1. Write a java program to create or to implement a stack using linked list

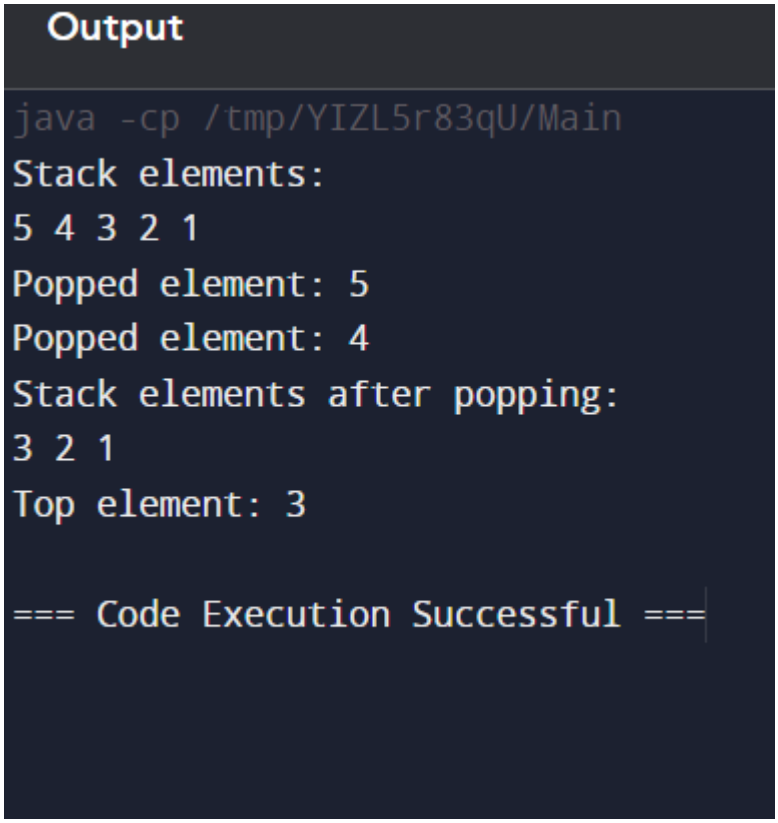
CODE:

```
class Node {
int data;
Node next;
public Node(int data) {
   this.data = data;
   this.next = null;
   }
}
class Stack {
Node top;
public Stack() {
top = null;
   }
public void push(int data) {
Node newNode = new Node(data);
if (top == null) {
top = newNode;
      }
else
{
newNode.next = top;
top = newNode;
}
}
public int pop() {
if (top == null) {
return -1;
}
```

```
int data = top.data;
top = top.next;
return data;
}
   public int peek() {
   return top == null ? -1 : top.data;
}
public boolean isEmpty() {
return top == null;
   }
public void printStack() {
Node temp = top;
while (temp != null) {
System.out.print(temp.data + " ");
temp = temp.next;
      }
System.out.println();
   }
}
public class Main {
   public static void main(String[] args) {
Stack stack = new Stack();
stack.push(1);
stack.push(2);
stack.push(3);
stack.push(4);
stack.push(5);
System.out.println("Stack elements:");
stack.printStack();
System.out.println("Popped element: " + stack.pop());
System.out.println("Popped element: " + stack.pop());
```

```
System.out.println("Stack elements after popping:");
stack.printStack();
System.out.println("Top element: " + stack.peek());
   }
}
```

OUTPUT:



