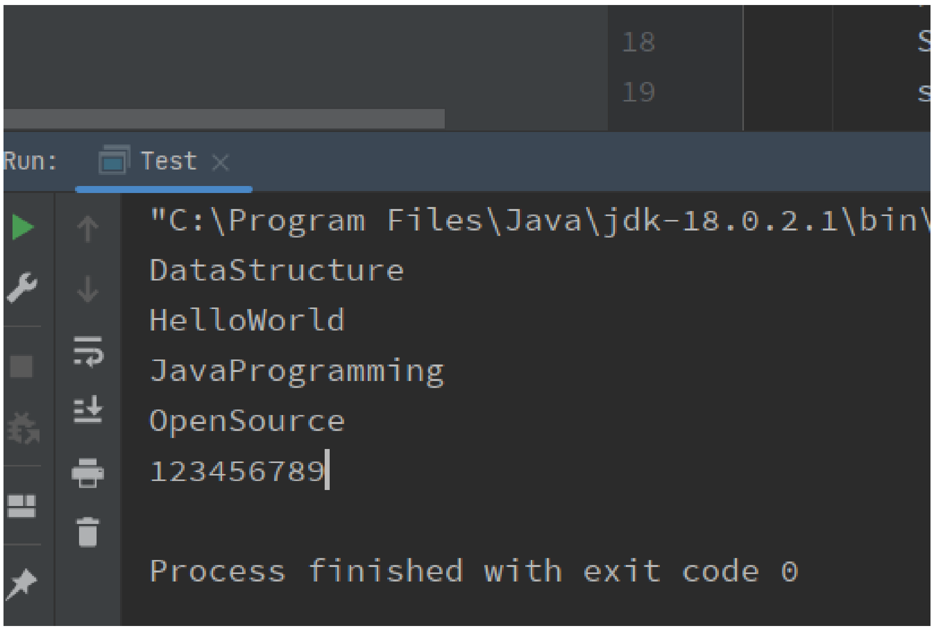
Question 01.

```
package Question01;
public class Queue {
    int front;
    int count;
    char[]  queue;
    int maxSize;
    int  rear;
    public Queue(int maxSize) {
        this.front = 0;
        this.count = 0;
        this.queue = new char[maxSize];
        this.maxSize = maxSize;
        this.rear = -1;
    }
    boolean IsQueueEmpty(){
        if (rear<front)
            return true;
        else
            return false;
    }
    boolean IsQueueFull() {
        if (rear == maxSize - 1) {
            return true;
        }
        return false;
    }
    void Append(char item) {
        if (IsQueueFull()) {
            System.out.printf("\nQueue is full\n");
        } else {
            queue[++rear] = (char) item;
            count++;
        }
    }
    char Serve() {
        if (IsQueueEmpty()) {
            System.out.printf("\nQueue is empty\n");
            return 0;
        }
        else {
            char x = queue[front++];
            count--;
            return x;
        }
    }
}
```

```
package Question01;
import java.util.Arrays;
public class StringConcator {

    String str01;
    String str02;

    public StringConcator(String str01, String str02) {
        this.str01 = str01;
        this.str02 = str02;
    }

    public String StringConcatMethod() {
        Queue q4str01 = new Queue(str01.length());
        Queue q4str02 = new Queue(str02.length());
        Queue q4all = new Queue(q4str01.maxSize + q4str02.maxSize);

        while (q4all.IsQueueEmpty()){
            char[] q1charArray =str01.toCharArray();
            char[] q2charArray =str02.toCharArray();
            for (char i : q1charArray) {
                    q4all.Append(i);
            }
            for (char i2:q2charArray) {
                q4all.Append(i2);

            }
        }
        System.out.println(q4all.queue);
        return Arrays.toString(q4all.queue);

    }
}
```

```
package Question01;

public class Test {
    public static void main(String[] args) {
        // Example 1
        StringConcator str01 = new StringConcator("Data", "Structure");
        str01.StringConcatMethod();

        // Example 2
        StringConcator str02 = new StringConcator("Hello", "World");
        str02.StringConcatMethod();

        // Example 3
        StringConcator str03 = new StringConcator("Java", "Programming");
        str03.StringConcatMethod();

        // Example 4
        StringConcator str04 = new StringConcator("Open", "Source");
        str04.StringConcatMethod();

        // Example 5
        StringConcator str05 = new StringConcator("12345", "6789");
        str05.StringConcatMethod();

    }
}
```



