National University of Singapore
School of Computing
TT1003: Programming Methodology Clinic
Semester II, 2024/2025

Clinic 1
Problem Solving with Python

Background

The focus of Clinic Session 1 is to reinforce a structured problem-solving approach while ensuring students gain a solid grasp of Python syntax. The session is designed to help students think critically about problems and apply a step-by-step framework to formulate and implement solutions effectively.

Problem Statement: Sorting a Deck for a Magic Trick

You are given a 9-digit positive integer E, where E consists of exactly one of each digit from 1 to 9 in some arbitrary order. This number represents the sequence $v_1, v_2, \ldots, v_9$, which specifies the order in which the cards should be revealed in a magic trick.

Your task is to implement the function:

```
def sort(E: int) -> int:
```

which takes E as input and returns another 9-digit integer D, representing the initial order of the deck. When performing the following operations on D, the cards must be revealed in the order specified by E:

For each value v_i in the sequence E:

1. Move the top card of the deck to the bottom v_i times.
2. Reveal and remove the top card. The revealed card must match v_i.

Constraints

- The function must manipulate E and D as **integers only**.
- You **cannot** use `str`, `list`, `tuple`, or any other non-integer type for manipulation.
- The output must be a valid 9-digit integer containing exactly one of each digit 1 to 9.

Task

Write the function `sort(E)`, which computes D, ensuring that when the described process is applied to D, the sequence E is revealed correctly.

Sample execution:

```
>>> sort(246897531)
    982135647
```

Explanation:

Starting with $D = 982135647$, applying the given process results in revealing the sequence $E = 246897531$:

- Move 9 to the bottom $\rightarrow$ 821356479
- Move 8 to the bottom $\rightarrow$ 213564798
- Reveal and remove 2 $\rightarrow$ 13564798
- Move 1, 3, 5, 6 to bottom, remove 4 $\rightarrow$ 7981356
- Move 7, 9, 8, 1, 3, 5 to bottom, remove 6 $\rightarrow$ 798135
- Move 7, 9, 8, 1, 3, 5, 6, 7, 9 to bottom, remove 8 $\rightarrow$ 13579
- Move 1, 3, 5, 7, 9, 1, 3, 5, 7 to bottom, remove 9 $\rightarrow$ 1357
- Move 1, 3, 5, 7, 1, 3, 5 to bottom, remove 7 $\rightarrow$ 135
- Move 1, 3, 5, 1, 3 to bottom, remove 5 $\rightarrow$ 13
- Move 1, 3, 1 to bottom, remove 3 $\rightarrow$ 1
- Remove 1 $\rightarrow$ Done

Solutions:

```
def sort(E):
    # fill in the code here
```

Acknowledgement

The problem is designed by Dr. Daren LER (dler@comp.nus.edu.sg) and worksheet is prepared by TA Hor Zhu Ming on the behalf of the TT1003 teaching team.