




SEPTEMBER 29, 2024

DSA LAB 05 SOLUTION

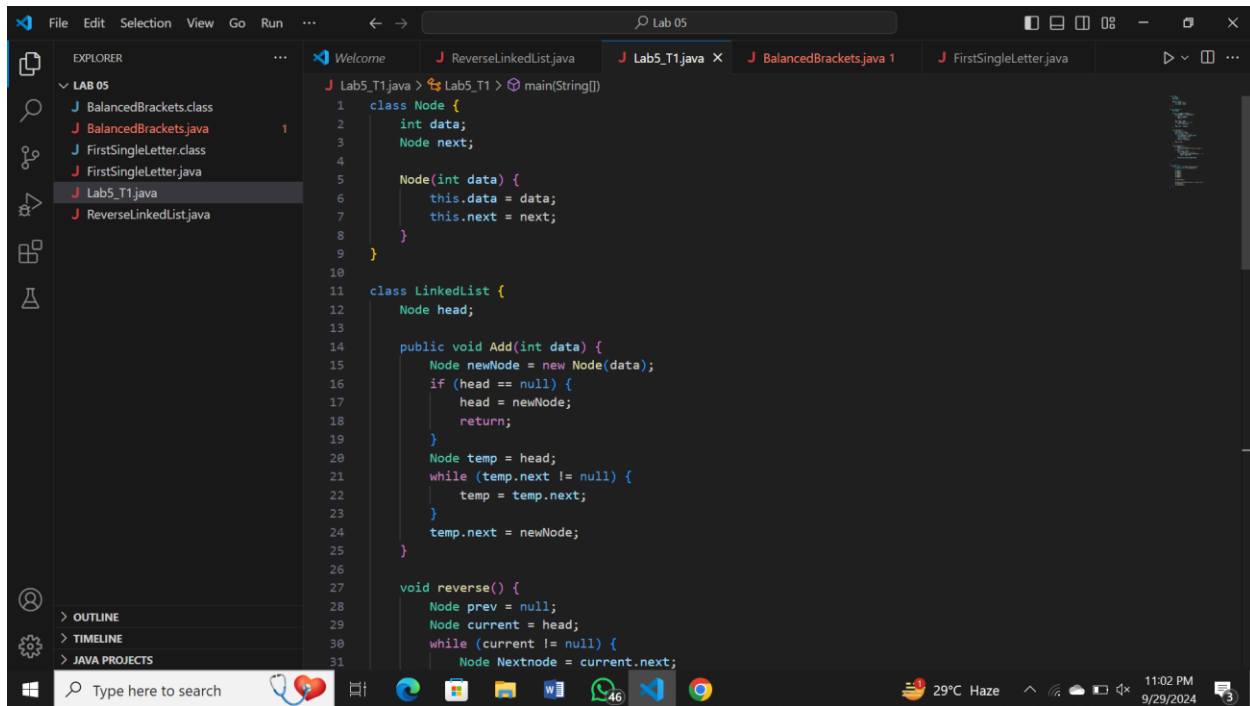
FAHEEM AKBAR

CMS ID: 023-23-0365

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Sukkur IBA University

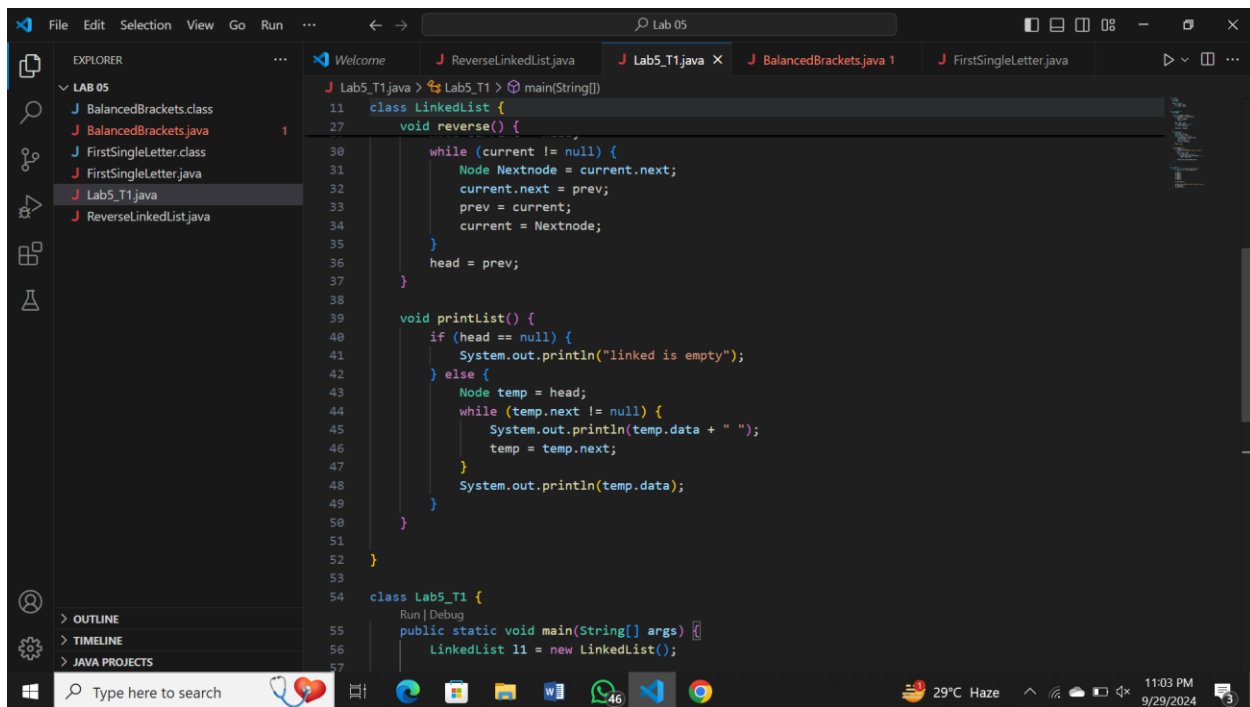


1. Print in reverse order: You are asked to design a method in linked list to print data in reverse order. You don't need to reverse linked list permanently.



The screenshot shows an IDE with a project named 'LAB 05'. The Explorer pane on the left lists files: 'BalancedBrackets.class', 'BalancedBrackets.java', 'FirstSingleLetter.class', 'FirstSingleLetter.java', 'Lab5_T1.java', and 'ReverseLinkedList.java'. The main editor displays the code for 'Lab5_T1.java'. It defines a 'Node' class with 'data' and 'next' attributes, and a 'LinkedList' class with a 'head' attribute. The 'Add' method in 'LinkedList' appends new nodes. The 'reverse' method is implemented