Recursion: Davis' Staircase ☆

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Problem	Submissions	Leaderboard	Editorial 🔒

Davis has a number of staircases in his house and he likes to climb each staircase 1, 2, or 3 steps at a time. Being a very precocious child, he wonders how many ways there are to reach the top of the staircase.

Given the respective heights for each of the s staircases in his house, find and print the number of ways he can climb each staircase, module $10^{10} + 7$ on a new line.

For example, there is $s = 1$ staircase in the house that is $n = 5$ steps high. Davis can step on the following sequences of steps:

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

There are 13 possible ways he can take these 5 steps. $13 \% 10000000007 = 13$.

Function Description

Complete the stepPerms function in the editor below. It should recursively calculate and return the integer number of ways Davis can climb the staircase, modulo 10000000007.

stepPerms has the following parameter(s):

- n: an integer, the number of stairs in the staircase

Input Format

The first line contains a single integer, s, the number of staircases in his house.

Each of the following s lines contains a single integer, n, the height of staircase i.

Constraints

- $1 \leq s \leq 5$
- $1 \leq n \leq 36$

Subtasks

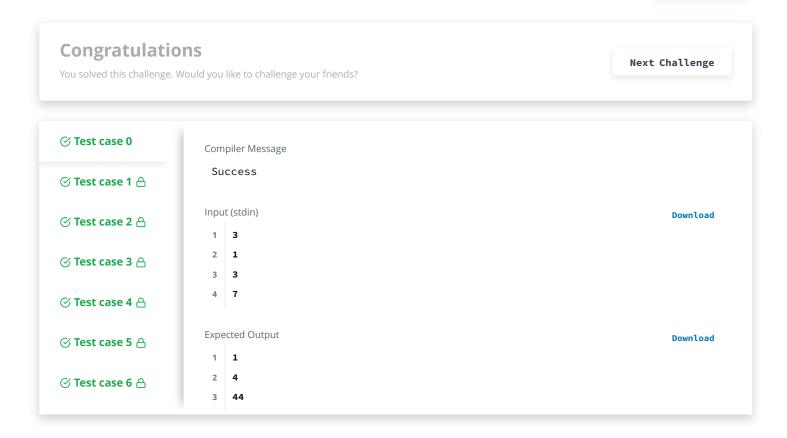- $1 \leq n \leq 20$ for 50% of the maximum score.

Output Format

For each staircase, return the number of ways Davis can climb it as an integer.

Sample Input

```
3
1
3
7
```

Sample Output

```
1
4
44
```

Explanation

Let's calculate the number of ways of climbing the first two of the Davis' $s = 3$ staircases:

1. The first staircase only has $n = 1$ step, so there is only one way for him to climb it (i.e., by jumping 1 step). Thus, we print 1 on a new line.

2. The second staircase has $n = 3$ steps and he can climb it in any of the four following ways:
   1. $1 \rightarrow 1 \rightarrow 1$
   2. $1 \rightarrow 2$
   3. $2 \rightarrow 1$
   4. 3

Thus, we print 4 on a new line.

Change Theme   C++

```cpp
1    #include <bits/stdc++.h>
2
3    using namespace std;
4    // Complete the stepPerms function below.
5    int stepPerms(int n) {
6        /*if(n==3)    // not able to resolve issue with recursion (TLE 3 cases)
7         return n+1;
8        if(n<=2)
9            return n;
10       if(n<=0)
11           return 0;
12
13       return stepPerms(n-1) + stepPerms(n-2) + stepPerms(n-3);*/
14       int res[n + 1];
15       res[0] = 1;
16       res[1] = 1;
17       res[2] = 2;
18       for (int i = 3; i <= n; i++)
19           res[i] = res[i - 1] + res[i - 2]
20                   + res[i - 3];
21
22       return res[n];
23   }
24
25   int main()
26   {
27       ofstream fout(getenv("OUTPUT_PATH"));
28
29       int s;
```

Line: 6 Col: 74

⬆ Upload Code as File   ☐ Test against custom input   Run Code   Submit Co...

Congratulations

You solved this challenge. Would you like to challenge your friends?

Next Challenge

⊘ **Test case 0**

⊘ **Test case 1** 🔒

⊘ **Test case 2** 🔒

⊘ **Test case 3** 🔒

⊘ **Test case 4** 🔒

⊘ **Test case 5** 🔒

⊘ **Test case 6** 🔒

Compiler Message

Success

Input (stdin)   Download

1	**3**
2	**1**
3	**3**
4	**7**

Expected Output   Download

1	**1**
2	**4**
3	**44**

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