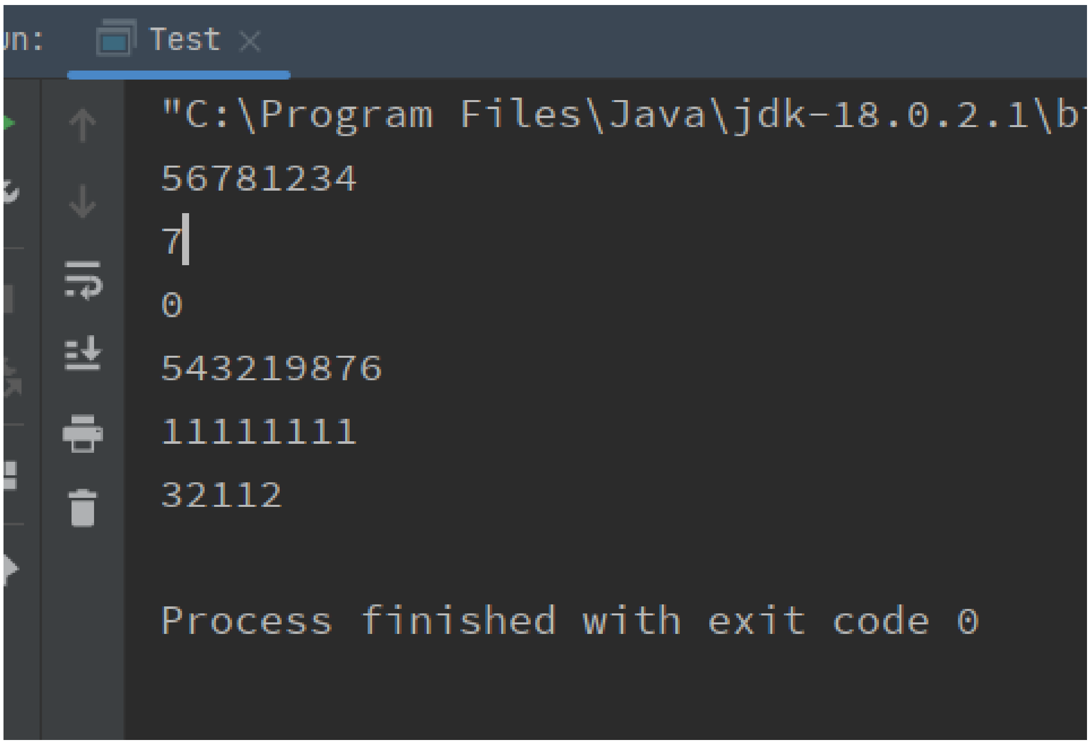
```
"C:\Program Files\Java\jdk-18.0.2.1\bin\
DataStructure
HelloWorld
JavaProgramming
OpenSource
123456789

Process finished with exit code 0
```