by traversing the list and reversing the 'next' pointers. The 'main' method creates a linked list with values 1, 2, 3, 4, 5 and calls the 'reverse' method.

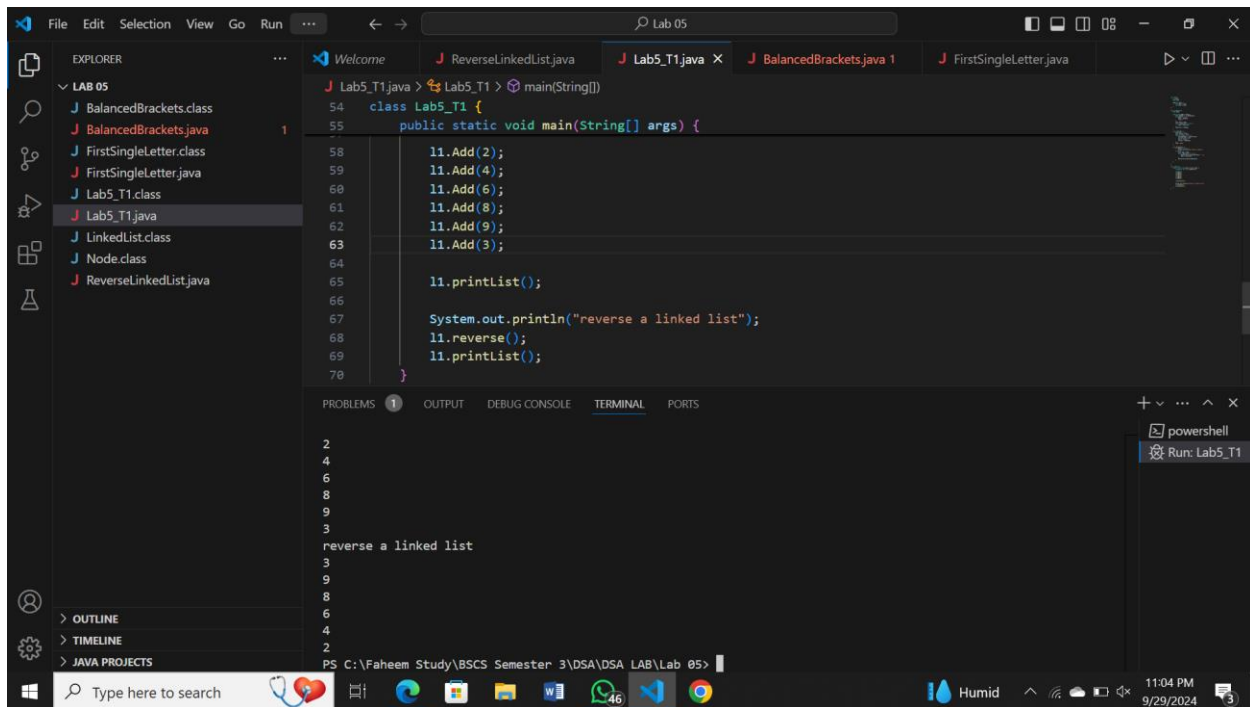
```
1 class Node {
2     int data;
3     Node next;
4
5     Node(int data) {
6         this.data = data;
7         this.next = next;
8     }
9 }
10
11 class LinkedList {
12     Node head;
13
14     public void Add(int data) {
15         Node newNode = new Node(data);
16         if (head == null) {
17             head = newNode;
18             return;
19         }
20         Node temp = head;
21         while (temp.next != null) {
22             temp = temp.next;
23         }
24         temp.next = newNode;
25     }
26
27     void reverse() {
28         Node prev = null;
29         Node current = head;
30         while (current != null) {
31             Node Nextnode = current.next;
```



