Stacks and Queues: Advanced Questions

🔥 1. Largest Rectangle in Histogram

Description: Given an array representing histogram bar heights, find the area of the largest rectangle.

Input:

heights = [2, 1, 5, 6, 2, 3]

Output:

10

🔥 2. Remove K Digits

Description: Given a number as a string and an integer k, remove k digits to make the smallest possible number.

Input:

num = "1432219"
k = 3

Output:

"1219"

🔥 3. Stock Span Problem

Description: For each day, calculate the number of consecutive days before it (including itself) the stock price was less than or equal.

Input:

prices = [100, 80, 60, 70, 60, 75, 85]

Output:

[1, 1, 1, 2, 1, 4, 6]

🔥 4. Remove All Adjacent Duplicates in String K

Description: Given a string and an integer k, remove k adjacent duplicate characters.

Input:

s = "deeedbbcccbdaa"
k = 3

Output:

"aa"

🔥 5. Decode String

Description: Decode an encoded string with nested patterns like `3[a2[c]] → accaccacc`.

Input:

s = "3[a2[c]]"

Output:

"accaccacc"

🔥 6. Basic Calculator (with parentheses)

Description: Implement a basic calculator to evaluate a string expression with `+`, `-`, and `()`.

Input:

s = "(1+(4+5+2)-3)+(6+8)"

Output:

23

🔥 7. Longest Valid Parentheses

Description: Given a string of (and), find the length of the longest valid (well-formed) parentheses substring.

Input:

s = "(()))())("

Output:

4

🔥 8. Implement LRU (Least Recently Used) Cache

Description: Design a data structure for an LRU cache using deque (or doubly linked list + hashmap).

Input:

```
cache = LRUCache(2)
cache.put(1, 1)
cache.put(2, 2)
print(cache.get(1))  # returns 1
cache.put(3, 3)      # evicts key 2
print(cache.get(2))  # returns -1 (not found)
```

Output:

1
-1

🔥 9. Trapping Rain Water

Description: Given n non-negative integers representing elevation, compute how much water can be trapped.

Input:

height = [0,1,0,2,1,0,1,3,2,1,2,1]

Output:

6

🔥 10. Asteroid Collision

Description: Simulate the collision of asteroids moving towards each other.

Input:

asteroids = [5, 10, -5]

Output:

[5, 10]