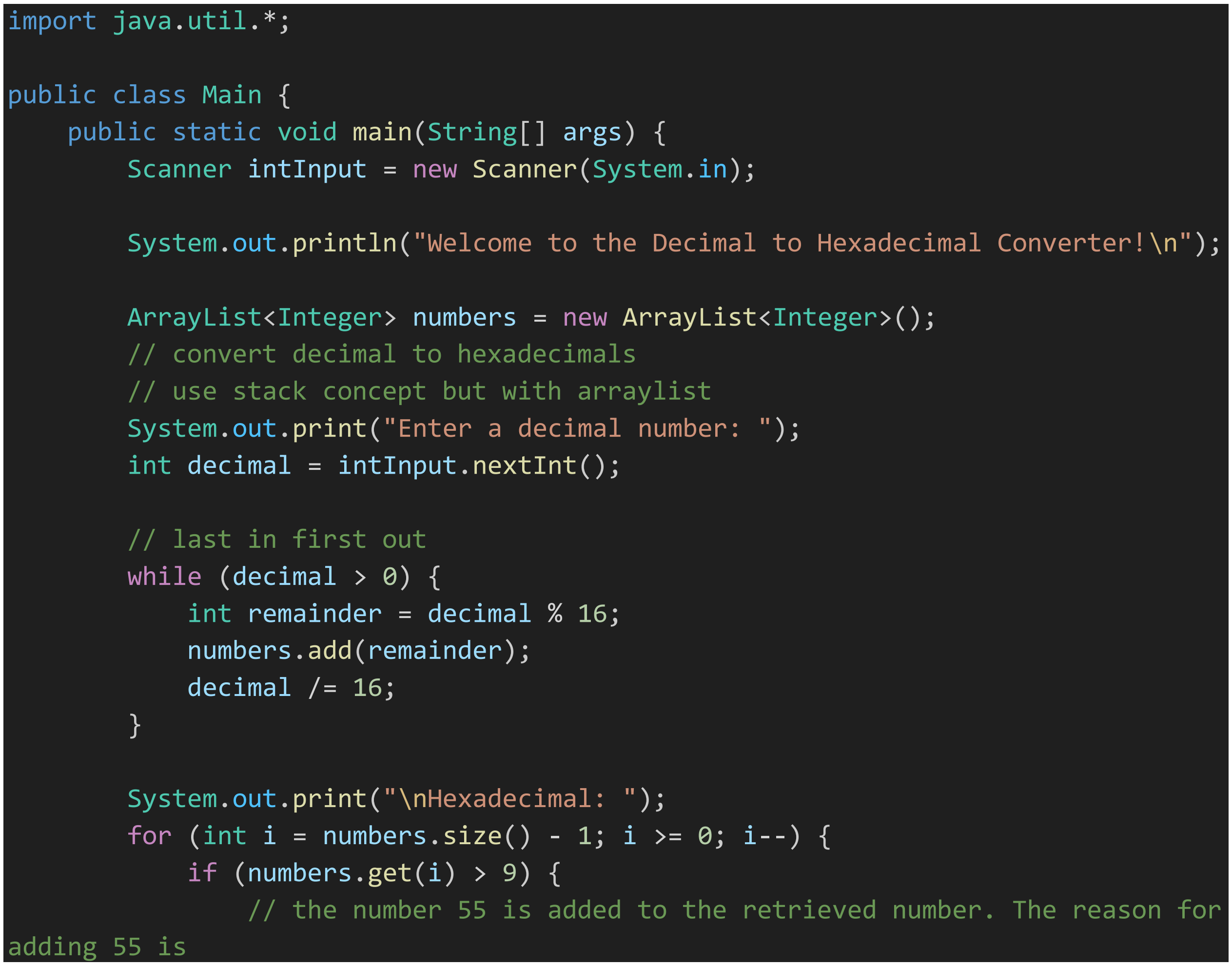
CSC248 – Fundamentals of Data Structure
Academic Session October 2023 – February 2024
Lab Assignment 5 – Stack (BI)

Course Outcomes (CO)	LO1	LO2	LO3
CO1			
CO2	√	√	√
CO3			

1. Write a program to convert the decimal number into hexadecimal number by using stack concept. –(**NOTE:** use built-in `ArrayList` method ONLY)