The screenshot shows the same IDE with the 'Lab5_T1.java' file. The 'reverse' method is now complete, reversing the 'next' pointers and updating the 'head' to the new first node. A new 'printList' method is added, which prints the data of each node in the order they appear in the list. The 'main' method is also updated to call 'printList' after reversing the list.

```
32         Node Nextnode = current.next;
33         current.next = prev;
34         prev = current;
35         current = Nextnode;
36     }
37     head = prev;
38 }
39
40 void printList() {
41     if (head == null) {
42         System.out.println("linked is empty");
43     } else {
44         Node temp = head;
45         while (temp.next != null) {
46             System.out.println(temp.data + " ");
47             temp = temp.next;
48         }
49         System.out.println(temp.data);
50     }
51 }
52
53 class Lab5_T1 {
54     public static void main(String[] args) {
55         LinkedList l1 = new LinkedList();
56         l1.Add(1);
57         l1.Add(2);
58         l1.Add(3);
59         l1.Add(4);
60         l1.Add(5);
61         l1.reverse();
62         l1.printList();
63     }
64 }
```

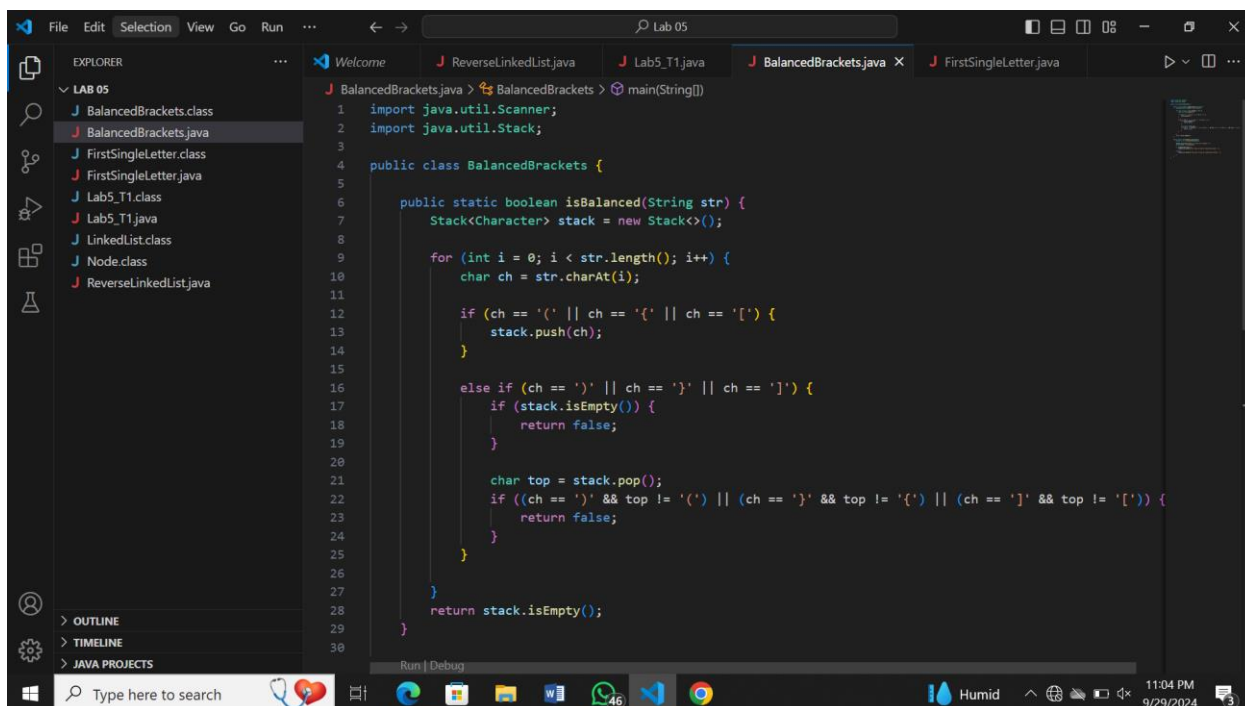
Output:



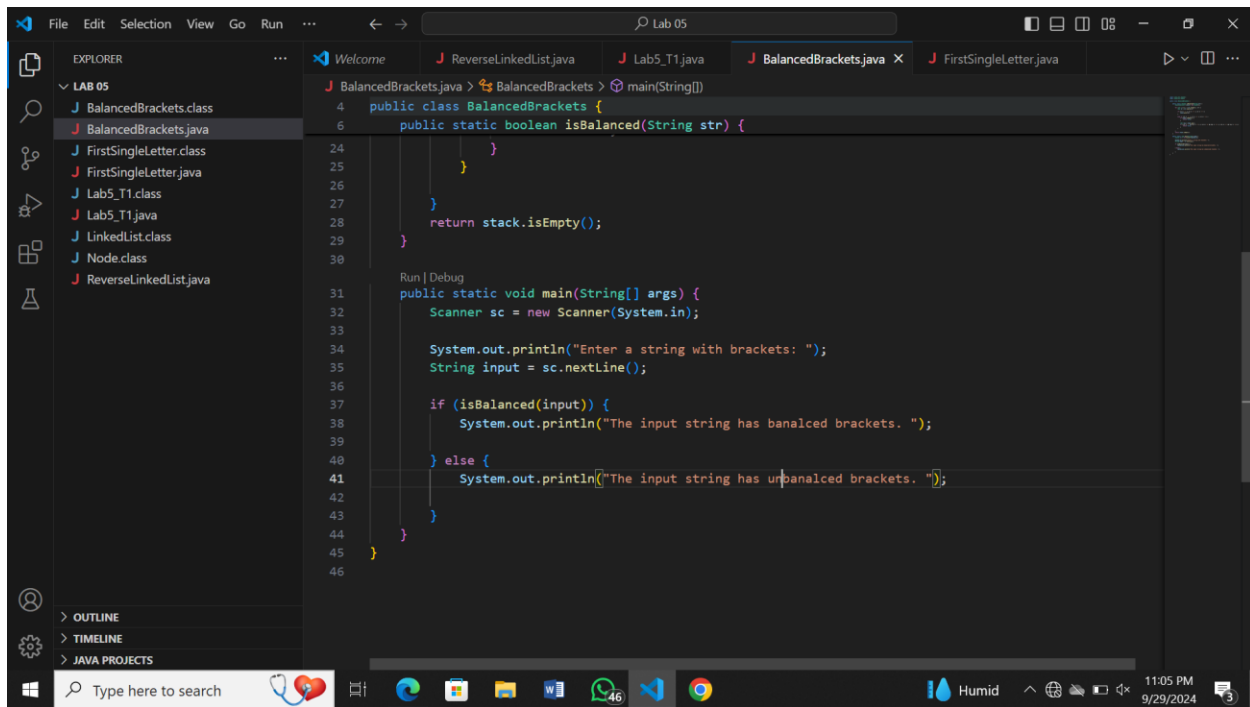
```
54 class Lab5_T1 {
55     public static void main(String[] args) {
58         11.Add(2);
59         11.Add(4);
60         11.Add(6);
61         11.Add(8);
62         11.Add(9);
63         11.Add(3);
64
65         11.printList();
66
67         System.out.println("reverse a linked list");
68         11.reverse();
69         11.printList();
70     }
}
```

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3
reverse a linked list
3
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4
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```

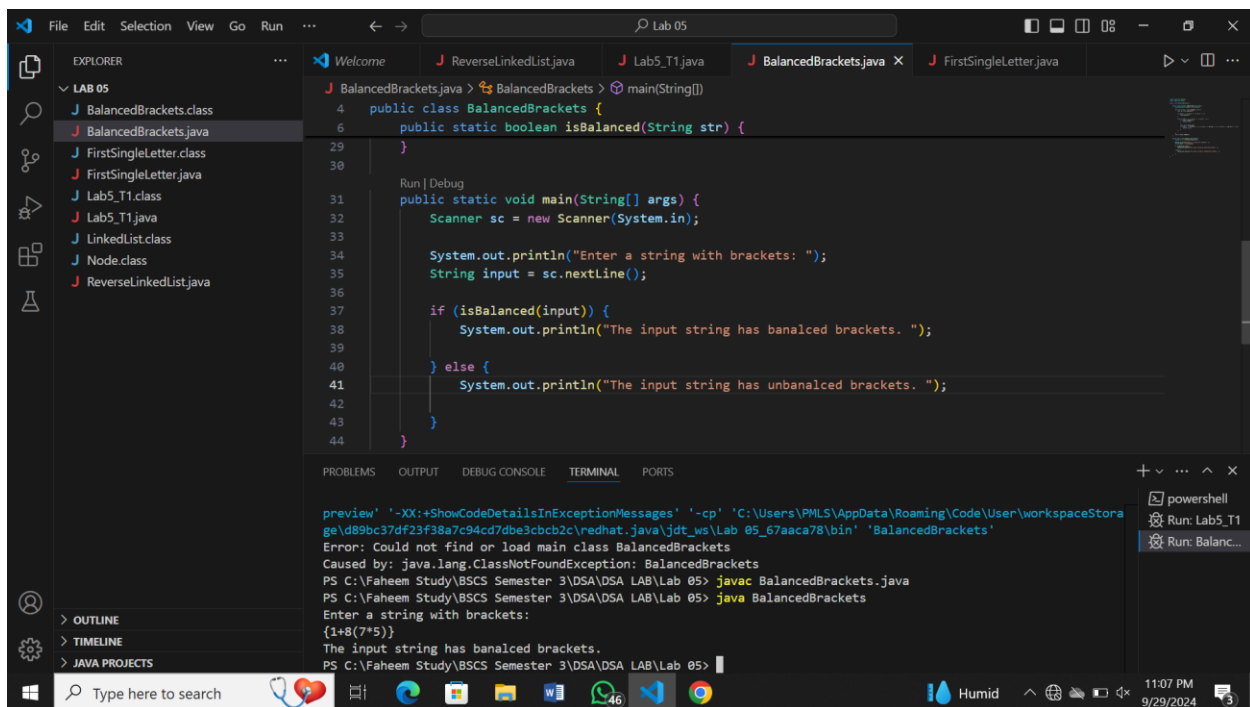
2. **Balanced Brackets:** Take user string input and check whether it's balanced or not. Use stack functions. Input may contain any of the bracket among {, [, (and any number and letters like: $\{([a+b]+c)-1\}$ and so on