Question 02.

```java
package Question02;
public class Queue {
    int front;
    int count;
    char[]  queue;
    int maxSize;
    int  rear;
    public Queue(int maxSize) {
        this.front = 0;
        this.count = 0;
        this.queue = new char[maxSize];
        this.maxSize = maxSize;
        this.rear = -1;
    }
    boolean IsQueueEmpty(){
        if (rear<front)
            return true;
        else
            return false;
    }
    boolean IsQueueFull() {
        if (rear == maxSize - 1) {
            return true;
        }
        return false;
    }
    void Append(char item) {
        if (IsQueueFull()) {
            System.out.printf("\nQueue is full\n");
        } else {
            queue[++rear] = (char) item;
            count++;
        }
    }
    char Serve() {
        if (IsQueueEmpty()) {
            System.out.printf("\nQueue is empty\n");
            return 0;
        }
        else {
            char x = queue[front++];
            count--;
            return x;
        }
    }
}
```

```
package Question02;
public class NumberDevider {
    int numberSize ;
    int Number;
    int midValue;
    public NumberDevider(int number) {
        char[] digitList = Integer.toString(number).toCharArray();
        this.Number = number;
        this.numberSize = digitList.length;
        this.midValue = numberSize/2;
    }
    public int NumberDeviderMethod(){
        String Numb = Integer.toString(Number);
        char[] digitList = Numb.toCharArray();
        Queue mainQueueHoldAllNumbers = new Queue(numberSize);
        while (mainQueueHoldAllNumbers.IsQueueEmpty()) {
            for (int i = midValue; i < digitList.length; i++) {
                mainQueueHoldAllNumbers.Append(digitList[i]);
            }
            for (int i = 0; i < midValue; i++) {
                mainQueueHoldAllNumbers.Append(digitList[i]);
            }
        }
        System.out.println(mainQueueHoldAllNumbers.queue);

    return Integer.parseInt(String.valueOf(mainQueueHoldAllNumbers.queue));
    }

}
```

```
package Question02;

public class Test {
    public static void main(String[] args) {
        NumberDevider nbdev = new NumberDevider(12345678);
        nbdev.NumberDeviderMethod();
        NumberDevider nbdev2 = new NumberDevider(7);
        nbdev2.NumberDeviderMethod();
        NumberDevider nbdev3 = new NumberDevider(0);
        nbdev3.NumberDeviderMethod();
        NumberDevider nbdev5 = new NumberDevider(987654321);
        nbdev5.NumberDeviderMethod();
        NumberDevider nbdev6 = new NumberDevider(11111111);
        nbdev6.NumberDeviderMethod();
        NumberDevider nbdev7 = new NumberDevider(12321);
        nbdev7.NumberDeviderMethod();
    }
}
```



