[CS 11] Prac 10k – Pinoy Party

Problem Statement

A staple in a Filipino birthday party is the hotdog-and-marshmallow-on-sticks-on-cabbage thingy. These are delicious!

IMAGE LINK

However, such a basic setup is not enough for your birthday party. Your party is a *combinatorics* party!

So it got you thinking. Surely there are other, better arrangements of hotdogs and marshmallows, other than the above? So you set out to explore other arrangements.

Suppose we model the stick as having n "spots". A marshmallow occupies one spot, while a hotdog occupies three spots. Furthermore, assume that there are two colors of marshmallows: yellow and pink.

Here are some possible arrangements for $n = 8$:

IMAGE LINK

Of these, the last two are not counted—it makes sense to only consider arrangements with at least one hotdog and at least one marshmallow.

How many ways are there to arrange hotdogs and marshmallows assuming there are n spots, and assuming it has at least one hotdog and at least one marshmallow?

The answer can be very large, so please output it modulo $1{,}000{,}000{,}007$.

Submit solution [CS 11] Practice 10

Points: 225 (partial)
Time limit: 3.0s
Memory limit: 1G

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Problem type

Allowed languages ~~NONE~~, py3

Task Details

Your task is to implement a function called `num_sticks`. This function has a single argument, the `int` n.

The function must return an `int` denoting the number of ways to arrange hotdogs and marshmallows assuming there are n spots, and assuming it has at least one hotdog and at least one marshmallow, modulo $1{,}000{,}000{,}007$.

Restrictions

(See 10a for more restrictions)

For this problem in particular:

- The following symbols are allowed: `map`, `filter`.
- The following import is allowed: `cache` and `lru_cache` from `functools`.
- The source code limit is 1000.

Example Calls

Example 1 Function Call

```
num_sticks(5)
```

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Example 1 Return Value

```
12
```

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Example 1 Explanation

Here are all the possible arrangements for $n = 5$:

IMAGE LINK

Example 2 Function Call

```
num_sticks(6)
```

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Example 2 Return Value

```
32
```

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Constraints

- The function `num_sticks` will be called at most 100 times.
- $1 \le n \le 10^{15}$

Scoring

- You get 90 ❤️ points if you solve all test cases where:
  - $n \le 22$
- You get 60 ❤️ points if you solve all test cases where:
  - $n \le 300$
- You get 40 💔 points if you solve all test cases where:
  - $n \le 10^6$
- You get 35 💔 points if you solve all test cases.

Clarifications

Report an issue

No clarifications have been made at this time.