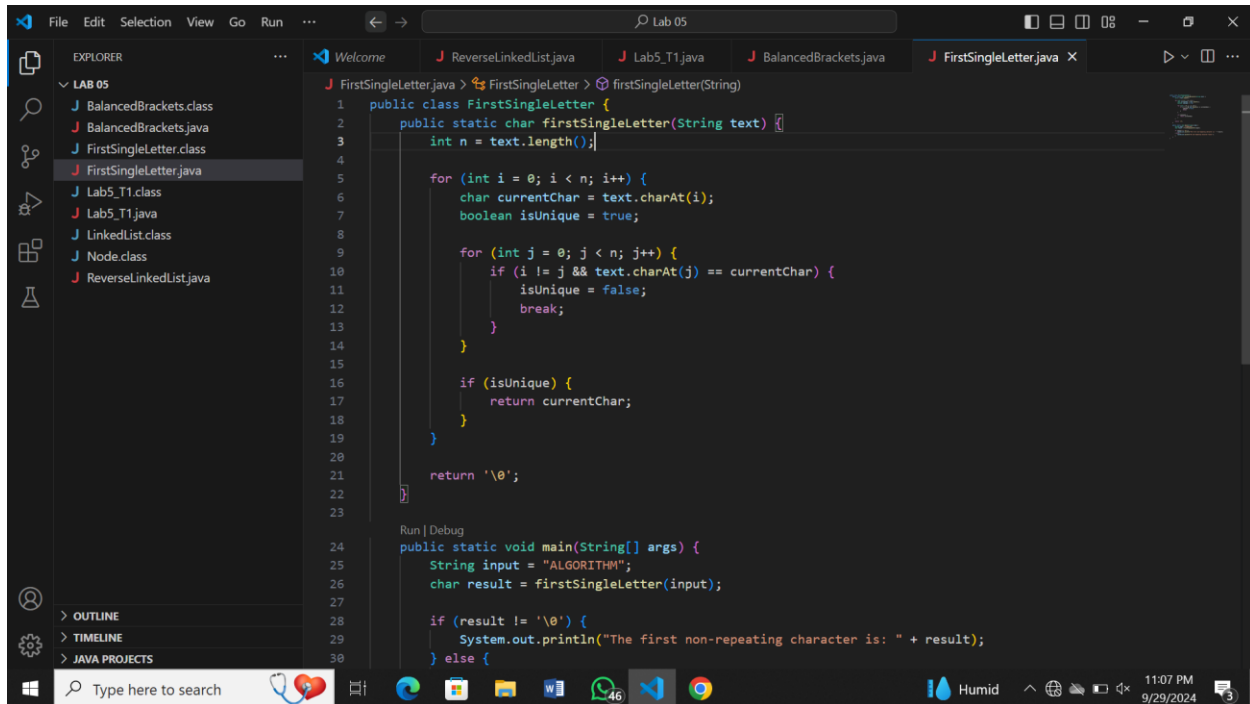
```
1 import java.util.Scanner;
2 import java.util.Stack;
3
4 public class BalancedBrackets {
5
6     public static boolean isBalanced(String str) {
7         Stack<Character> stack = new Stack<>();
8
9         for (int i = 0; i < str.length(); i++) {
10             char ch = str.charAt(i);
11
12             if (ch == '(' || ch == '[' || ch == '{') {
13                 stack.push(ch);
14             }
15
16             else if (ch == ')' || ch == ']' || ch == '}') {
17                 if (stack.isEmpty()) {
18                     return false;
19                 }
20
21                 char top = stack.pop();
22                 if ((ch == ')' && top != '(') || (ch == ']' && top != '[') || (ch == '}' && top != '{')) {
23                     return false;
24                 }
25             }
26
27             return stack.isEmpty();
28         }
29     }
30 }
```



