[CS 11 25.1] Mock HOPE 2f – Tail and Cycle

Cheatsheet is available here: https://oj.dcs.upd.edu.ph/cs11cheatsheet/

Problem Statement

There is a function f that transforms each of the integers 0 to $n-1$ to some integer between 0 to $n-1$.

You are given an integer s between 0 and $n-1$ inclusive. Consider the infinite sequence

$$s, f(s), f(f(s)), f(f(f(s))), \cdots$$

It can be shown that there is a point where this sequence starts looping. We call this loopy part the *cycle*, and we call the part that comes before the cycle the *tail*.

Can you identify the tail and cycle of the sequence above?

Task Details

Your task is to implement a function named `tail_and_cycle`, which should have the following *signature*:

```
def tail_and_cycle(f, s):
```

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The above says that it has two arguments f and s.

- f is represented as a tuple of n integers, where if the i^{th} integer (0-indexed) is j, that means that $f(i) = j$.
- s is an integer denoting the starting point of the sequence.

The function must return a pair (`tuple` of length 2) of lists denoting the tail and cycle of the sequence, respectively.

Restrictions

- The following symbols can be used:
  - `list`, `set`, `dict`, `enumerate`, `append`, `pop`, `extend`, `remove`, `sort`, `sorted`, `insert`, `clear`, `reverse`.
- `while` loops are allowed.
- `for` loops are *disallowed*.
- Generators and comprehensions are *disallowed*.
- Recursion is *disallowed*.
- Your source code must have at most 550 bytes.

Examples

Example 1 Function Call

```
tail_and_cycle((2, 3, 1, 0), 1)
```

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Example 1 Return Value

```
([], [1, 3, 0, 2])
```

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Example 1 Explanation

The sequence is
$1 \to 3 \to 0 \to 2 \to 1 \to 3 \to 0 \to 2 \to 1 \to 3 \to 0 \to 2 \to 1 \to \cdots$

Example 2 Function Call

```
tail_and_cycle((2, 2, 1, 5, 0, 3), 0)
```

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Example 2 Return Value

```
([0], [2, 1])
```

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Example 2 Explanation

The sequence is $0 \to 2 \to 1 \to 2 \to 1 \to 2 \to 1 \to 2 \to 1 \to \cdots$

Constraints

- The function `tail_and_cycle` will be called at most $70{,}000$ times.
- $1 \le n \le 350{,}000$
- The sum of n across all calls to `tail_and_cycle` will be $\le 350{,}000$.
- Each integer in the tuple that represents f is between 0 and $n-1$, inclusive.
- $0 \le s \le n-1$

Scoring

Note: New tests may be added and all submissions may be rejudged at a later time. (All future tests will satisfy the constraints.)

- You get 25 ❤️ points if you solve all test cases where:
  - All elements in the tuple that represents f are pairwise distinct.
- You get 100 🔴 points if you solve all test cases.

Clarifications

Report an issue

No clarifications have been made at this time.