Example:

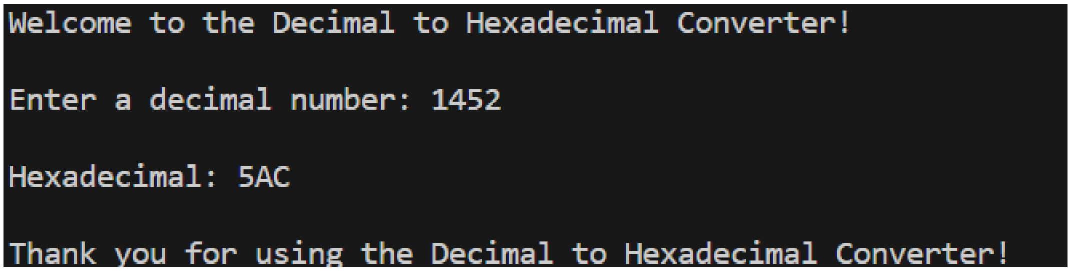
$1452_{10} = 5AC_{16}$



```
import java.util.*;

public class Main {
    public static void main(String[] args) {
        Scanner intInput = new Scanner(System.in);

        System.out.println("Welcome to the Decimal to Hexadecimal Converter!\n");

        ArrayList<Integer> numbers = new ArrayList<Integer>();
        // convert decimal to hexadecimals
        // use stack concept but with arraylist
        System.out.print("Enter a decimal number: ");
        int decimal = intInput.nextInt();

        // last in first out
        while (decimal > 0) {
            int remainder = decimal % 16;
            numbers.add(remainder);
            decimal /= 16;
        }

        System.out.print("\nHexadecimal: ");
        for (int i = numbers.size() - 1; i >= 0; i--) {
            if (numbers.get(i) > 9) {
                // the number 55 is added to the retrieved number. The reason for
adding 55 is
```

```java
                // because in the ASCII table, the character ‘A’ (which represents 10 in
                // hexadecimal) is at position 65. So, if you have a number like 10, adding 55
                // will give you the ASCII value of ‘A’.
                char hex = (char) (numbers.get(i) + 55);
                System.out.print(hex);
            } else {
                System.out.print(numbers.get(i));
            }
        }

        System.out.println();
        System.out.println("\nThank you for using the Decimal to Hexadecimal Converter!");

        intInput.close();
    }
}
```