Output:



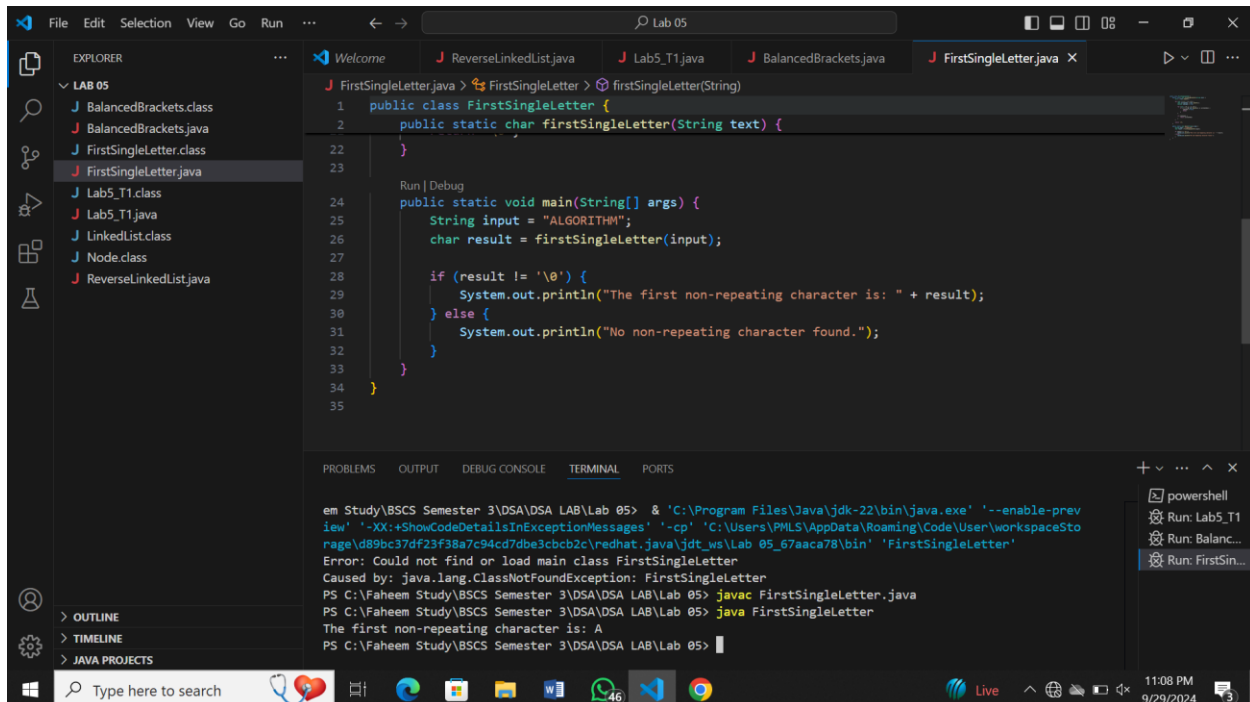
3. FirstSingleLetter: Create the function char firstSingleLetter (const char text [], const int n) which finds and returns the first letter of text that occurs only once. n is the number of characters in the text



The screenshot shows a code editor with the following code in FirstSingleLetter.java:

```
1 public class FirstSingleLetter {
2     public static char firstSingleLetter(String text) {
3         int n = text.length();
4
5         for (int i = 0; i < n; i++) {
6             char currentChar = text.charAt(i);
7             boolean isUnique = true;
8
9             for (int j = 0; j < n; j++) {
10                if (i != j && text.charAt(j) == currentChar) {
11                    isUnique = false;
12                    break;
13                }
14            }
15
16            if (isUnique) {
17                return currentChar;
18            }
19        }
20
21        return '\0';
22    }
23
24    public static void main(String[] args) {
25        String input = "ALGORITHM";
26        char result = firstSingleLetter(input);
27
28        if (result != '\0') {
29            System.out.println("The first non-repeating character is: " + result);
30        } else {
31            System.out.println("No non-repeating character found.");
32        }
33    }
34 }
35
```

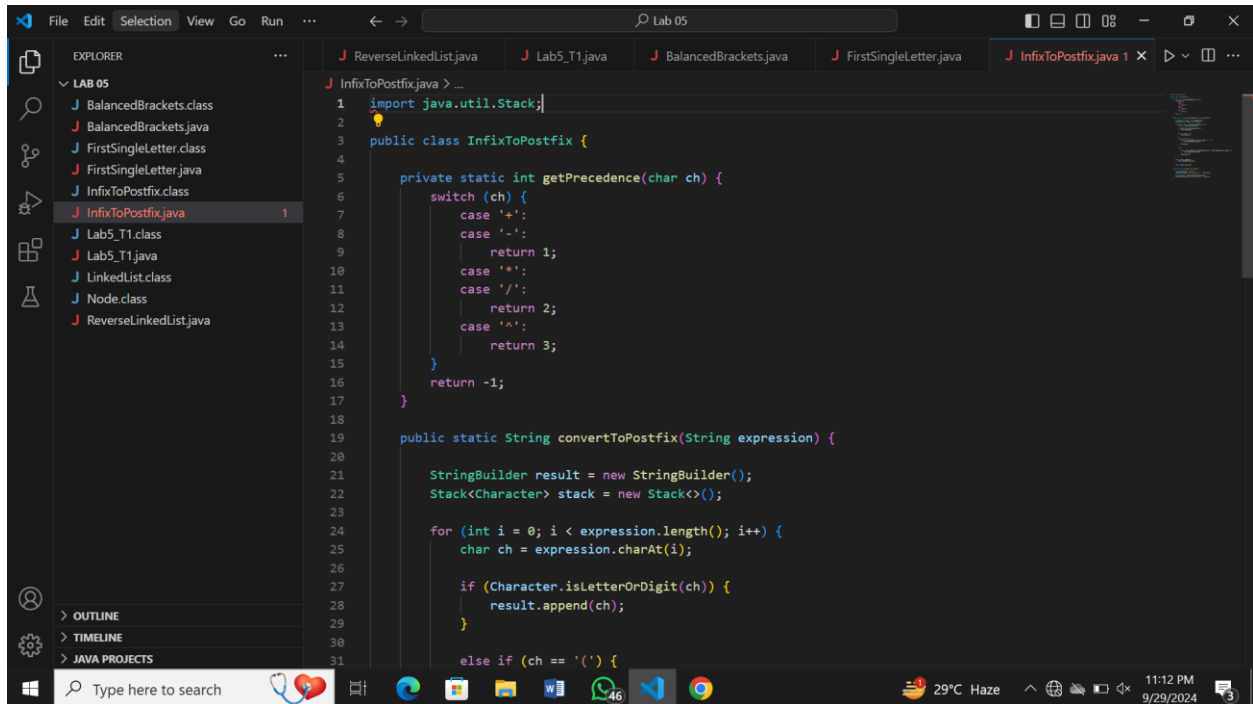
Output:



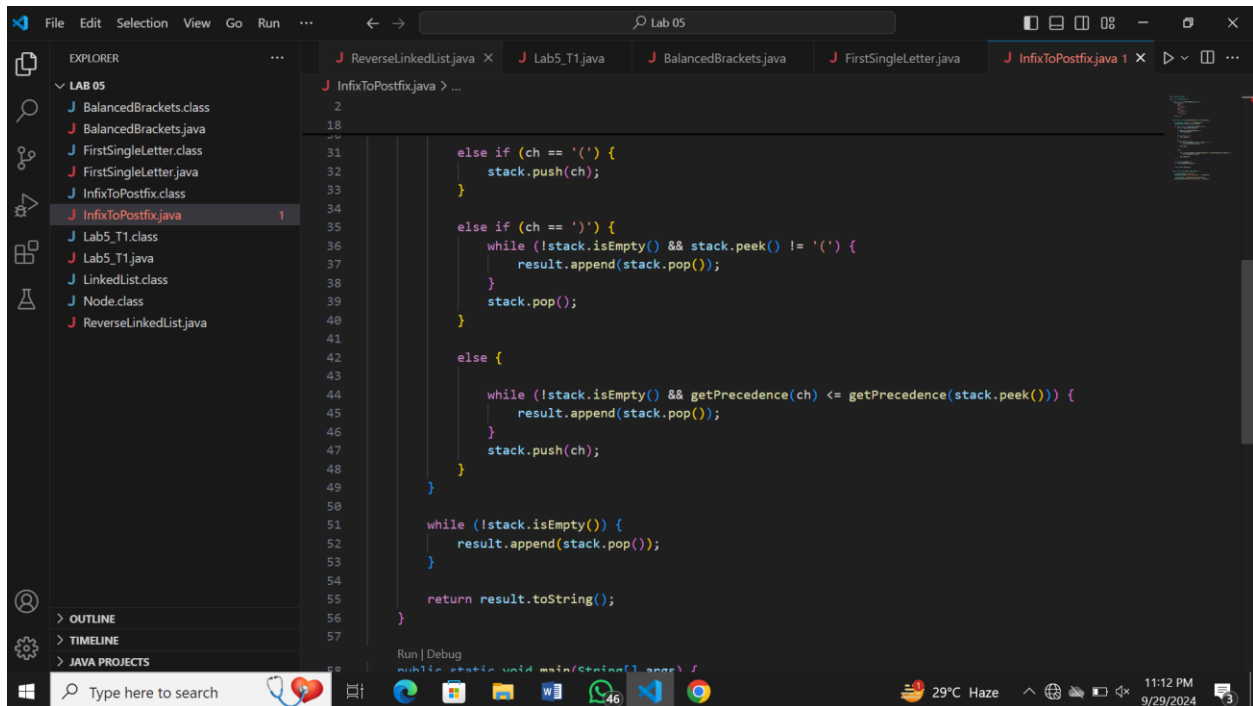
The screenshot shows the same code editor with the terminal output at the bottom:

```
em Study\BSCS Semester 3\DSA\DSA LAB\Lab 05> & 'C:\Program Files\Java\jdk-22\bin\java.exe' '-enable-preview' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\PMLS\AppData\Roaming\Code\User\workspaceStorage\d89bc37df23f38a7c94cd7d0e3cbb2c\redhat.java\jdk_ws\Lab_05_67aaca78\bin' 'FirstSingleLetter'
Error: Could not find or load main class FirstSingleLetter
Caused by: java.lang.ClassNotFoundException: FirstSingleLetter
PS C:\Faheem Study\BSCS Semester 3\DSA\DSA LAB\Lab 05> javac FirstSingleLetter.java
PS C:\Faheem Study\BSCS Semester 3\DSA\DSA LAB\Lab 05> java FirstSingleLetter
The first non-repeating character is: A
PS C:\Faheem Study\BSCS Semester 3\DSA\DSA LAB\Lab 05>
```

