# DSA Lab: 09

**Department of Computer Science**

**Iqra University Islamabad**

# DSA

**Maqsood Ahmed**

**ID: 38186**

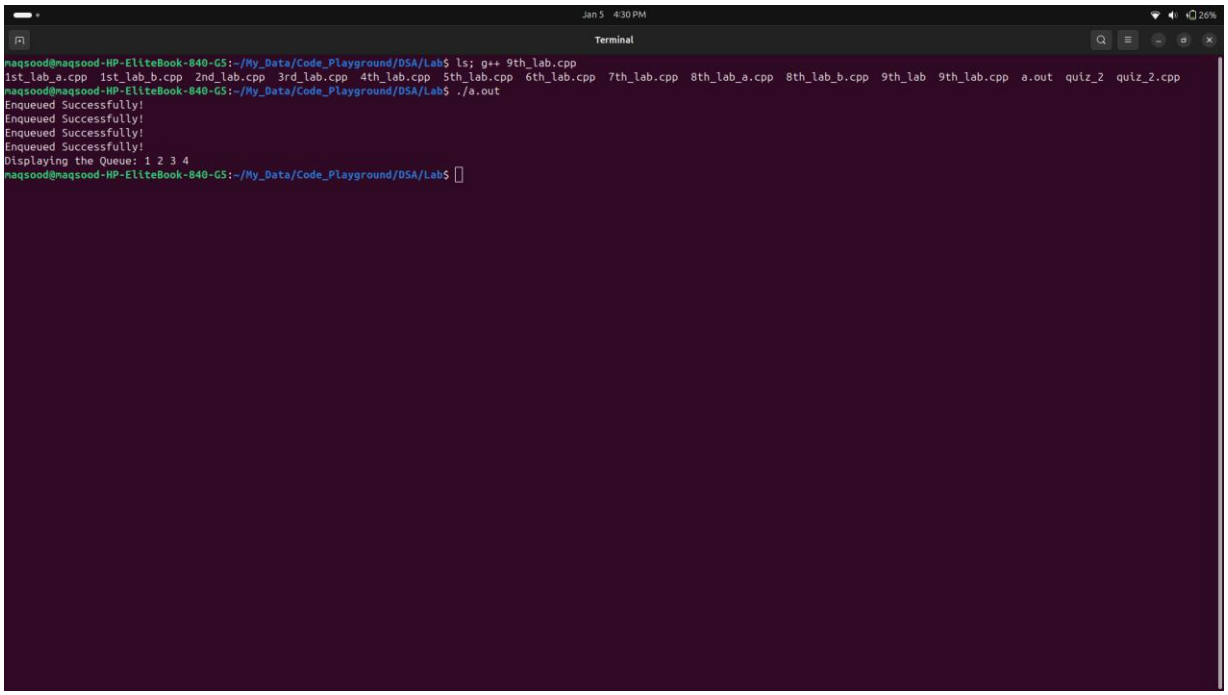
# Queue Data Structures using Arrays:

## Source Code:

```
#include <iostream>
using namespace std;

class Queue {
    private:
        int* arr;
        int front;
        int rear;
        int size;
        int itemCount;
    public:
        // Constructor
        Queue() {
            size = 100;
            arr = new int[size];
            front = rear = -1;
            itemCount = 0;
        }
        // Destructor
        ~Queue() {
            delete[] arr;
        }
        // Enqueue operation
        void enqueue(int value) {
            if(isFull()) {
                cout << "The queue is Full.\n";
                return;
            }
            if (isEmpty()) front = 0; // Ensure front is updated for the first element
            rear = (rear + 1) % size;
            arr[rear] = value;
            itemCount++;
        }
        // Dequeue operation
        int dequeue() {
            if(isEmpty()) {
                cout << "The queue is Empty!\n";
                return -1;
            }
            int result = arr[front];
            if (front == rear) { // Reset queue if it becomes empty
                makeNull();
            } else {
                front = (front + 1) % size;
                itemCount--;
            }
            return result;
```

```
    }
    // Peek operation
    int peek() {
        if(isEmpty()) {
            throw runtime_error("Queue is empty!\n");
        }
        return arr[front];
    }
    // Check if the queue is full
    bool isFull() {
        return ((rear + 1) % size) == front;
    }
    // Check if the queue is empty
    bool isEmpty() {
        return front == -1;
    }
    // Reset the queue
    void makeNull() {
        front = rear = -1;
        itemCount = 0;
    }
    // returns the total elements fo the queue
    int getSize() {
        return itemCount;
    }
};


void displayQueue(Queue &q) {
    while(!q.isEmpty()) {
        cout << q.peek() << ' ';
        q.dequeue();
    }
}

int main() {
    Queue q;
    q.enqueue(1);
    q.enqueue(2);
    q.enqueue(3);
    q.enqueue(4);

    displayQueue(q);

    return EXIT_SUCCESS;
}
```