Sample Output

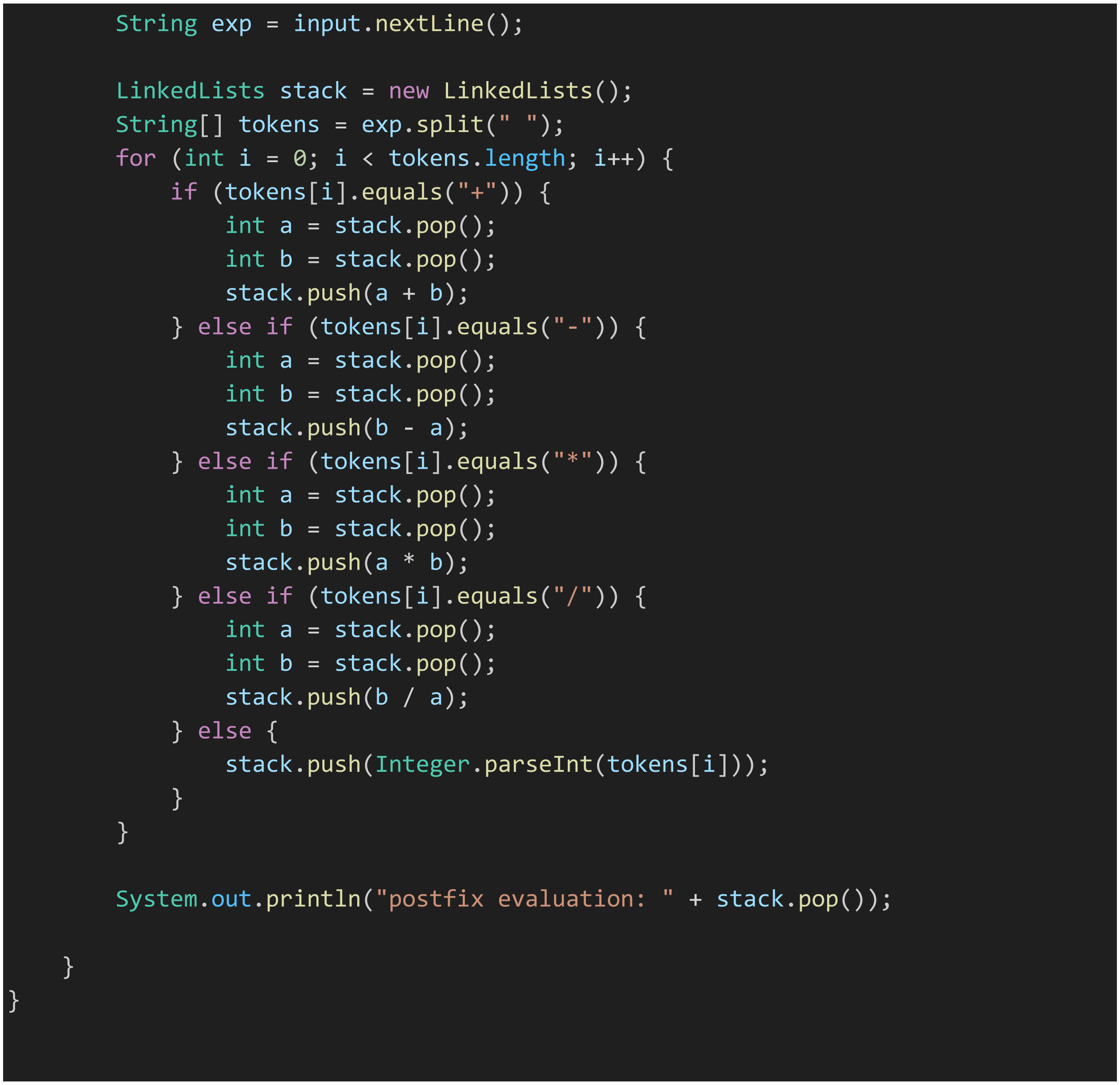


```
Welcome to the Decimal to Hexadecimal Converter!

Enter a decimal number: 1452

Hexadecimal: 5AC

Thank you for using the Decimal to Hexadecimal Converter!
```

2. Write a program to evaluate a postfix arithmetic expression. You **MUST** use User Defined Type(UDT) Linked List

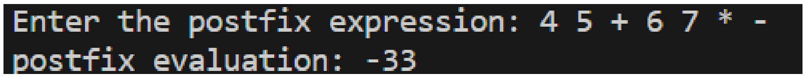
   Example: 2 6 * 3 - / 5 5 * +
   Result : 28

```java
import java.util.Scanner;

class Node {
    int data;
    Node next;
}

class LinkedLists {
    Node top;

    LinkedLists() {
        top = null;
    }

    void push(int data) {
        Node node = new Node();
        node.data = data;
        node.next = top;
        top = node;
    }

    int pop() {
        if (top == null) {
            System.out.println("Stack Underflow");
            return -1;
        } else {
            int temp = top.data;
            top = top.next;
            return temp;
        }
    }
}

public class Main {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter the postfix expression: ");
```



```
        String exp = input.nextLine();

        LinkedLists stack = new LinkedLists();
        String[] tokens = exp.split(" ");
        for (int i = 0; i < tokens.length; i++) {
            if (tokens[i].equals("+")) {
                int a = stack.pop();
                int b = stack.pop();
                stack.push(a + b);
            } else if (tokens[i].equals("-")) {
                int a = stack.pop();
                int b = stack.pop();
                stack.push(b - a);
            } else if (tokens[i].equals("*")) {
                int a = stack.pop();
                int b = stack.pop();
                stack.push(a * b);
            } else if (tokens[i].equals("/")) {
                int a = stack.pop();
                int b = stack.pop();
                stack.push(b / a);
            } else {
                stack.push(Integer.parseInt(tokens[i]));
            }
        }

        System.out.println("postfix evaluation: " + stack.pop());

    }
}
```

Sample Output



```
Enter the postfix expression: 4 5 + 6 7 * -
postfix evaluation: -33
```