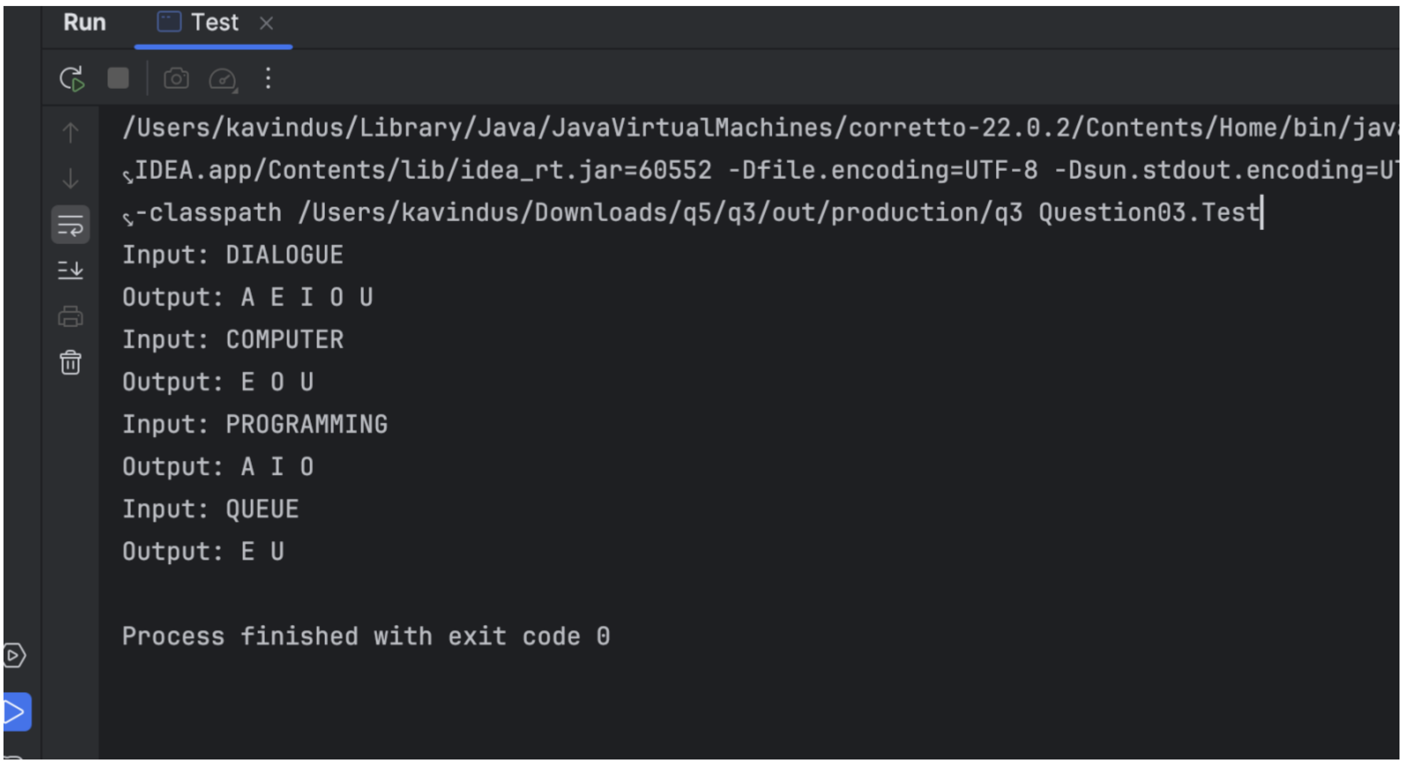
```
"C:\Program Files\Java\jdk-18.0.2.1\b
56781234
7
0
543219876
11111111
32112

Process finished with exit code 0
```

Question 03.

```
package Question03;
public class Queue {
    int front;
    int count;
    char[] queue;
    int maxSize;
    int rear;
    public Queue(int maxSize) {
        this.front = 0;
        this.count = 0;
        this.queue = new char[maxSize];
        this.maxSize = maxSize;
        this.rear = -1;
    }
    boolean IsQueueEmpty(){
        if (rear < front)
            return true;
        else
            return false;
    }
    boolean IsQueueFull() {
        if (rear == maxSize - 1) {
            return true;
        }
        return false;
    }
    void Append(char item) {
        if (IsQueueFull()) {
            System.out.printf("\nQueue is full\n");
        } else {
            queue[++rear] = (char) item;
            count++;
        }
    }
    char Serve() {
        if (IsQueueEmpty()) {
            System.out.printf("\nQueue is empty\n");
            return 0;
        }
        else {
            char x = queue[front++];
            count--;
            return x;
        }
    }
}
```

```java
package Question03;

public class VowelFinder {
    String inputString;

    public VowelFinder(String inputString) {
        this.inputString = inputString.toUpperCase();
    }

    public void findVowelsInOrder() {
        Queue resultQueue = new Queue(5);

        if (inputString.contains("A")) {
            resultQueue.Append('A');
        }

        if (inputString.contains("E")) {
            resultQueue.Append('E');
        }

        if (inputString.contains("I")) {
            resultQueue.Append('I');
        }

        if (inputString.contains("O")) {
            resultQueue.Append('O');
        }

        if (inputString.contains("U")) {
            resultQueue.Append('U');
        }

        System.out.print("Output: ");
        while (!resultQueue.IsQueueEmpty()) {
            System.out.print(resultQueue.Serve() + " ");
        }
        System.out.println();
    }

    public boolean isVowel(char c) {
        c = Character.toUpperCase(c);
        return c == 'A' || c == 'E' || c == 'I' || c == 'O' || c == 'U';
    }
}
```