2. Write a java program to create or to implement a queue using linked list

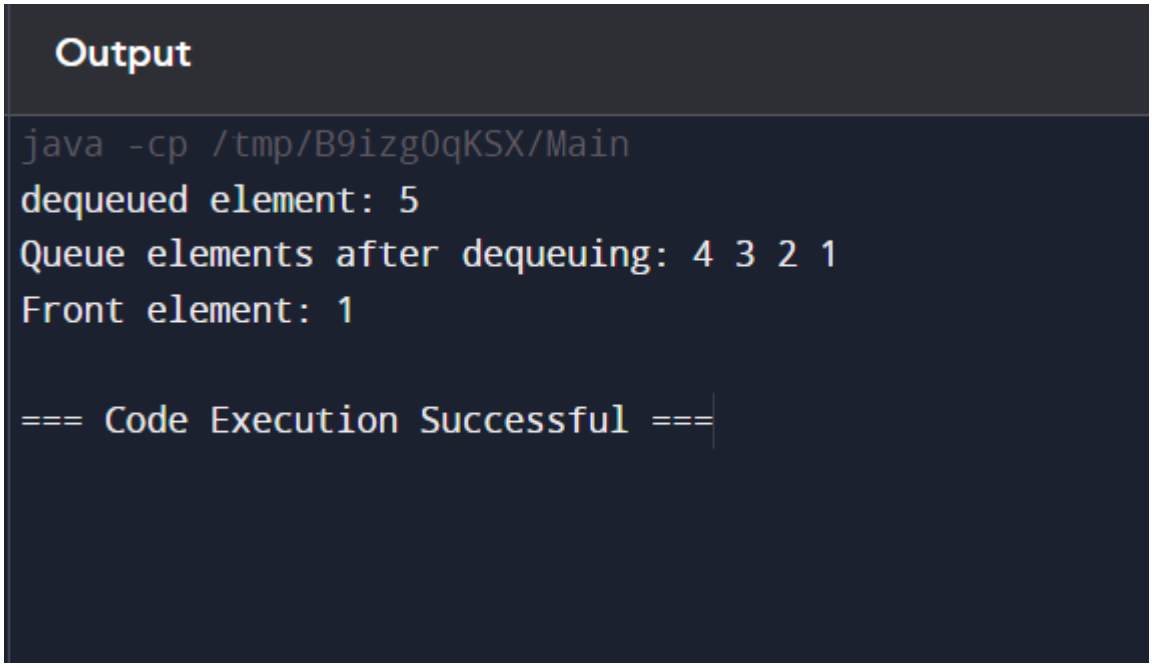
CODE:

```
class Node {
int data;
Node next;
public Node(int data) {
this.data = data;
this.next = null;
}
}
```

```
class Queue {
Node front;
Node rear;
public Queue() {
this.front = null;
this.rear = null;
}
public void enqueue(int data) {
Node newNode = new Node(data);
if (rear == null) {
front = newNode;
rear = newNode;
} else {
rear.next = newNode;
rear = newNode;
}
}
public int dequeue() {
if (front == null) {
throw new RuntimeException("Queue is empty");
}
int data = front.data;
front = front.next;
if (front == null) {
rear = null;
}
return data;
   }
public int peek() {
if (front == null) {
throw new RuntimeException("Queue is empty");
```

```
}
return front.data;
}
public boolean isEmpty() {
return front == null;
    }
}
public class Main {
public static void main(String[] args) {
Queue queue = new Queue();
queue.enqueue(5);
queue.enqueue(4);
queue.enqueue(3);
queue.enqueue(2);
queue.enqueue(1);
System.out.println("dequeued element: " + queue.dequeue());
System.out.print("Queue elements after dequeuing: ");
while (!queue.isEmpty()) {
System.out.print(queue.dequeue() + " ");
}
System.out.println();
queue.enqueue(1);
queue.enqueue(2);
queue.enqueue(3);
System.out.println("Front element: " + queue.peek());
    }
}
```

OUTPUT:



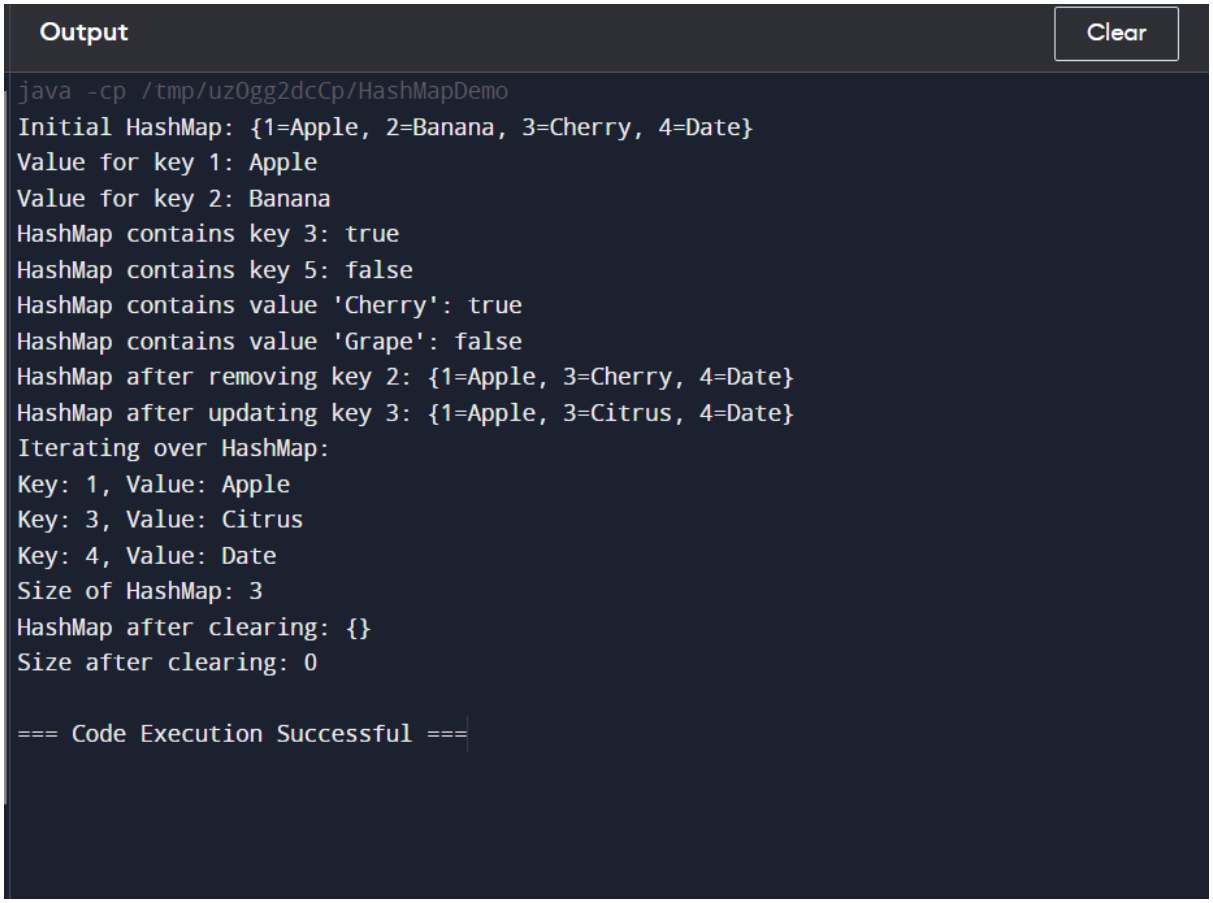
3. Hash Map

CODE:

```
import java.util.HashMap;
import java.util.Map;
public class HashMapDemo {
    public static void main(String[] args) {
        HashMap<Integer, String> map = new HashMap<>();
map.put(1, "Apple");
map.put(2, "Banana");
map.put(3, "Cherry");
map.put(4, "Date");
System.out.println("Initial HashMap: " + map);
System.out.println("Value for key 1: " + map.get(1));
System.out.println("Value for key 2: " + map.get(2));
System.out.println("HashMap contains key 3: " + map.containsKey(3));
System.out.println("HashMap contains key 5: " + map.containsKey(5));
System.out.println("HashMap contains value 'Cherry': " + map.containsValue("Cherry"));
System.out.println("HashMap contains value 'Grape': " + map.containsValue("Grape"));
```

```
map.remove(2);
System.out.println("HashMap after removing key 2: " + map);
map.put(3, "Citrus");
System.out.println("HashMap after updating key 3: " + map);
System.out.println("Iterating over HashMap:");
for (Map.Entry<Integer, String> entry : map.entrySet()) {
System.out.println("Key: " + entry.getKey() + ", Value: " + entry.getValue());
    }
System.out.println("Size of HashMap: " + map.size());
map.clear();
System.out.println("HashMap after clearing: " + map);
System.out.println("Size after clearing: " + map.size());
  }
}
```

OUTPUT:



4. Compare the students

CODE:

```
import java.util.ArrayList;
import java.util.Collections;
class Student implements Comparable<Student> {
    int rollNo;
    String name;

    Student(int rollNo, String name) {
        this.rollNo = rollNo;
        this.name = name;
    }
    public int compareTo(Student other) {
        if (this.rollNo < other.rollNo) {
            return -1;
        } else if (this.rollNo > other.rollNo) {
            return 1;
        } else {
            return 0;
        }
    }
    public String toString() {
        return "Student{rollNo=" + rollNo + ", name='" + name + "'}";
    }
}

public class Main {
    public static void main(String[] args) {
        ArrayList<Student> students = new ArrayList<>();
```

```
        students.add(new Student(3, "Alice"));
        students.add(new Student(1, "Bob"));
        students.add(new Student(2, "Charlie"));

        Collections.sort(students);

        for (Student student : students) {
            System.out.println(student);
        }
    }
}
```

OUTPUT: