combination of bricks is different. Since the answer can be very large, find it modulo 10^9+7.

Input Format

Input starts with an integer T, denoting the number of test cases. Then T testcases follow.

Each case starts with 2 integers N, M denoting the length of the path and Jack's jumping limit.

Constraints

$1 \leq T \leq 100$

$1 \leq N, M \leq 5000$

Output Format

For each case, print the number of different prime paths modulo 10^9+7 in a separate line.

Sample Input 0

```
2
4 3
5 4
```

Sample Output 0

```
4
9
```

Explanation 0

<====>, < −− ==>, <= −− =>, and <== −− > are the **4** prime paths for case **1**.

Submissions: 174
Max Score: 1

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C

```c
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <stdlib.h>

int main() {

    /* Enter your code here. Read input from STDIN. Print output to STDOUT */
    return 0;
}
```

Line: 1 Col: 1

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