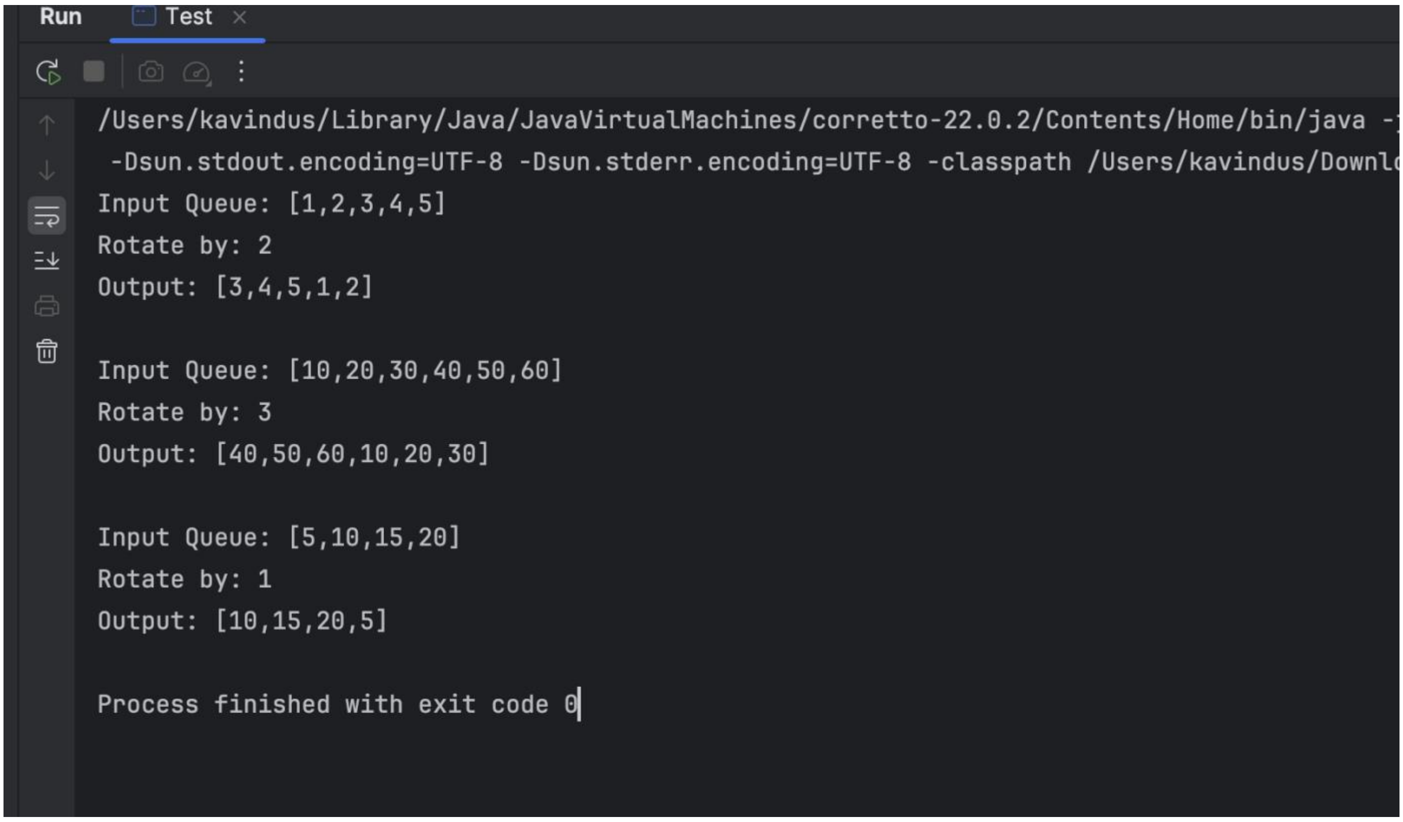
```
package Question03;

public class Test {
    public static void main(String[] args) {
        // Example 1
        VowelFinder example1 = new VowelFinder("DIALOGUE");
        System.out.println("Input: " + example1.inputString);
        example1.findVowelsInOrder();

        // Example 2
        VowelFinder example2 = new VowelFinder("COMPUTER");
        System.out.println("Input: " + example2.inputString);
        example2.findVowelsInOrder();

        // Example 3
        VowelFinder example3 = new VowelFinder("PROGRAMMING");
        System.out.println("Input: " + example3.inputString);
        example3.findVowelsInOrder();

        // Example 4
        VowelFinder example4 = new VowelFinder("QUEUE");
        System.out.println("Input: " + example4.inputString);
        example4.findVowelsInOrder();
    }
}
```



```
/Users/kavindus/Library/Java/JavaVirtualMachines/corretto-22.0.2/Contents/Home/bin/jav
IDEA.app/Contents/lib/idea_rt.jar=60552 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=U
-classpath /Users/kavindus/Downloads/q5/q3/out/production/q3 Question03.Test
Input: DIALOGUE
Output: A E I O U
Input: COMPUTER
Output: E O U
Input: PROGRAMMING
Output: A I O
Input: QUEUE
Output: E U

Process finished with exit code 0
```

Question 04.

```
package Question04;

public class Node {
    int data;
    Node next;

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



```
/Users/kavindus/Library/Java/JavaVirtualMachines/corretto-22.0.2/Contents/Home/bin/java -
 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/kavindus/Downl
Input Queue: [1,2,3,4,5]
Rotate by: 2
Output: [3,4,5,1,2]

Input Queue: [10,20,30,40,50,60]
Rotate by: 3
Output: [40,50,60,10,20,30]

Input Queue: [5,10,15,20]
Rotate by: 1
Output: [10,15,20,5]

Process finished with exit code 0
```

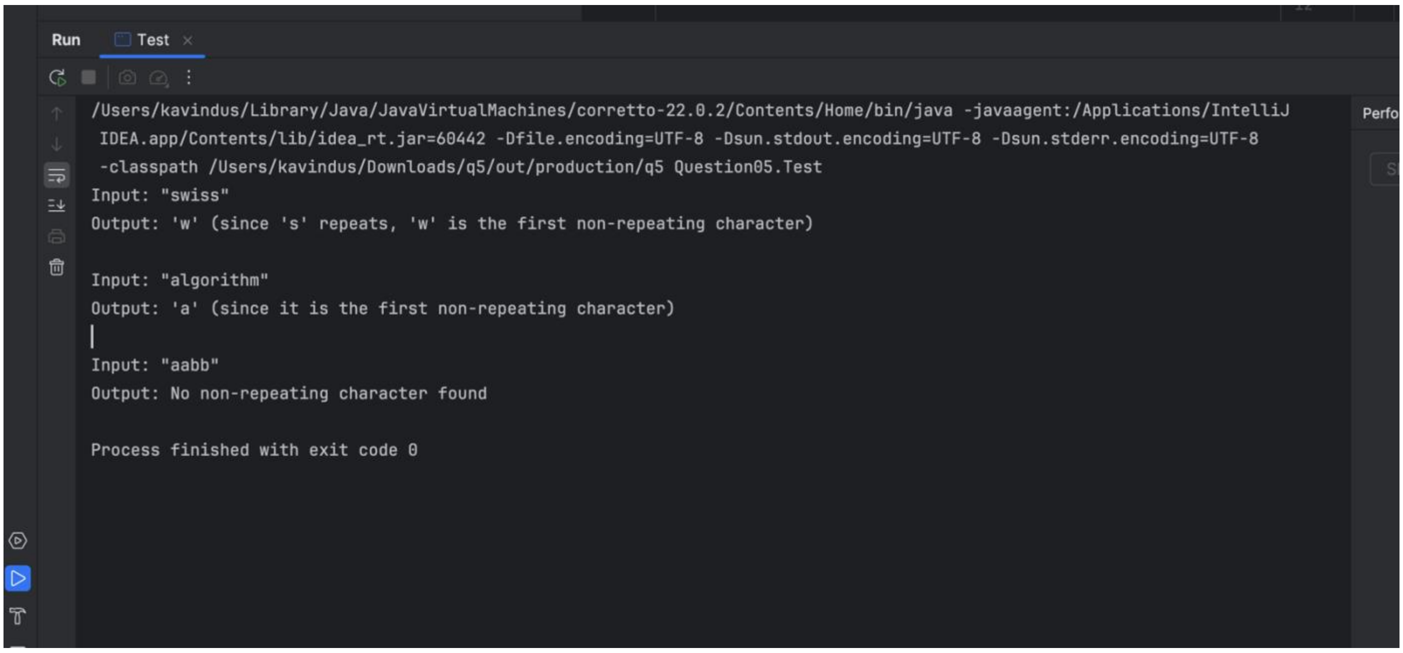
```
package Question04;

