Data Structures

Queue Homework 3

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Teaching, Training and Coaching since more than a decade!

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Problem #1: Queue using 2 Stacks: **O(1)** **enqueue**

- Implement Queue functionalities using 2 stack objects
- However, the **enqueue**() function must remain O(1)

```
qu = Queue()

for i in range(1, 5):
    qu.enqueue(i)

while not qu.empty():
    print(qu.dequeue(), end = ' ')
# 1 2 3 4
```

```
class Queue:
    def __init__(self):
        self.stk1, self.stk2 = Stack(), Stack()
```

Problem #2: Circular Queue

- In the lecture, we found how the **added_elements** variable makes our code **easier to code and understand**
  - It's easier to detect empty/full queues.
    Recall how rear=front can be for both full and empty queues
  - Printing the queue is easy
- To realize the effect of your **design choices**, develop the code without added_elements
  - You need to make a simple and critical decision to help figure out empty/full cases
  - Make the necessary changes for the remainder of the code
- Testing
  - Use the **exact main() body** from the lecture code. Don’t change it

Problem #3: Sum of last K numbers (stream)

- This class receives a **infinite stream** of numbers, each time returning the sum of the last **k numbers**
- E.g. if k = 4
  - Stream: 1 2 3 **4** 5 6 7 8 9 ….
  - Returns: 1, 1+2, 1+2+3, **1+2+3+4**, 2+3+4+5, 3+4+5+6, ..
    - That is for 6 ⇒ 18
- Develop next() in O(k)

```
class LastKNumberSumStream:
    def __init__(self, k):
        self.k = k
        # ToDo

    def next(self, new_num):
        # Compute and return sum of last K numbers sent so far
        return ... # ToDo
```

```python
if __name__ == '__main__':
    processor = LastKNumberSumStream(4)

    while True:
        num = int(input())
        print('Sum of last K numbers', processor.next(num))
```

mainpy

```
/home/moustafa/system-installs1/anaconda3/envs/pyt/bin/python /
1
Sum of last K numbers 1
2
Sum of last K numbers 3
3
Sum of last K numbers 6
4
Sum of last K numbers 10
5
Sum of last K numbers 14
6
Sum of last K numbers 18
7
Sum of last K numbers 22
8
Sum of last K numbers 26
```

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."