# **OUTPUT:**




# Queue Data Structure Using Linked List:

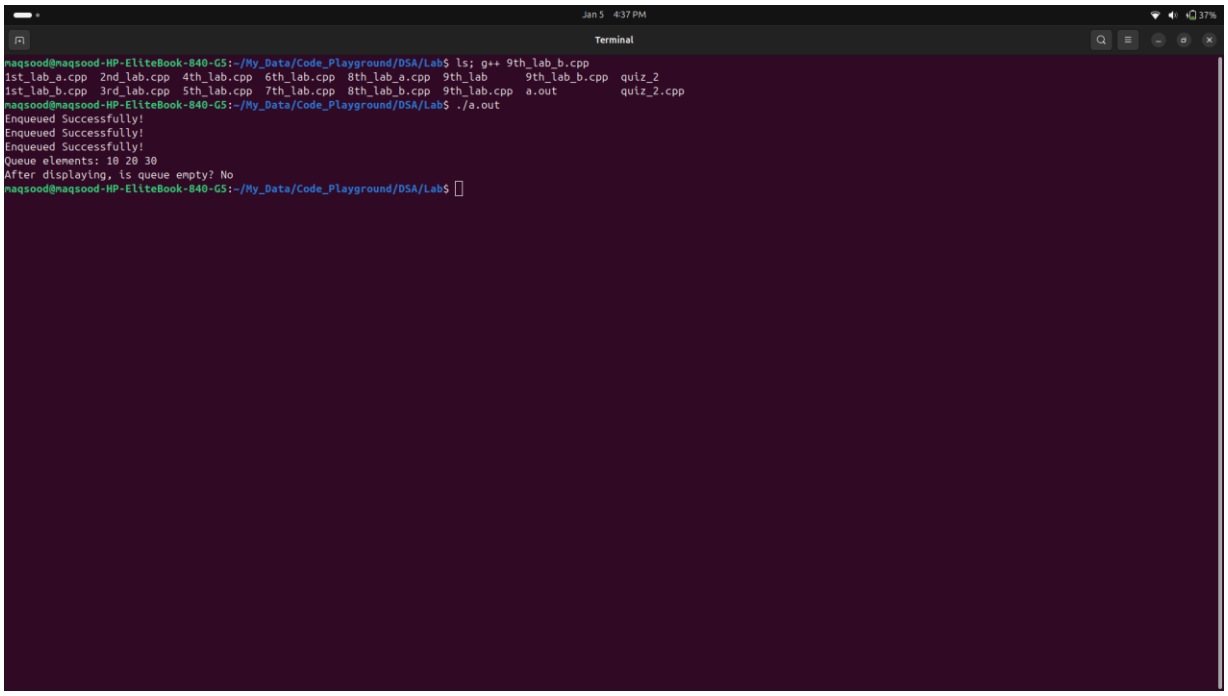
## Source Code:

```
#include <iostream>
using namespace std;

class Node {
   public:
      int data;
      Node* next;
      Node(int val) {
         this->data = val;
         this->next = NULL;
      }
};

class Queue {
   private:
      Node* front;
      Node* rear;
   public:
      Queue() : front(NULL), rear(NULL) {}

      void enqueue(int val) {
         Node* temp = new Node(val);

         if(!rear) {
            rear = temp;
            front = temp;
            cout << "Enqueued Successfully!\n";
            return;
         }
```

```
        rear->next = temp;
        rear = temp;  // Update the rear pointer
        cout << "Enqueued Successfully!\n";
    }

    void dequeue() {
        if(!front) {
            cout << "Queue is empty!\n";
            return;
        }

        Node* temp = front;
        front = front->next;
        delete temp;
        cout << "Dequeued successfully!\n";
    }

    int peek() {
        if(!front) {
            cout << "Queue is empty!\n";
            exit(0);
        }

        return front->data;
    }

    bool isEmpty() {
        return front == NULL;
    }

    // For displaying the queue without modifying it
    void display() {
        Node* temp = front;
        while(temp) {
            cout << temp->data << ' ';
            temp = temp->next;
        }
        cout << '\n';
    }
};

int main(void) {

    Queue q;
    q.enqueue(10);
    q.enqueue(20);
    q.enqueue(30);

    cout << "Queue elements: ";
    q.display(); // Display elements without dequeuing

    cout << "After displaying, is queue empty? " << (q.isEmpty() ? "Yes" : "No") << '\n';
```

```
    return EXIT_SUCCESS;
}
```

## OUTPUT:




# The End