public class LinkedQueue {
    private Node front;
    private Node rear;
    private int size;

    public LinkedQueue() {
        this.front = null;
        this.rear = null;
        this.size = 0;
    }

    public boolean isEmpty() {
        return front == null;
    }

    public void enqueue(int data) {
        Node newNode = new Node(data);

        if (isEmpty()) {
            front = newNode;
        } else {
            rear.next = newNode;
        }

        rear = newNode;
        size++;
    }

    public int dequeue() {
        if (isEmpty()) {
            System.out.println("Queue is empty");
            return -1;
        }

        int data = front.data;
        front = front.next;

        if (front == null) {
            rear = null;
        }

        size--;
        return data;
    }

    public int size() {
        return size;
    }

    public void display() {
        if (isEmpty()) {
            System.out.println("[]");
            return;
        }

        StringBuilder sb = new StringBuilder("[");
        Node current = front;

        while (current != null) {
            sb.append(current.data);
            current = current.next;

            if (current != null) {
                sb.append(",");
            }
        }

        sb.append("]");
        System.out.println(sb.toString());
    }
}
```

```java
package Question04;

public class QueueRotator {
    LinkedQueue queue;
    int rotateBy;

    public QueueRotator(int[] elements, int rotateBy) {
        this.queue = new LinkedQueue();
        this.rotateBy = rotateBy;


        for (int element : elements) {
            queue.enqueue(element);
        }
    }

    public void rotate() {
        if (queue.isEmpty() || rotateBy <= 0 || rotateBy % queue.size() == 0) {
            return;
        }
        rotateBy = rotateBy % queue.size();
        for (int i = 0; i < rotateBy; i++) {
            int temp = queue.dequeue();
            queue.enqueue(temp);
        }
    }

    public void displayQueue() {
        queue.display();
    }
}
```

```java
package Question04;

public class Test {
    public static void main(String[] args) {
        // Example 1
        int[] elements1 = {1, 2, 3, 4, 5};
        QueueRotator rotator1 = new QueueRotator(elements1, 2);
        System.out.print("Input Queue: ");
        rotator1.displayQueue();
        System.out.print("Rotate by: 2\nOutput: ");
        rotator1.rotate();
        rotator1.displayQueue();
        System.out.println();

        // Example 2
        int[] elements2 = {10, 20, 30, 40, 50, 60};
        QueueRotator rotator2 = new QueueRotator(elements2, 3);
        System.out.print("Input Queue: ");
        rotator2.displayQueue();
        System.out.print("Rotate by: 3\nOutput: ");
        rotator2.rotate();
        rotator2.displayQueue();
        System.out.println();

        // Example 3
        int[] elements3 = {5, 10, 15, 20};
        QueueRotator rotator3 = new QueueRotator(elements3, 1);
        System.out.print("Input Queue: ");
        rotator3.displayQueue();
        System.out.print("Rotate by: 1\nOutput: ");
        rotator3.rotate();
        rotator3.displayQueue();
    }
}
```

Question 05.

