DATA STRUCTURE

Q1 Challenge Task (with algorithm and code)

Push ["1", "2", "3"], pop two, push "4". Which is top?

🔍 Algorithmic Steps:

1. Initialize an empty stack.
2. Push "1", "2", "3" → Stack becomes ["1", "2", "3"]
3. Pop two → Removes "3" and "2" → Stack becomes ["1"]
4. Push "4" → Stack becomes ["1", "4"]
5. Check top → Last item is "4"

Code Explanaions

```
stack = []

# Step 1: Push operations

stack.append("1")

stack.append("2")

stack.append("3")

# Step 2: Pop two

stack.pop()

stack.pop()

# Step 3: Push "4"

stack.append("4")

# Step 4: Check top
```

Reflection Question

Why does a stack represent temporary actions?

Stacks are ideal for modeling temporary actions because they follow the **Last-In, First-Out (LIFO)** principle. Here's why:

- **Undo/Redo Systems**: Temporary actions like edits or form submissions are stored in order, and the most recent one is reversed first.
- **Function Calls**: In programming, temporary contexts like function calls are stacked, and the last called function returns first.
- **Browser History**: Navigating back removes the most recent page first.
- **Short-Term Memory**: Stacks mimic how we handle transient tasks—deal with the latest first, then work backward.

Q2 Challenge Question (algorithm + explanation)

Queue vs Stack for distributing voter cards. Which is correct?

✅ Correct Structure: **Queue**

🔍 Algorithmic Reasoning:

1. **Voter card distribution** is a **first-come, first-served** process.
2. A **queue** follows **FIFO (First-In, First-Out)** — the first person to arrive gets served first.
3. A **stack** follows **LIFO (Last-In, First-Out)** — which would unfairly serve the last person first.

Code Illustration (Queue):from collections import deque

voter_queue = deque(["Voter1", "Voter2", "Voter3"])

voter_card = voter_queue.popleft() # Voter1 gets served first

Reflection Question

Why does FIFO ensure fairness in elections?

FIFO (First-In, First-Out) ensures fairness because:

- **Equal Opportunity**: Every voter is served in the order they arrive, preventing bias or favoritism.
- **Transparency**: The process is predictable and visible, reducing suspicion or manipulation.
- **Efficiency**: It avoids chaos and crowding, maintaining orderly service.
- **Trust**: Voters feel respected and valued when their time is honored.

In democratic systems, fairness is foundational — and FIFO helps uphold that principle by treating every participant with equal priority