4. Convert Infix expression to Postfix expression using Stack data structure.



```
1 import java.util.Stack;
2
3 public class InfixToPostfix {
4
5     private static int getPrecedence(char ch) {
6         switch (ch) {
7             case '+':
8             case '-':
9                 return 1;
10            case '*':
11            case '/':
12                return 2;
13            case '^':
14                return 3;
15        }
16        return -1;
17    }
18
19    public static String convertToPostfix(String expression) {
20
21        StringBuilder result = new StringBuilder();
22        Stack<Character> stack = new Stack<>();
23
24        for (int i = 0; i < expression.length(); i++) {
25            char ch = expression.charAt(i);
26
27            if (Character.isLetterOrDigit(ch)) {
28                result.append(ch);
29            }
30
31            else if (ch == '(') {
```



```
32                stack.push(ch);
33            }
34
35            else if (ch == ')') {
36                while (!stack.isEmpty() && stack.peek() != '(') {
37                    result.append(stack.pop());
38                }
39                stack.pop();
40            }
41
42            else {
43                while (!stack.isEmpty() && getPrecedence(ch) <= getPrecedence(stack.peek())) {
44                    result.append(stack.pop());
45                }
46                stack.push(ch);
47            }
48        }
49
50        while (!stack.isEmpty()) {
51            result.append(stack.pop());
52        }
53
54        return result.toString();
55    }
56
57    public static void main(String[] args) {
```

Output:

The screenshot shows an IDE with the following components:

- EXPLORER:** A list of files under 'LAB 05', including 'InfixToPostfix.java' which is selected.
- EDITOR:** Displays the code for 'InfixToPostfix.java'. The code includes a `main` method that takes an expression 'A+B*C+D', prints it, converts it to postfix 'ABC*+D+', and prints the result.
- PROBLEMS:** Shows an error message: 'Error: Could not find or load main class InfixToPostfix'. The message indicates a `ClassNotFoundException` and suggests running `javac InfixToPostfix.java`.
- OUTPUT:** Displays the output of the program: 'Infix Expression: A+B*C+D' followed by 'Postfix Expression: ABC*+D+'.
- TERMINAL:** Shows the command prompt where the user ran `javac InfixToPostfix.java` and `java InfixToPostfix`.

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em Study\BSCS Semester 3\DSA\DSA LAB\Lab 05> & 'C:\Program Files\Java\jdk-22\bin\java.exe' '--enable-prev  
iew' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\PMLS\AppData\Roaming\Code\User\workspaceSto  
rage\d89bc37df23f38a7c94cd7db3c3cb2c\redhat.java\jdt_ws\Lab_05_67aaca78\bin' 'InfixToPostfix'  
Error: Could not find or load main class InfixToPostfix  
Caused by: java.lang.ClassNotFoundException: InfixToPostfix  
PS C:\Faheem Study\BSCS Semester 3\DSA\DSA LAB\Lab 05> javac InfixToPostfix.java  
PS C:\Faheem Study\BSCS Semester 3\DSA\DSA LAB\Lab 05> java InfixToPostfix  
Infix Expression: A+B*C+D  
Postfix Expression: ABC*+D+  
PS C:\Faheem Study\BSCS Semester 3\DSA\DSA LAB\Lab 05>
```

11:11 PM
9/29/2024