# Data structure exercises III

# Project 96

# 1.STACK QUESTION

## Challenge Task (Algorithmic + Explanation)

Push ["X", "Y", "Z"], pop all. Which is left?

🔍 Algorithm Steps:

1. **Initialize an empty stack**
2. **Push "X", "Y", "Z"** → Stack becomes: ["X", "Y", "Z"]
3. **Pop all elements** → Remove "Z", then "Y", then "X"
4. **Check stack** → It should be empty

Code Explanations:

```
stack = []

# Push operations

stack.append("X")

stack.append("Y") stack.append("Z")

# Pop all

stack.pop()

stack.pop()

stack.pop()

# Check what's left print("Stack after popping all:", stack)
```

**This is output:** Stack after popping all: []

## Reflection Question

### Why is a stack considered temporary storage of actions?

Stacks are ideal for temporary storage because they follow the **Last-In, First-Out (LIFO)** principle. This means the most recent action is the first to be undone or retrieved.

☐ **Undo operations:** Applications like text editors or form systems use stacks to track recent actions. When you press "Undo," the last action is reversed.

## 2. QUEUE QUESTIONS

**Challenge Question: Queue vs Stack for Cafeteria Services**
☐ A cafeteria should serve people in the order they arrive.

- **Queue** uses FIFO: first in, first out — ensuring fairness.
- **Stack** uses LIFO: last in, first out — unfair for early arrivals.
- Therefore, **queue** is the correct structure for cafeteria service.

## Code Explanation:

```
from collections import deque

# Queue for cafeteria

cafeteria_queue = deque()

# People arrive

cafeteria_queue.append("Alice")

cafeteria_queue.append("Bob")

cafeteria_queue.append("Charlie")

# Serve in FIFO order

served = cafeteria_queue.popleft()

print("First served:", served)
```

**Explanation**:

- Alice arrives first → gets served first.
- Queue ensures fairness and order.

## Reflection Question: Why FIFO Ensures Fairness in Food Service?

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

- ➤ **Respects arrival time**: The first person to arrive is the first to be served.
- ➤ **Prevents bias**: No one can skip ahead arbitrarily.
- ➤ **Reduces frustration**: Everyone knows their turn will come in order.

➢ **Mimics real-world norms**: From banks to hospitals, FIFO is the standard for equitable service.