```
package Question05;

public class CharNode {
    char data;
    CharNode next;

    public CharNode(char data) {
        this.data = data;
        this.next = null;
    }
}
```



```
/Users/kavindus/Library/Java/JavaVirtualMachines/corretto-22.0.2/Contents/Home/bin/java -javaagent:/Applications/IntelliJ
 IDEA.app/Contents/lib/idea_rt.jar=60442 -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8
 -classpath /Users/kavindus/Downloads/q5/out/production/q5 Question05.Test
Input: "swiss"
Output: 'w' (since 's' repeats, 'w' is the first non-repeating character)

Input: "algorithm"
Output: 'a' (since it is the first non-repeating character)

Input: "aabb"
Output: No non-repeating character found

Process finished with exit code 0
```

```java
package Question05;

public class LinkedCharQueue {
    private CharNode front;
    private CharNode rear;

    public LinkedCharQueue() {
        this.front = null;
        this.rear = null;
    }

    public boolean isEmpty() {
        return front == null;
    }

    public void enqueue(char data) {
        CharNode newNode = new CharNode(data);

        if (isEmpty()) {
            front = newNode;
        } else {
            rear.next = newNode;
        }

        rear = newNode;
    }

    public char dequeue() {
        if (isEmpty()) {
            System.out.println("Queue is empty");
            return '\0';
        }

        char data = front.data;
        front = front.next;

        if (front == null) {
            rear = null;
        }

        return data;
    }
    public char peek() {
        if (isEmpty()) {
            System.out.println("Queue is empty");
            return '\0';
        }

        return front.data;
    }

    public void remove(char c) {
        if (isEmpty()) {
            return;
        }

        if (front.data == c) {
            front = front.next;

            if (front == null) {
                rear = null;
            }

            return;
        }


        CharNode current = front;
        CharNode prev = null;

        while (current != null && current.data != c) {
            prev = current;
            current = current.next;
        }


        if (current != null) {
            prev.next = current.next;

            if (current == rear) {
                rear = prev;
            }
        }
    }
}
```

```
package Question05;

public class NonRepeatingCharFinder {
    String inputString;

    public NonRepeatingCharFinder(String inputString) {
        this.inputString = inputString;
    }

    public char findFirstNonRepeating() {
        LinkedCharQueue queue = new LinkedCharQueue();
        int[] charCount = new int[256];
        for (int i = 0; i < inputString.length(); i++) {
            char c = inputString.charAt(i);
            charCount[c]++;
            if (charCount[c] == 1) {
                queue.enqueue(c);
            }
            else if (charCount[c] == 2) {
                queue.remove(c);
            }
        }


        if (!queue.isEmpty()) {
            return queue.peek();
        }

        return '\0';
    }
}
```

```
package Question05;

public class Test {
    public static void main(String[] args) {
        // Example 1
        NonRepeatingCharFinder finder1 = new NonRepeatingCharFinder("swiss");
        char result1 = finder1.findFirstNonRepeating();
        System.out.println("Input: \"" + finder1.inputString + "\"");
        System.out.println("Output: '" + result1 + "' (since 's' repeats, '" +
result1 + "' is the first non-repeating character)");
        System.out.println();

        // Example 2
        NonRepeatingCharFinder finder2 = new
NonRepeatingCharFinder("algorithm");
        char result2 = finder2.findFirstNonRepeating();
        System.out.println("Input: \"" + finder2.inputString + "\"");
        System.out.println("Output: '" + result2 + "' (since it is the first
non-repeating character)");
        System.out.println();

        // Example 3
        NonRepeatingCharFinder finder3 = new NonRepeatingCharFinder("aabb");
        char result3 = finder3.findFirstNonRepeating();
        System.out.println("Input: \"" + finder3.inputString + "\"");
        if (result3 == '\0') {
            System.out.println("Output: No non-repeating character found");
        } else {
            System.out.println("Output: '" + result3 + "' (since it is the
first non-repeating character)");
        }
    }
}
```